

**National Park Service
U.S. Department of the Interior**

**BRYCE CANYON NATIONAL PARK
UTAH**



FIRE MANAGEMENT PLAN

Environmental Assessment/Assessment of Effect

November 2004

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Fire Management Plan and Environmental Assessment

BRYCE CANYON NATIONAL PARK

SUMMARY

The National Park Service (NPS) proposes to develop a new Fire Management Plan for Bryce Canyon National Park, Utah. The plan would guide the wildland fire program by providing management direction that would support the accomplishment of resource management and protection objectives.

Fuel loadings and vegetation densities have increased in some areas beyond their range of natural variability. Some park developed areas, adjacent public developed areas and adjacent federal lands are now at risk. Increased management intervention is required to reduce fuels that, under severe burning conditions, could threaten life and property, and to restore the role of fire as a natural disturbance across the Bryce Canyon National Park landscape.

The current 1994 fire plan permits prescribed fires to meet resource objectives, as well as limited manual hazardous fuels treatments involving cutting and thinning to establish defensible space around values to be protected. All wildland fires are currently suppressed.

The revised Fire Management Plan would provide strategies that include suppression of unwanted wildland fires, expanding opportunities for increasing the use of prescribed fire to meet resource objectives and improving fuel reduction treatments (mechanical fuel reduction and prescribed fire) that would enhance defensibility around structures.

The fire management plan that will be developed from this environmental assessment will be an interagency plan with the USFS. The Fire Management Plan (FMP) provides a framework for joint management of wildland and prescribed fire as tools to safely accomplish both resource protection and resource management objectives on USFS and NPS lands. The lands include those administered by Bryce Canyon National Park, Cedar Breaks National Monument, Powell and Cedar City Ranger Districts, Dixie National Forest in southern Utah. The (FMP) is an Appendix to Bryce Canyon National Park's and Cedar Breaks Resource Management Plan (RMP) and a supplement to the Dixie National Forest's Land and Resource Management Plan (LRMP). This environmental assessment is just for lands administered by Bryce Canyon National Park.

Two alternatives, a no-action and a proposed action/preferred alternative, were identified based on program goals and objectives; internal and external scoping; guidance from existing park plans; policy guidance from the NPS; the 2001 Federal Fire Policy; the National Fire Plan; and research, monitoring, and experience from the existing fire management program.

Alternative A (No Action): Current fire management calls for suppression of all wildland fires throughout the park. Fire is considered an unacceptable risk. Fuel loading and ladderling can present a problem to fire suppression efforts, so strategies such as firebreak construction,

prescribed fire, and mechanical thinning (in wildland urban interface areas only) are employed as necessary to reduce fuel hazards throughout the park. Prescribed fire may be used to reduce fuels, discourage exotic species, or otherwise fulfill resource management or research objectives.

Alternative B (Proposed Action/NPS Preferred Alternative): The proposed action would allow for implementation of the full range of fire management activities, including wildland fire use and fuels management. Wildland fire activities would include suppression and use of wildland fire for resource benefit. Fuels management activities would include prescribed fire, and mechanical and herbicide treatments. The main focus of these activities and treatments as currently emphasized by national policy is public and firefighter safety, communities identified as at risk from wildland fires (wildland urban interface), historic fire regime, current condition class, and collaboration with other agencies and stakeholders.

NOTE TO REVIEWERS AND RESPONDENTS

This environmental assessment is available on the Bryce Canyon National Park Internet Web site at <http://www.nps.gov/brca/> and is being distributed for public and agency review and comment for a period of 30 days in accordance with the National Environmental Policy Act. If you wish to comment on the environmental assessment, you may mail comments to the name and address below.

Our practice is to make comments, including names and home addresses of respondents, available for public review during regular business hours. Individual respondents may request that we withhold their home address from the record, which we will honor to the extent allowable by law. **If you wish us to withhold your name and/or address, you must state this prominently at the beginning of your comment.** We will make all submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, available for public inspection in their entirety.

Please send comments by December 24, 2004 to:

**Superintendent
Attn: Fire Management Plan/EA
Bryce Canyon National Park
P.O. Box 170001
Bryce Canyon, UT 84717**

**Or email: brca_superintendent@nps.gov
Subject: Fire Management Plan/EA**

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INTRODUCTION

Purpose and Need

The purpose of fire management planning at Bryce Canyon National Park (hereafter “Bryce Canyon” or “the park”) is to protect and conserve the natural and cultural resources of the park for the enjoyment of present and future generations. This includes perpetuation of the ecosystem in which these resources occur. Fire management is a tool used to maintain and/or restore ecological integrity. Fire management is also intended to protect human life and property, both public and private.

Historically, fire has played an important role in the ecological development of the landscape we know today in and around Bryce Canyon. Naturally occurring fire on this landscape periodically and, in most vegetation types, frequently thinned vegetation. These naturally occurring fires reduced and maintained fuel loads at low levels, such that most ignitions had few long-term adverse impacts. Over time, continued suppression of natural fire has resulted in the accumulation of fuels, creating potentially hazardous conditions that threaten human lives and personal property. These conditions also threaten the natural functions of healthy ecosystems by altering natural vegetation.

The current Fire Management Plan (FMP) was revised in 1994. In that planning effort, the National Park Service (NPS) identified management options that included prescribed fire and fire suppression. However, our understanding and management of fire has evolved over time, recognizing the role of fire in sustaining healthy ecosystems. Therefore, a new FMP is needed to implement new NPS policies developed from these experiences. Priorities within the new policy focus first on the protection of human life. The second priority focuses equally on the protection of resource values and property. This new policy provides direction for park managers to use fire as a tool in maintaining natural processes and vegetation community structure.

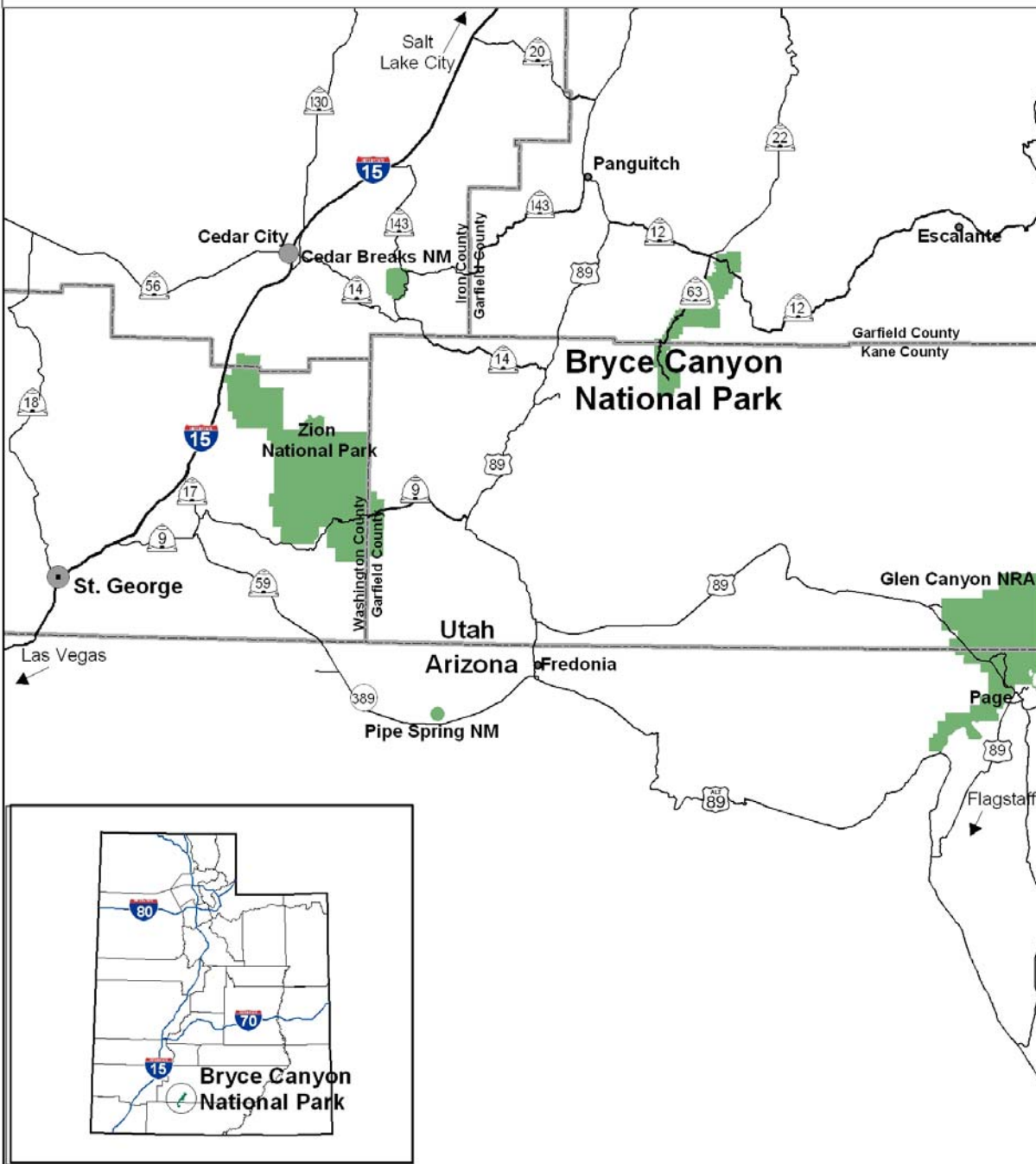
Location and Description

Bryce Canyon National Park is located on the western edge of the Colorado Plateau (Refer to Map A). The park lies in portions of two counties in Utah — Garfield and Kane Counties. The entrance of the park is approximately 210 miles southeast of Salt Lake City, Utah.

The park is located on the southeast escarpment of the Paunsaugunt Plateau where the plateau breaks abruptly to the east and south in a series of steep walls and slopes. The park is composed of numerous natural amphitheaters cut into the Pink Cliffs formation on this eastern side of the plateau. There is great contrast between the colorful lowlands along the eastern flank of the park and timbered hillsides and tablelands to the west. Elevations range from 6,580 feet to 9,115 feet above sea level.

Most of the land surrounding Bryce Canyon National Park is federally owned and managed by the U.S. Forest Service (USFS) as part of the Powell Ranger District of Dixie National Forest. The Bureau of Land Management (BLM) manages land along the northern and northeastern park boundaries. Remaining land in the area is owned by the State of Utah and private landowners (Map B).

Map A: General Location



Projection: Transverse Mercator
UTM Coordinate System, Zone 12
Datum: NAD 1983

Map Produced By
Bryce Canyon NP
Fire Management



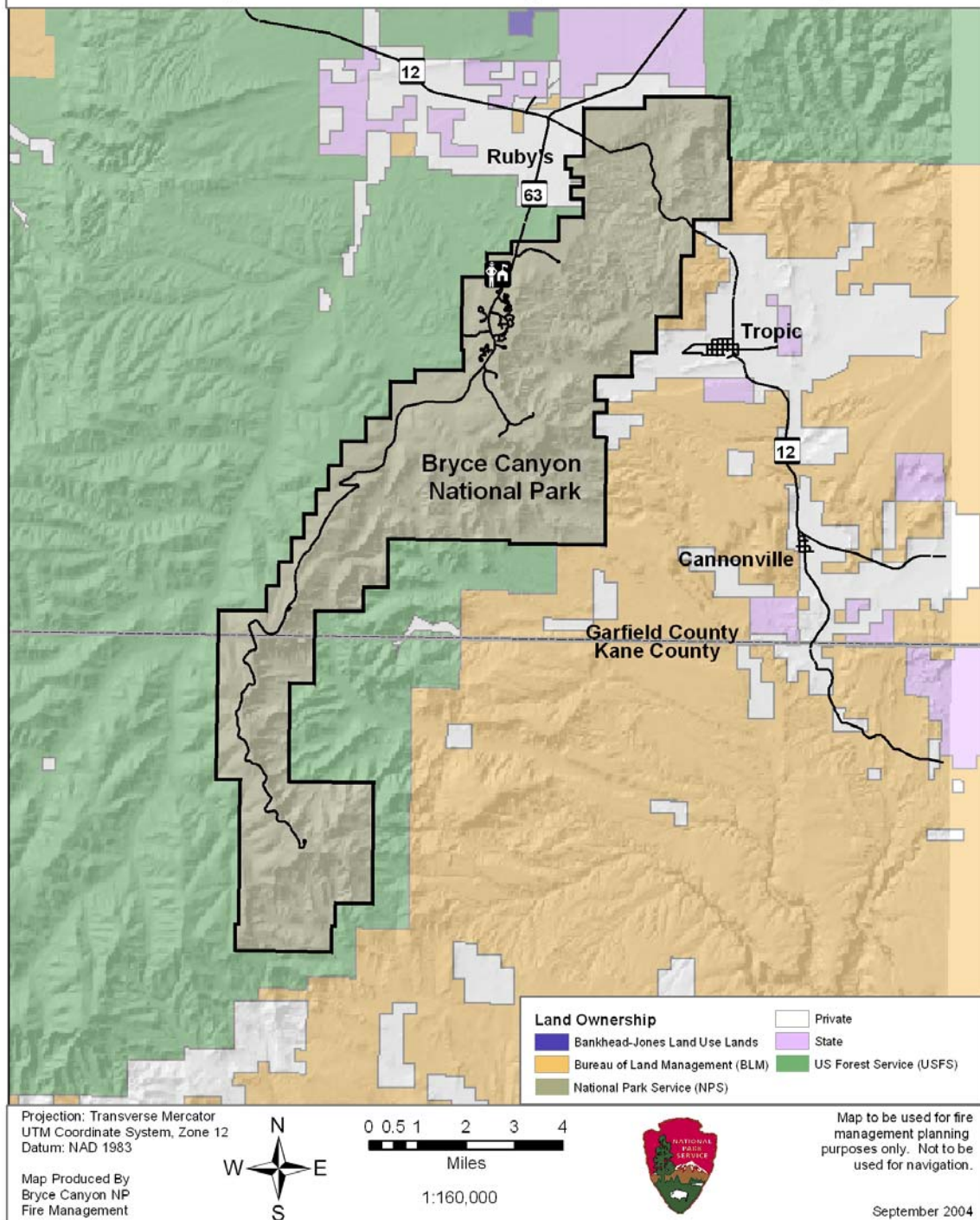
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Map to be used for fire
management planning
purposes only. Not to be
used for navigation.

September 2004

Map B: Surrounding Land Ownership



Historical Perspective of Fire

Land Use History

Based on the existing archaeological record, the area within and surrounding Bryce Canyon has been occupied by humans for over 9,500 years. There is evidence that prehistoric human inhabitants hunted game and gathered native vegetation throughout the area. They later cultivated vegetables to supplement their diet. There is speculation that they used fire to manipulate vegetation during these activities, although no definitive evidence exists. This subject continues to be researched and debated.

In 1776 Fathers Dominguez and Escalante, and in 1841 Osborne Russell (a fur trapper), noted that indigenous people deliberately burned grasslands in central Utah. Also, both the Navajo and the Ute are known to have employed deliberate burning to reduce hazards, and improve the habitat and hunting grounds for game species (Stewart 1953). John Wesley Powell (1879) stated that the primary obstacle to the forests occupying their full potential range in Utah was the frequent fires ignited by Indians.

The Bryce Canyon National Park Wildland Fire Management Plan (1994) describes the arrival of Euro-americans and subsequent fire suppression as:

"After the 1870's the activities of man interrupted the natural fire interval and patterns of burning. Livestock grazing reduced the light fuels that had historically carried fires in the forests and interspersed meadows. Even though there were probably no efforts to control naturally caused fires between the 1870's and early 1900's the frequency of fires and the area burned decreased due to the decrease of perennial grasses, which provided flash fuels.

After 1905 when the Forest Service began managing the forests on the plateau, active fire suppression began in earnest. A full fire suppression policy has continued to the present under the management of the National Park Service. Fire no longer plays the ecological role it once did in the forests of the Paunsaugunt Plateau, particularly in Bryce Canyon National Park."

Documented Wildland Fires

Wildland fires are any non-structural fire, other than a prescribed fire, that occurs in the wildland. This term encompasses fire previously called both wildfire and prescribed natural fire. Records of wildland fire occurrences in the park prior to the 1940s either do not exist or are incomplete. Beginning in 1940, wildland fires were better documented. In 1974, an official database was implemented across the NPS to increase the accuracy of fire documentation.

Over the past 30 years (1973-2003) the park has averaged 4 fires annually. Based on submitted DI-1202 Fire Reports, 122 fires occurred in the park during that time. A fire history summary for the park can be found in Appendix A and is shown on Map C.

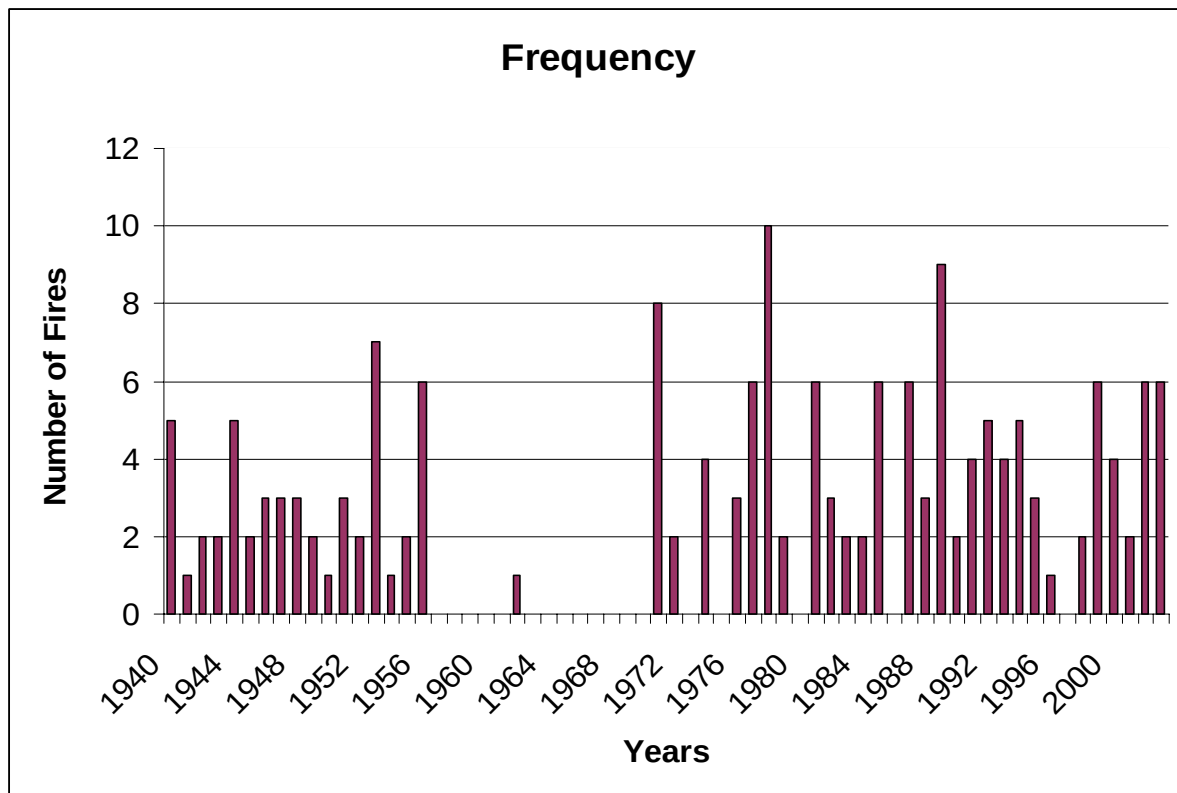
Table 1 summarizes wildland fire activity from 1940 to 2003. Figure 1 displays fire frequency based on all documented wildland fires since 1940.

Table 1: Summary of Wildland Fires 1940 to 2002				
Decade	Total number of fires	Number of ALL fires less than 5 acres	Number of ALL fires greater than 5 acres	Acres of suppressed wildland fire
1940-1949	28	27	1	14
1950-1959*	22	22	0	9

1960-1969 *	1	1	0	0
1970-1979 *	35	35	0	14
1980-1989	37	36	1	17
1990-1999	32	31	1	20
2000-2003	18	17	1	10
TOTAL	174	170	4	81

* Fire records are missing for the period from 1957-1961, and 1963-1970

Figure 1: Fire Frequency Since 1940 (based on completed fire reports)

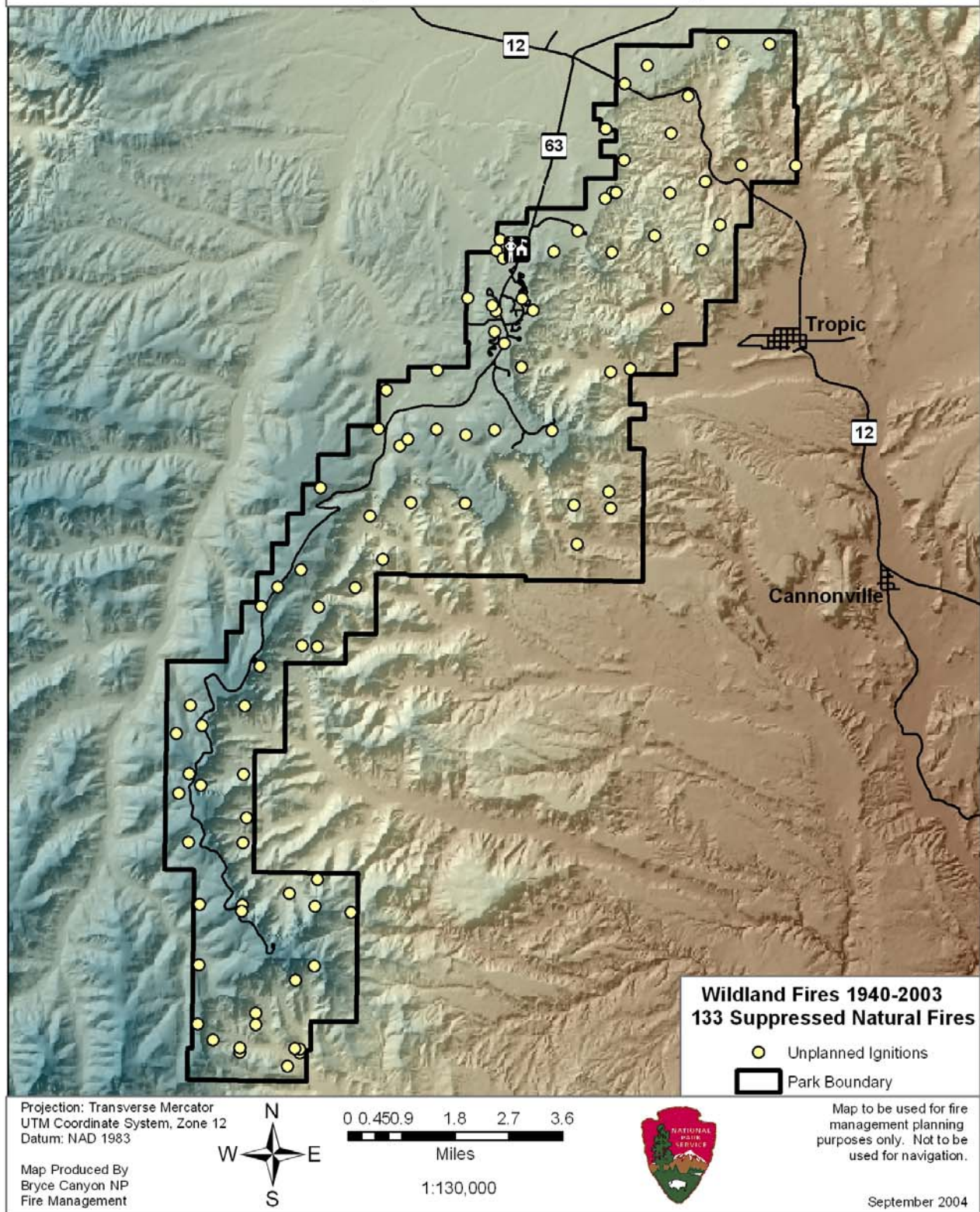


Fire History Studies in the Southwestern United States

The following fire history studies may provide a range of fire frequencies that occurred naturally in vegetation types that are similar to those in Bryce Canyon.

- A Great Basin National Park study conducted in pinyon-juniper woodlands evaluated 32 tree samples. The data showed a complex and variable fire history that largely took place before 1860 and varied considerably depending on aspect, topography, and ignition source. The study found that the fire return intervals ranged from 15 to 53 years in the pinyon-juniper woodlands. This study further showed that the fire frequencies of individual trees varied from 19 to 46 years (Gruell 1994).
- A Mesa Verde National Park study conducted in pinyon-juniper vegetation types found a fire return of approximately 400 years and a fire return interval of approximately 100 years in the petran chaparral community (Floyd et al. 2000).

Map C: Fire History



- The Rito de Los Frijoles group 1 study conducted on the Jemez Mountain Range in northern New Mexico examined 9 samples. When Swetnam and Basin (1996) further analyzed the data, they found an average fire return interval of 7 years in a ponderosa pine/pinyon-juniper forest ranging in elevation from 6,660 to 6,750 feet. This same analysis examined fires that were recorded by 25 percent or more of the trees in the sample and found a fire interval between 8 and 24 years, with an average of 16 years.
- A study conducted at Walnut Canyon National Monument in northern Arizona analyzed 18 tree samples. When Swetnam and Basin (1996) further analyzed the data they found an average fire return interval of 3 years in a ponderosa pine/pinyon-juniper forest ranging in elevation from 6,660 to 6,800 feet. This same analysis looked at fires that were recorded by 25 percent or more of the trees in the sample and found a fire interval between 1 and 12 years, with an average of 6 years.
- The Mesita Blanca study conducted at El Malpais National Monument in central New Mexico evaluated 26 tree samples. When Swetnam and Basin (1996) further analyzed the data, they found an average fire return interval of 8 years in a ponderosa pine/pinyon-juniper forest ranging in elevation from 7,370 to 7,420 feet. This same analysis looked at fires that were recorded by 25 percent or more of the trees in the sample and found a fire interval between 8 and 25 years, with an average of 17 years.

A study conducted on the Chuska Mountain Range in northeastern Arizona on the Navajo Indian Reservation assessed 16 samples. When Swetnam and Basin (1996) further analyzed the data, they found an average fire return interval of 3 years in a ponderosa pine/mixed conifer forest ranging in elevation from 8,800 to 8,900 feet. This same analysis looked at fires that were recorded by 25 percent or more of the trees in the sample and found a fire interval between 2 and 14 years, with an average of 8 years.

Fire History Studies in Southern Utah

Other fire history studies in southwest and south central Utah have been completed. The studies did not compare tree ring data across a larger geographic area, limiting the ability to transpose the data onto other landscapes; however, the following studies provide a range of fire frequencies for the general area near Bryce Canyon.

- A fire history study conducted in the late 1980s in primarily ponderosa pine communities with some Douglas fir on the Paunsaugunt Plateau found that the fire return intervals ranged from 15 to 18 years. Fire frequencies of individual trees varied from 19 to 46 years on a sample of 14 trees (Stein 1988).
- Utah State University researchers West and Loope (1977) cored the largest trees in pinyon-juniper woodlands in Zion National Park to determine the time since the last fire. The average was around 160 years. From this and other evidence, they concluded that fire was too infrequent at lower elevations to warrant detailed research at the time, and that fire was significant only at upper elevations.
- West and Madany (1981) conducted an extensive fire history study at Zion National Park. This study not only researched the fire chronology of the upper elevations of the park, but also discussed the role of indigenous use of fire, livestock grazing, and pioneer (historical recorded accounts by early settlers of the region) and suppression of fire. Combined with fewer Paiute ignitions and fire suppression by settlers, fires were removed from the ecosystem, as the NPS continued fire exclusion in the 1920s.

This study found a fire frequency of 4 to 7 years. Sixty-seven of the 123 sample sections contained pith that could be used to calculate the age at which a tree was first scarred. Sixty-four of the trees were ponderosa pine. The remaining three trees were white fir, Douglas fir, and Rocky Mountain juniper. The research derived from this study area fits into the general pattern for studies in other states for ponderosa pine plant communities. Analysis of fire scars found a fire frequency in 12

watersheds of 2.7 to 25 years prior to European settlement, and fires larger than 960 acres occurred nearly every 3 years prior to 1881.

West and Madany cited the following as part of the Zion fire history study.

Snow (1911) surveyed the area around 1911 and commented, "... soil generally gravelly and rocky, ... but supports an excellent growth of grasses, especially good on the west side of the canon [i.e., Horse Pasture Plateau]. The timber in this township is mostly pinon, yellow pine [ponderosa pine], red pine [Douglas fir], and cedar [juniper]; but is mostly scattering."

Alter (1942) cited a description from Priddy Meek's journal. [This description is of the land to the northeast of Zion.] In June of 1852, Priddy described the area as "... Rich soil, plenty of grass and timber ... so that a team and wagon might be driven any place ... We traveled three days amongst this timber, which is of the best quality and clear of underbrush." Their findings seem to indicate that the conversion of ponderosa pine savanna into forest cannot be attributed mainly to the absence of fire as widely believed, but may be due to a host of factors (Madany and West 1984).

Fire History Studies in Bryce Canyon National Park

Ponderosa Pine and Mixed Conifer Studies

Buchanan and Tolman (1983) studied the dendrochronology in Bryce Canyon National Park and found a pre-settlement fire return interval of 4-7 years. This study evaluated 87 fires from 1616 to 1900 and 6 fires after 1900.

Wight (1989) researched the fire history in forests dominated by ponderosa pine within Bryce Canyon. The research focused primarily from the meadow west of the visitor center to East Creek Meadow, which is south of Sunset Campground. The results of this research showed that fire had been very prevalent in the area.

A total of 75 fires occurred on the 22 trees that were sampled. The master fire chronology for the study area was divided into two eras. The historic era occurred prior to 1900, while the suppression era followed. Fire frequency for the historic period was 3.3 years on a sample of 22 trees, while the fire frequency for the suppression era was 9.9 years on a sample of 4 trees. The period between 1750-1900 was characterized by numerous fires, but after this date the fire frequency declined due to grazing activities of the late 1800's and the initiation of suppression actions. Many of the fires that were recorded on the 22 trees were small and affected only a few of the trees. These small fires were more prevalent on the ridge tops and hillsides, while larger fires were more common along the meadows and toe slopes.

Jenkins' (1995) fire history study of the mixed conifer forests of Bryce Canyon found a fire return interval of 7.5 years prior to the 1900s, with an increase to 45 years since the early 1900s. This study was conducted in the southwest portion of the park. Data were collected on a sample of 20 trees, which recorded a total of 53 fires that encompassed a 400-year time frame.

Historical Fire Regimes and Current Condition Classes

In order to understand the connection of documented wildland fires to that of fire history, it is necessary to understand fire regimes. Fire regimes describe historical fire conditions under which vegetation communities have evolved and have been maintained (Hardy et al. 1998). Fire regimes describe the frequency and severity of fire events in vegetation communities. Fire frequency is the average number of years between fires. Severity is the effect of the fire on the dominant overstory vegetation, which can be forest, shrub, or herbaceous. The current condition class (described below) also must be considered in

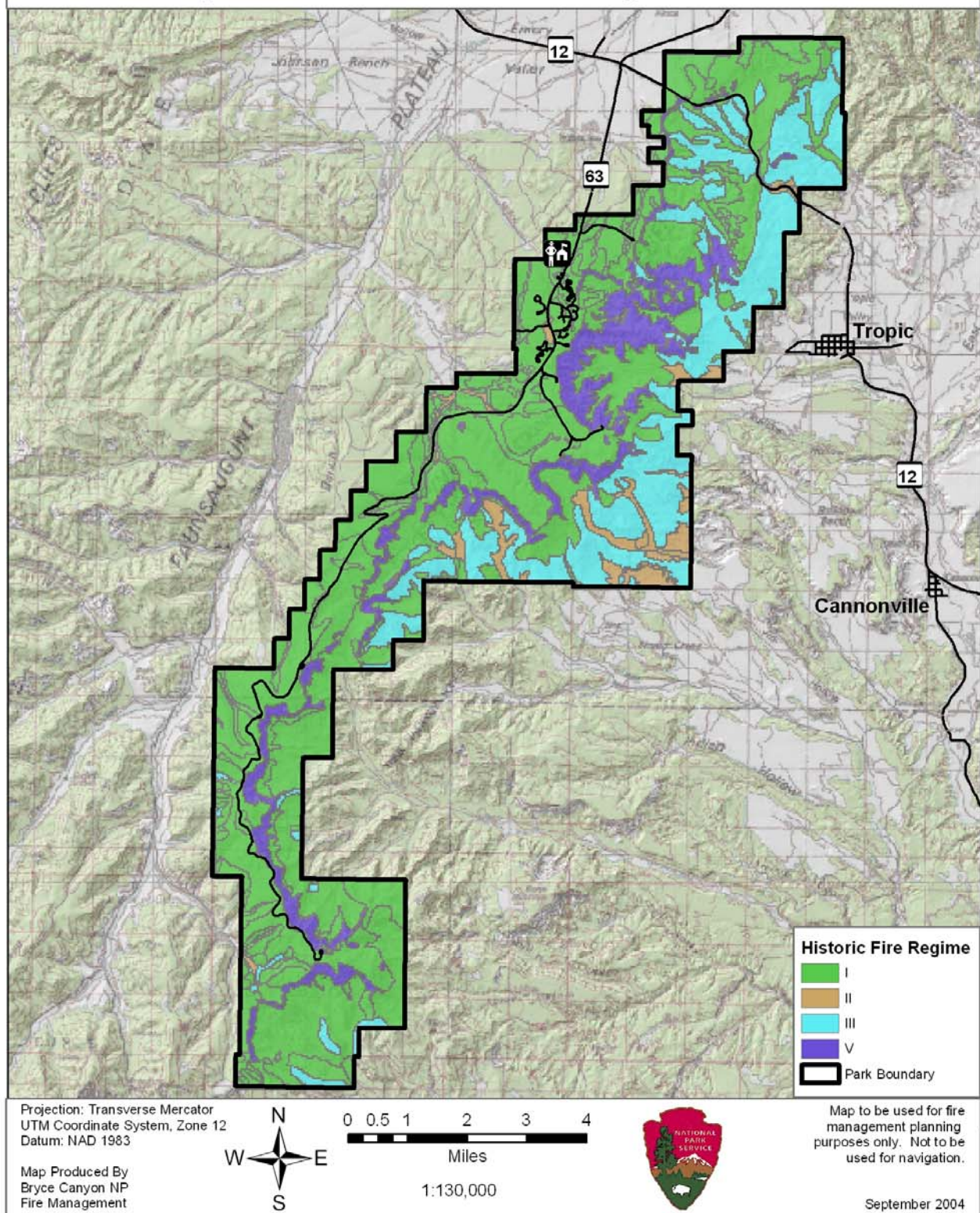
order to understand how these historical fire regimes have been altered though past management practices.

Historical natural fire regime data are not exact reconstructions of historical conditions, being defined as conditions existing before extensive pre-Euro-American settlement (pre-1900), but rather reflect typical fire frequencies and effects that evolved in the absence of fire suppression (Hardy et. al. 1998). This document uses the five regimes as defined by Schmidt et al. (2002) including fire frequency and severity. They modified Heinselman's (1981) seven fire regimes, which were defined by return interval and fire intensity. Schmidt used a methodology similar to that used by Brown and others (1994), who integrated site characteristics, habitat types, topographic attributes, and vegetation types to map fire regimes. Fire frequency and severity measures were used to determine the departure from historical conditions. One or more activities may have caused this departure: fire exclusion, timber harvesting, livestock grazing, introduction and establishment of non-native plant species, introduced insects and disease, or other management activities. Table 2 describes the classification, fire frequency (fire return interval), severity, and class assumptions for modeling or determining the historical fire regime class. Map D displays the historical fire regimes within Bryce Canyon.

Current condition class is a qualitative measure describing the degree of departure from historical fire regimes, possibly resulting in alterations of key ecosystem components such as species composition, structural stage, stand age, canopy closure, and fuel loadings. Data typically show the degree of departure from historical fire regimes. The classification system includes three current condition classes: 1) fire regimes are within an historical range, and the risk of losing key ecosystem components is low; 2) fire regimes have been moderately altered from their historical range and the risk of losing key ecosystem components is moderate; 3) fire regimes have been significantly altered from their historical range and the risk of losing key ecosystem components is high. Table 3 lists the condition class rating, gives a brief description of the fire regime characteristics, and provides example of management options that may be used in maintaining or restoring landscapes. Map E displays the fire regime condition classes within Bryce Canyon.

Table 2: Historical Fire Regime Class Designation			
Historical Fire Regime Class	Fire Frequency (fire return interval)	Severity	Modeling Assumptions
I	0 – 35+ years, frequent	Surface	Open forest or savannah maintained by frequent fire; also includes frequent mixed severity fires that create mosaic of different age post-fire open forest, early to mid-seral forest structural stages, and shrub or herb dominated patches (generally < 100 acres).
II	0 – 35+ years, frequent	Replacement	Shrub or grasslands maintained or cycled by frequent fire; fires kill non-sprouting shrubs, such as sagebrush, which typically regenerate and become dominant within 10 – 15 years; fires remove tops of sprouting shrubs, such as mesquite or chaparral, which typically re-sprout and dominate within 5 years; fires typically kill most tree regeneration, such as juniper, pinyon pine, ponderosa pine, Douglas-fir, or lodgepole pine.
III	35 – 100+ years, infrequent	Mixed	Mosaic of different age post-fire open forest, early to mid-seral forest structural stages, and shrub or herb dominated patches (generally < 100 acres) maintained or cycled by infrequent fire.
IV	35 – 100+ years, infrequent	Replacement	Large patches (generally > 100 acres) of similar age post-fire shrub or herb dominated structures, or early to mid-seral forest cycled by infrequent fire.
V	> 100 – 200 years, infrequent/rare	Replacement	Large patches (generally > 100 acres) of similar age post-fire shrub or herb dominated structures, or early to mid- to late seral forest cycled by infrequent fire.
(Hann and Bunnell 2001)			

Map D: Historical Fire Regime Classes



Map E: Current Condition Classes

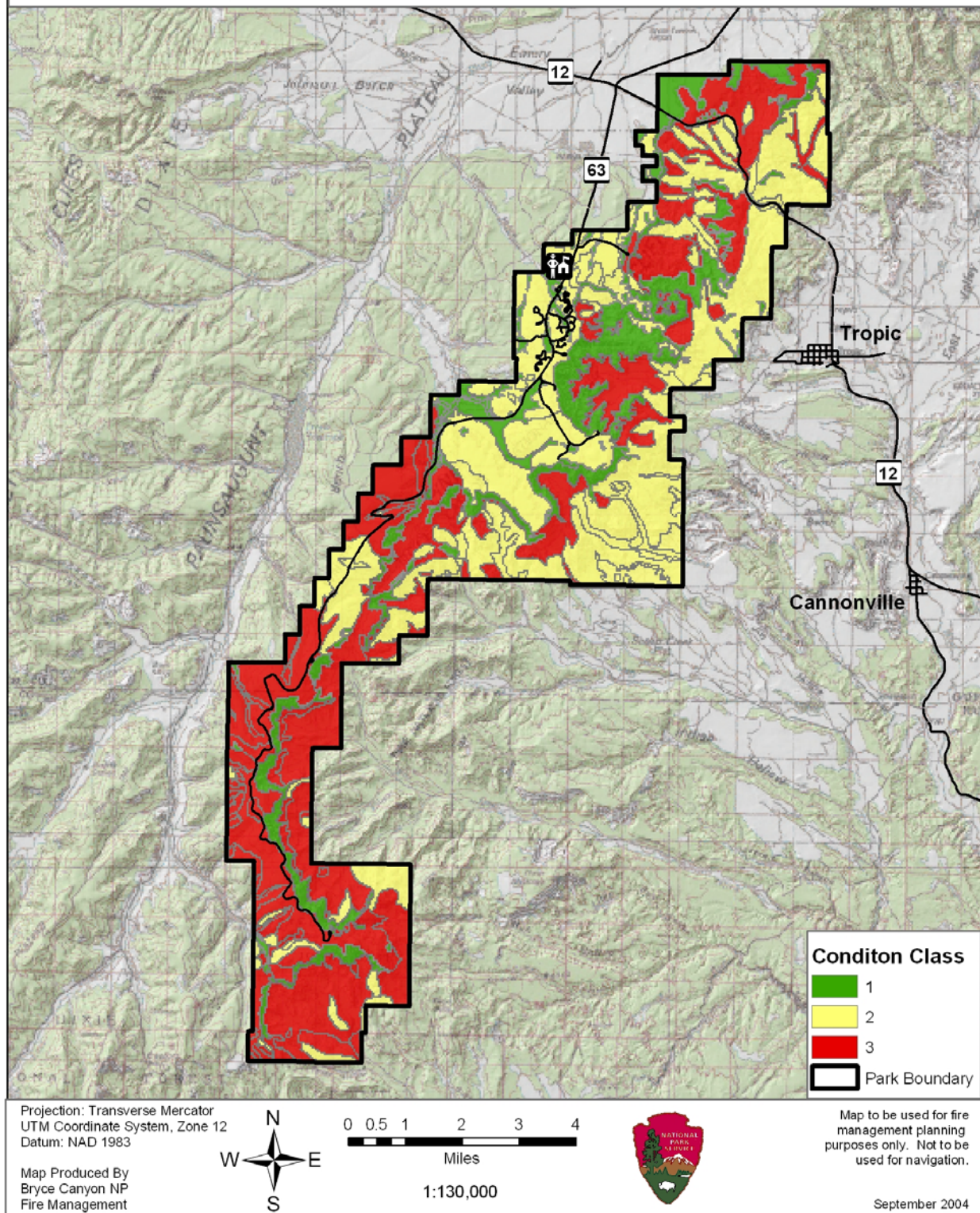


Table 3: Fire Regime Current Condition Class		
Condition Class	Fire Regime	Example Management Options
1	Fire regimes are within historical range, and the risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within historical range.	Where appropriate, these areas can be maintained within the historical fire regime by treatments such as fire use.
2	Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by one or more return intervals (either increased or decreased), resulting in moderate changes to one or more of the following: fire size, intensity and severity, and/or landscape patterns. Vegetation attributes have been moderately altered from their historical range.	Where appropriate, these areas may need moderate levels of restoration treatments, such as fire use and hand or mechanical treatments, to be restored to the historical fire regime.
3	Fire regimes have been significantly altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals, resulting in dramatic changes to one or more of the following: fire size, intensity, severity, and/or landscape patterns. Vegetation attributes have been significantly altered from their historical range.	Where appropriate, these areas may need high levels of restoration treatments, such as hand or mechanical treatments, before fire can be used to restore the historical fire regime.
Fire Regime Current Condition Class is a qualitative measure describing the degree of departure from historical fire regimes, possibly resulting in alterations of key ecosystem components, such as species composition, structural stage, stand age, canopy closure, and fuel loadings. One or more of the following activities may have caused this departure: fire suppression, timber harvesting, livestock grazing, introduction and establishment of non-native plant species, introduced insects or disease, or other management activities (Schmidt, K.M., et. al. 2002).		

Vegetation Communities by Historical Fire Regimes (FR) and Current Condition Class (CC)

The vegetation at Bryce Canyon was mapped through a joint project with the U.S. Bureau of Reclamation, The Nature Conservancy (Nature Serve), and the NPS. Table 4 shows the major vegetation communities by historical fire regime class and current condition class. Table 4 utilizes the vegetation communities described in the *Affected Environment* section, along with the historical fire regime class designation from Table 2. Specific fire history information for some of the vegetation communities at the park has not been developed. The historical fire regime classification is presented here in a general sense to categorize each vegetation type by frequency and severity (refer to the above descriptions of historical fire regime and current condition class).

Table 4: Vegetation Communities by Historical Fire Regime and Current Condition Class			
Vegetation Communities	Historical Fire Regime Class¹	Current Condition Class²	Fire History Assumptions and Notes
White Fir (Mixed Conifer)	I	3	Depending on location, vegetation probably burned within a 7 year time frame as derived from the fire history study. In general, CC 3 with some areas of CC 2.
Basin (Big) Sagebrush (Shrublands)	II	2	FR of II and a CC of 2 as the fire regime has been moderately altered due to suppression activities, grazing influences, and exotic plant introductions.
Breaks (Sparse rim badlands)	V	1	FR V because very infrequent fires with a CC of 1 since fire regime is within historical range.
Caryx rossi (Moist Meadows)	II	1	FR of II and a CC of 1 within historical range and low risk of losing key ecosystem components.
Juniper / Pinyon	<u>III</u> or IV	2	FR of III and a CC of 2 as the fire regime has been moderately altered due to suppression activities, grazing influences, and exotic plant introductions.
Bristlecone Pine	V	1	FR of V and a CC of 1 within historical range and low risk of losing key ecosystem components.
Ponderosa Pine	I	<u>3</u> and 2	Depending on location, vegetation probably burned within the 4 to 7 year time frame as derived from the fire history studies. In general, CC 3 with some areas of CC 2.
Engelmann Spruce	III	1	FR of III and a CC of 1 as the fire regime is within the historical range.
Quaking Aspen	III	3	Depending on location, vegetation probably burned within a 7 year time frame as derived from the fire history study, however a FR of III and a CC of 3 since this type has been significantly altered.
Douglas Fir	I	2	Depending on location, vegetation probably burned within a 7 year time frame as derived from the fire history study. FR of I and a CC of 2 as the fire regime has been moderately altered due to suppression activities.
Gambel Oak	II	2	FR of II and a CC of 2 as the fire regime has been moderately altered due to suppression activities.
Grassland	I	1	FR of I and a CC of 1 within historical range and low risk of losing key ecosystem components.
Stream	V	1	FR V with infrequent fires with a CC of 1 (minor exotic plant introductions - Tamarisk and Russian Olive).
¹Underlined FR or CC roman numerals or numbers (ex. <u>II</u>) indicate most of the vegetation falls within this FR or CC. ²Historical fire regime and current condition class for each vegetation type was determined using expert knowledge and experience with these vegetation types. The fire effects information system also provided insight into vegetation characteristics and responses related to fire. Since the vegetation types were combined for a common vegetation description, many of the classifications for fire regime and condition class encompassed large cross-sections of specific vegetation descriptions. At this level, some of these classifications are at a very coarse scale. Refined work is needed on these historical fire regimes and current condition classes. The national direction is to map these classifications at the landscape scale (6th code watershed) with plot assessments sampled on the ground and a secondary level is to classify historical fire regime and current condition class by detailed vegetation maps. (Hann and Bunnell 2001; Schmidt, K.M., et. al. 2002; USDA, 2004)			

Legislative History

Bryce Canyon National Park was originally established as a National Monument by Presidential Proclamation No. 1664 on June 8, 1923, that stated in part:

“Whereas, certain lands within the Powell National Forest in the State of Utah, known as Bryce Canyon, are of unusual scenic beauty, scientific interest and importance, and it appears that the public interest will be promoted by reserving these areas with as much land as may be necessary for the proper protection thereof as a national monument.”

On June 7, 1924, provisional legislation was passed to establish Utah National Park for the benefit and enjoyment of the people. However, the provisions were not met until after February 25, 1928, when the name Utah National Park was legislatively changed to Bryce Canyon National Park. The park was officially established September 15, 1928 as Bryce Canyon National Park. In 1931, a proclamation adding lands to Bryce Canyon National Park was signed, stating:

“Whereas it appears that the public interests would be promoted by including such lands within said park for the preservation of their natural state and outstanding scenic features and for road protection purposes.”

Lands adjacent to the park were identified as having outstanding scenic values as early as 1924 when a congressional report stated:

“...the attractiveness of the canyon is a sublime spectacle viewed as a panorama from certain points of vantage...”

An act signed in 1930 adding lands to the existing park stated the purpose to be:

“...preserving in their natural state the outstanding scenic features to the south and west of Bryce Canyon National Park.”

The park currently contains 35,835 acres. In order to comply with the enabling legislative language, “...including such lands within said park for the preservation of their natural state...”, fire must be utilized as a management tool. Appendix B contains the enabling legislation for Bryce Canyon.

Significance and Mission Goals

The significance and mission goals of Bryce Canyon are key elements that helped shape the management of the park, including the fire management program. Significance addresses why the park is unique – the cultural heritage and natural features. The mission goals articulate the ideal future conditions the NPS is trying to attain.

Bryce is significant for the following reasons:

- Bryce Canyon has exceptional scenic qualities. Colorful and intricately carved rock formations, vast panoramas of cliffs and canyons, forests and meadows, and clean, high-quality air combine to form one of the finest spectacles to be found in the United States.
- The park provides a variety of opportunities to visitors, especially those seeking solitude.
- The park exhibits unique geomorphology and sedimentology of scientific interest, which are well illustrated by the park’s landforms.
- The park has a wide variety of biologic communities and archaeological resources.

Mission goals of Bryce Canyon are to:

- Be the recognized leader in the preservation of the natural and cultural heritage of the United States by providing the highest quality protection of those resources.
- Provide an outstanding quality of service that engenders understanding, appreciation, and support by our visitors for the values we protect.
- Build an environment that stimulates interest, commitment, quality, productivity, and unity of purpose among employees, while reflecting the ethnic/cultural diversity of the region.

Relationship to Other Plans

The actions proposed in this document are consistent with the *Bryce Canyon General Management Plan* (GMP) (1987), which call for the development of “a fire management program for the park to facilitate the protection and maintenance of the natural environment....” Additionally, the *Bryce Canyon National Park Resource Management Plan* (RMP) (1996) states “...the reintroduction of fire is of vital necessity for the forest health” and “efforts to both use and monitor its impacts is of paramount importance.”

The following plans were identified as being relevant to the development of this Environmental Assessment:

- *Cedar City District Wildland Fire Management Plan*, July 26, 1999, Bureau of Land Management, Cedar City District. The plan encompasses all BLM lands surrounding Bryce Canyon National Park.
- *Utah Code – Title 65A – Chapter 08 – Management of Forest Lands and Fire Control and Rule R652-120. Wildland Fire*, effective January 1, 2004, Utah State Legislature. The plan covers State of Utah lands adjacent to Bryce Canyon National Park.
- *Dixie National Forest Fire Management Plan*, May 2003. This plan covers all forest lands surrounding Bryce Canyon National Park.
- *Evacuation and Road Closure Plan*, August 2002, signed by Color Country Fire Management Officers.

Laws, Policies, and Authorities

The following regulations and guidance documents relate directly to the completion of the Fire Management Plan and this Environmental Assessment.

National Environmental Policy Act (NEPA) – The purpose of NEPA is to encourage productive and enjoyable harmony between humans and the environment; to promote efforts that will prevent or eliminate damage to the environment and stimulate the health and welfare of mankind; and to enrich the understanding of the ecological systems and natural resources important to the Nation. NEPA requirements are satisfied by successful completion of an Environmental Assessment (EA) or Environmental Impact Statement (EIS), in addition to a decision document.

Director’s Order-12 (DO-12) – DO-12 is the NPS guidance for Conservation Planning, Environmental Impact Analysis, and Decision Making. DO-12 outlines the guidelines for implementing NEPA according to NPS regulations. DO-12 meets all Council on Environmental Quality (CEQ) regulations for implementing NEPA.

NPS Organic Act 1916 – Congress directed the U.S. Department of the Interior and the NPS to manage units “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 will leave them unimpaired for the enjoyment of future generations” (16 USC § 1). Congress reiterated this mandate in the Redwood National Park Expansion Act of 1978 by stating that the NPS must conduct its actions in a manner that will ensure no “derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress (16 USC § 1 a-1).

Director’s Order-18 (DO-18) – DO-18 is the NPS guidance for Wildland Fire Management, which states that “every NPS unit with burnable vegetation must have an approved Fire Management Plan.” DO-18 defines what an approved FMP must include, stressing that “firefighter and public safety is the first priority” and promoting “an interagency approach to managing fires on an ecosystem basis across agency boundaries.” Procedures for completion, review, approval, and required contents for FMPs are provided in Reference Manual-18 (RM-18). Until an FMP is approved, NPS units must take an aggressive suppression action on all wildland fires.

Review and Update of the 1995 Federal Wildland Fire Management Policy (2001) – provides guidance and updates for federal fire managers.

Interim Air Quality Policy on Wildland and Prescribed Fires (Environmental Protection Agency) (1998) – provides guidance for mitigating air pollution impacts caused by fires in the wildlands and wildland urban interface.

In addition to the regulations and orders listed above, other regulations and policies guide the assessment of impacts. These are listed below:

- **NPS Management Policies (2001)** – defines how the National Park Service will meet its park management responsibilities under the 1916 NPS Organic Act.
- **Federal Clean Air Act and Amendments of 1990** – includes national ambient air quality criteria; states that federal land managers have an affirmative responsibility to protect air quality-related values from adverse impacts.
- **Utah Air Quality Regulations** – provides protection for air quality related values.
- **Clean Water Act/Regulations** – provides national recommended ambient water quality criteria and calls for no degradation of the nation’s surface waters.
- **Utah Water Quality Regulations** – conserves waters of the state to protect, maintain, and improve water quality.
- **Executive Order 11990** – provides for the protection of wetlands.
- **Executive Order 11988** – provides for the protection of floodplains.
- **Clean Water Act and Section 404 Regulations** – provides for the protection of wetlands and waters of the United States.
- **Endangered Species Act/Section 7** – provides for the listing and protection of endangered and threatened species and their critical habitat; requires consultation under Section 7 if any listed species may be adversely affected.
- **Wilderness Act of 1964** – states that wilderness areas shall be administered for the use and enjoyment of all people in a manner that will leave them unimpaired for future use and enjoyment as wilderness. Sixty-two percent of Bryce is classified as proposed wilderness to reflect the park’s wilderness recommendation.
- **NPS Director’s Order-47** – states that proposed wilderness areas are to be managed to preserve their wilderness character and values.
- **National Historic Preservation Act (NHPA)/Section 106** – provides for the identification and protection of historic sites and structures.

- **Archeological Resource Protection Act** – provides for the protection of archeological resources on public lands.
- **Executive Order 13007** – provides for protection of Indian sacred sites.
- **NPS Director’s Order-28** – defines how the NPS will protect and manage cultural resources on NPS lands in accordance with the NPS Management Policies.
- **NPS Director’s Order-77** –offers guidance to NPS employees responsible for managing, conserving, and protecting natural resources and includes information on prescribed fire management.
-

Goals of the Fire Management Plan

The following goals have been identified to guide the fire management program for Bryce Canyon:

- Ensure that firefighter and public safety is the first priority in every fire management activity and that these activities comply with established fire-safe management practices.
- Prevent and suppress unwanted fires using effective strategies and methods under the decision process of sound risk management.
- Allow for naturally ignited wildland fires to function within their role as an essential ecological process and natural agent of change in maintaining and restoring vegetation communities.
- Use prescribed fire treatments as a naturally functioning process and to achieve vegetation management objectives that support land and resource management plans.
- Document and analyze both short-term and long-term fire effects data in evaluating the effectiveness of fire activities in meeting program objectives and developing scientifically-based management decisions.
- Promote understanding and acceptance of the natural role of wildland fire in maintaining and restoring ecosystem function through a proactive public education program.
- Participate, contact, coordinate, and cooperate in interagency programs (federal, tribal, state and local agencies) as part of the essential process in developing agreements, standardizing policies/procedures, and increasing cross-boundary programs.

Desired Future Conditions

In managing and restoring the ecological benefits of fire on the landscape, managers must understand the differences between current conditions and desired future conditions (DFC). Managers must also understand the practices and environmental factors that contributed to the current conditions.

Ayn Shilsky (2003) summarizes the benefits of identifying desired future conditions:

Building a common vision starts with broad goals for a landscape project, but broad goals don’t help us determine what to do, where, and when. Desired future conditions include broad goals and spatially explicit assessments of current and reference conditions. Landscape scale descriptions of desired future conditions provide the context for determining integrated finer-scale (i.e., stand) priorities and strategies for fire management, fuel treatment, fire regime restoration, and related resource issues.

James M. Vose (2000) highlights the importance of an ecosystem perspective:

Fire is a potentially powerful tool for achieving desired conditions of forest ecosystems. The departure of current ecosystem conditions from desired ecosystem conditions (defined by structural and functional characteristics) depends on the history of land use and disturbance. The disturbance history also influences the rate of attainment of desired conditions and the magnitude of ecosystem process response. Hence, from an ecosystem perspective, managers

must understand the interactions among land use history, current conditions, and desired conditions.

A number of federal laws and NPS policies and practices helped guide the development of desired conditions for resources potentially affected by fire management activities. It is important to recognize that further work is needed at Bryce Canyon to better understand the interrelationships within natural systems. As this occurs, desired conditions may be refined as part of adaptive management. This could be accomplished at the landscape or vegetation community scale and could be useful in developing ecological models and refining ecosystem priorities. Desired future condition statements for each affected resource are described below.

Air Quality

- Fire management activities are consistent with the Utah Smoke Management Plan and State Implementation Plan (in development).
- Smoke emissions do not cause unhealthy air quality conditions or exceed National Ambient Air Quality Standards in surrounding areas.
- Fire management activities minimize the aesthetic impacts of smoke on the airshed in Bryce Canyon.
- Emissions from fires inside the park are managed to minimize impacts beyond park boundaries, through joint planning and implementation with adjacent agencies with jurisdiction.

Vegetation

- Fire processes in fire dependent/adapted vegetation communities are managed to promote healthy and functional ecosystems. Vegetation succession reflects the natural range of variability under conditions that would occur under historical fire regimes.
- Fire is used as a tool to protect and enhance native vegetation communities.
- Fire program operations do not contribute to the spread of invasive weeds in Bryce Canyon.
- Coordination with Resource Management occurs in developing native seed sources.

Water Quality and Hydrology

- Water quality and flow, from surface and groundwater, reflect the full range of natural conditions that would occur under a natural fire regime. Some aspects of water quality and flow are influenced by fire patterns, such as discharge, sediment transport, nutrient flushing, and flood magnitude.
- Water quality is consistent with state standards developed under the Clean Water Act and is not adversely affected by fire operations.

Natural Soundscapes

- Visitors have opportunities throughout the park to experience natural sounds in an unimpaired condition.
- Disruption for essential fire operations is temporary and limited in scope, time, and area.
- The natural soundscape is conserved during fire management activities.

Wilderness

- Wilderness values are maintained or enhanced through fire management activities.
- Wilderness values (i.e., preservation of natural conditions, outstanding opportunities for solitude, primitive and unconfined recreational experience, preserved and used in an unimpaired condition) are protected while conducting fire management activities. Signs of human activity remain substantially unnoticeable.

Wildlife

- Native wildlife habitat is maintained, restored, or enhanced through fire management practices that are consistent with natural processes.
- Fire is used as a tool to prevent unnatural catastrophic fires, resulting from high fuel loads and denser vegetation that may adversely affect wildlife habitat.

Cultural Resources

- During natural or prescribed ignitions, fire management operations are specifically designed to protect and/or enhance cultural resource integrity, scientific research potential, and interpretive value.
- Fire management staff collaborates with appropriate Resource Management staff to seek information and technical expertise for the purpose of identifying cultural resource preservation and protection needs.

Visitor Experience

- A safe visitor experience is provided throughout fire management activities.
- Information is provided to visitors on the ecological, social, cultural, and aesthetic values of fire.

Park Partners

- Through knowledge and understanding, local and tribal governments, park neighbors, state, interagency cooperators, and the public work collaboratively with the park to implement the fire management program objectives and foster a spirit of cooperation.

Issues and Impact Topics Analyzed in Detail

An issue describes a relationship between an action and an environmental resource. Issues associated with proposed fire management activities were identified through internal and external scoping. Internal scoping included an interdisciplinary team with a member representing each affected division and resource group within the park (refer to the *List of Preparers* in the *Consultation and Coordination* section of this document). External scoping was accomplished through various means, including workshops and an informational newsletter (refer to *Consultation and Coordination* section of this document). Through issue identification, impact topics (resource categories) were also identified. The impact topics are listed below followed by an issue statement. Each impact topic is described in the *Affected Environment* section and is analyzed in the *Environmental Consequences* section.

Air Quality

- Emissions from fires could reduce air quality below federal, state, or local air quality standards.
- Emissions from fires could affect air quality in adjacent communities.

Sensitive, Threatened or Endangered Animal and Plant Species

- Fire could affect species or alter habitat for these species.

Soils

- Fire of varying intensities could alter the physical, chemical, and biological properties of the soil as a result of vegetation removal, consumption of organics, and increased temperatures.
- The lack of fire could alter the physical, chemical, and biological properties of the soil as a result of interrupted nutrients cycling in fire maintained habitat types.

Vegetation

- Fire affects the productivity and composition of vegetation communities.
- As a result of fire exclusion, some habitats are currently characterized by more dense growth. This has also led to fuel accumulations that have contributed to an ever-increasing large and severe wildland fire problem in these otherwise fire dependent and tolerant vegetation types.
- Plant communities not tolerant or not adapted to fire may be susceptible to detrimental fire effects from increases in invasive non-native plant species that could become established after fire.
- Fire may influence the spread of invasive non-native plant species.

Water Quality and Hydrology

- Bare, burned slopes would be subject to runoff during rainfall events, which could result in sedimentation and nutrient loading to streams. This could degrade water quality below federal, state, or local water quality standards.

Wetlands

- Fire could affect riparian or wetland vegetation, decrease stream shading, and result in chemical changes for macroinvertebrates.

Natural Soundscapes

- Fire management activities include the use of equipment that would generate noise, which could impact the natural soundscape.

Wilderness

- Fire management activities could affect wilderness experiences and values.

Wildlife

- Fire could affect habitat for wildlife and fisheries.
- Fire could result in direct mortality of wildlife species.

Cultural Resources

- Fire or fire-related activities could affect cultural resources.

Economic Considerations

- Fire or smoke from fires could alter the socioeconomics of the local area due to changes in visitation.
- Fire activities could provide additional income to the local area.

Public Health and Safety

- Fire could be dangerous or present risks to the health, safety, life, or property of firefighters, NPS employees, and the general public.

Visitor Use and Experience

- Fires could prevent visitors from experiencing or enjoying all or part of the park and adjacent areas.

Issues Considered and Dismissed from Further Consideration

The following issues were eliminated from further analysis for the reasons stated below.

Floodplains

No floodplain functions would be affected by fire or fire management activities proposed in this plan. Wetlands that may be located in or near floodplains are addressed under the Vegetation and Wetlands topic.

Park Operations

Park operations were dismissed for further review since implementation of either action requires the same level of assistance from other federal and state agencies. This would allow park operations to continue during fire management activities, and neither alternative would have substantial adverse or beneficial impacts to park operations.

Ecologically Critical Areas

No Ecologically critical areas are known in or near the park. The breaks may be considered as critical areas of the park; however, they do not burn due to lack of vegetation to carry fire.

Prime and Unique Farmlands Lands

No prime and unique farmlands occur in the park or the near vicinity.

Energy Requirements/Depletable Resource Requirements and Conservation Potential

None of the alternatives would affect energy depletable resource requirements or conservation potential to the extent that detailed analysis would be required.

Environmental Justice

None of the alternatives would have a disproportionate health or environmental effect on minorities and/or low-income populations and communities.

Indian Trust Resources

Secretarial Order 3175 requires that any anticipated impacts to Indian trust resources from a proposed project or action by the U.S. Department of the Interior agencies be explicitly addressed in environmental documents. No Indian trust resources occur within the park. The lands comprising Bryce Canyon is not held in trust by the Secretary of the Interior for the benefit of Indians due to their status as Indians. Therefore, Indian trust resources were dismissed as an impact topic.

Sustainability and Long-term Management

Aspects of this topic are covered under several other topics that address long-term management objectives and impacts in relation to fire management activities that would occur under the environmental assessment alternatives.

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. Sustainable practices 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.

Water Uses and Water Rights

None of the alternatives would affect water uses or water rights to the extent that detailed analysis would be required.

Evacuation Plans for Areas Adjacent to the Park

Preparing evacuation plans for private lands adjacent to the park was dismissed from further analysis in this document because these areas fall under the jurisdiction of the State of Utah. This responsibility falls under the jurisdiction of the County Sheriffs in coordination with the Utah Division of Forestry, Fire, and

State Lands and the County Commissioners. The development of an evacuation plan would be coordinated through the County fire wardens and State and County law enforcement agencies. Bryce Canyon personnel would assist with adjacent area coordination and planning.

ALTERNATIVES

Introduction

This section describes the alternatives analyzed in this document – the No Action and the Proposed Action. The No Action Alternative, Alternative A, represents the existing fire management program. The Proposed Action/Preferred Alternative, Alternative B, describes proposed guidelines for wildland fire suppression, wildland fire use, prescribed fire, mechanical treatments, and herbicide treatments. The following summary tables can be found at the end of the *Alternatives* section:

- Table 7: Comparison of Fire Management Strategies by Alternative
- Table 8: Comparison of the Achievement of Fire Management Goals by Alternative
- Table 9: Impact Summary Table

Alternative A – No Action Alternative (Current Fire Management)

The No Action Alternative is based on the 1994 Fire Management Plan and NPS Directors Order No. 18 – Fire Management Guidelines.

Current fire management allows for suppression of all wildland fires and the use of prescribed fire, but does not allow wildland fire use. Herbicide treatments are not permitted, and mechanical removal is not allowed except in wildland urban interface (WUI) areas. The following fire management objectives apply to all areas under the No Action alternative.

- Promote a Fire Prevention Program and aggressively control all unplanned human-caused wildland fires.
- Protect life, property, and resources from wildland fires at costs commensurate with threatened values.
- Use prescribed fire to reduce hazardous fuel accumulation and restore fire to fire-dependent ecological communities where appropriate.
- Use suppression tactics and strategies that minimize long-term impacts of suppression actions.

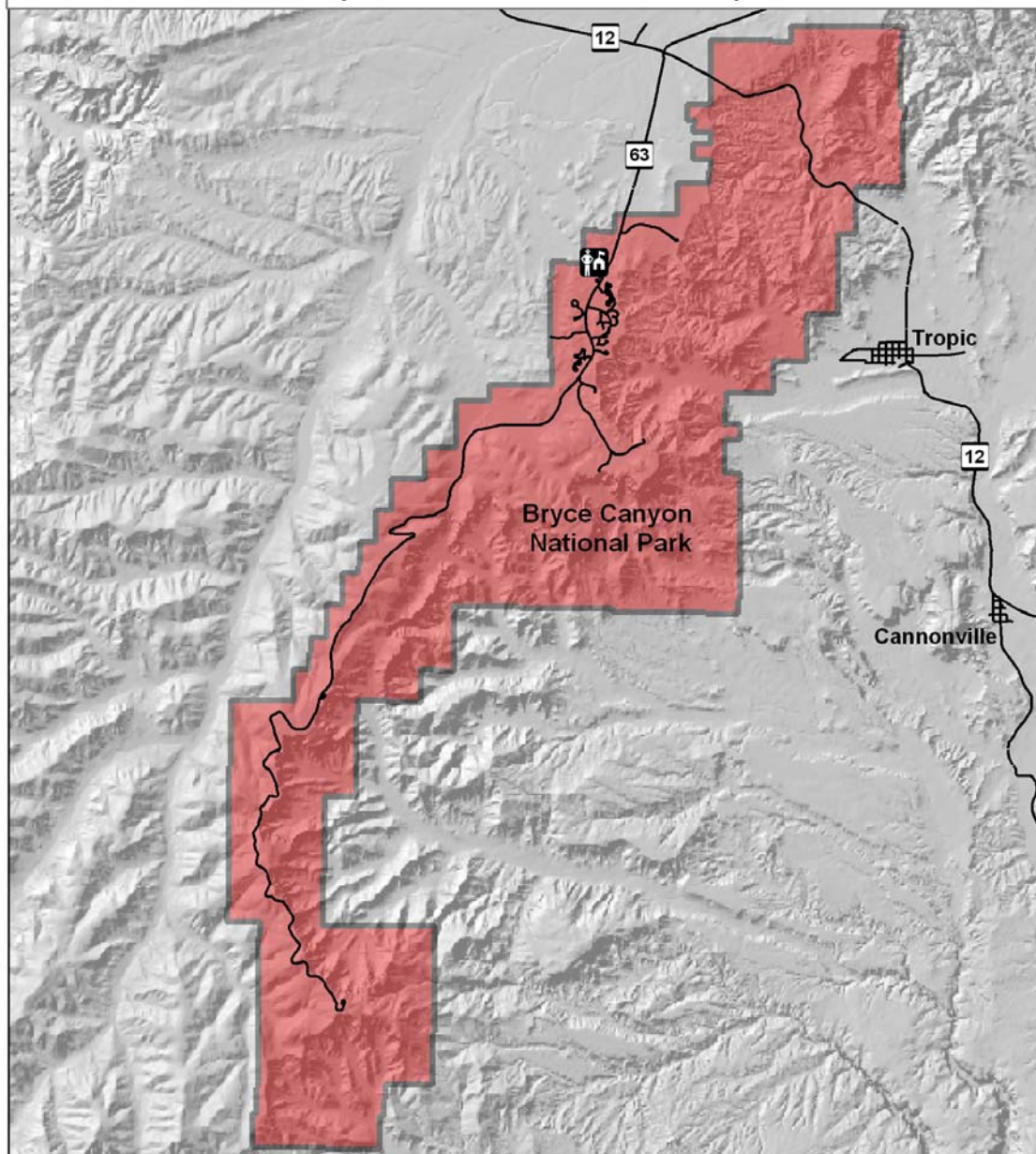
Suppression Fire Management Unit

Under the No Action alternative, all lands within Bryce Canyon would be within the Suppression Fire Management Unit (FMU) (see Map F and Table 5). Wildland fire would be considered an unacceptable risk in all areas of the park. Fuel loading and laddering can present a problem to fire suppression efforts, so activities such as firebreak construction, prescribed fire, and mechanical thinning (in WUI areas only) would be employed as necessary to reduce fuel hazards throughout the park.

Prescribed fire may be used to reduce fuels, discourage exotic species, or otherwise fulfill resource management objectives. Prescribed fire may also be employed in the Suppression FMU for management or research purposes consistent with stated resource management objectives.

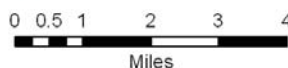
Prior to any prescribed fire, a burn plan is prepared that would outline objectives and delineate prescribed fire units. Prescriptions for prescribed fires include acceptable ranges of temperature, wind speed and direction, relative humidity, fuel moisture, fire danger indices, and air quality smoke management conditions.

**Map F: Current Fire Management Unit
(Alternative A - No Action)**



Projection: Transverse Mercator
UTM Coordinate System, Zone 12
Datum: NAD 1983

Map Produced By
Bryce Canyon NP
Fire Management



1:130,000



Map to be used for fire
management planning
purposes only. Not to be
used for navigation.

September 2004

Mechanical removal would not be allowed in the Suppression FMU except in areas identified as a wildland urban interface. Herbicide treatment would not be allowed in the park under the current plan.

Table 5: Alternative A – Summary of Current Fire Management Strategies by Unit					
FIRE MANAGEMENT UNIT	Wildland Fire Suppression Strategy	Wildland Fire Use For Resource Benefit Strategy	Prescribed Fire Strategy	Mechanical Strategy	Herbicide Strategy
SUPPRESSION	•Allowed: would use aggressive initial attack to suppress wildland fires at minimum size, using the appropriate suppression response.	•Not allowed at any time.	•Allowed: would be used to reduce hazardous fuels and for resource management purposes.	•Not allowed •Exception: would be allowed in identified Wildland Urban Interface (WUI) areas.	•Not allowed
All lands within the boundaries of Bryce Canyon National Park.					

Alternative B – Proposed Action/Preferred Alternative

The proposed action would allow for implementation of the full range of fire management activities, including wildland fire use and various fuels management techniques. Wildland fire activities would include suppression and use of wildland fire for resource benefit. Fuels management activities would include prescribed fire, and mechanical and herbicide treatments. The main focus of these activities and treatments as currently emphasized by national policy is public and firefighter safety, communities identified as at risk from wildland fires (wildland urban interface), historic fire regime, current condition class, and collaboration with other agencies and stakeholders.

Under Alternative B, the park would be divided into four fire management units. Table 6 summarizes the fire management strategies by FMU, and Map G depicts the boundaries of the proposed FMUs. These FMU's correspond to the FMU's on the Dixie National Forest and under the Interagency Fire Management Plan, which would manage fires across boundaries. Bryce Canyon would use an adaptive management approach to fuels management, which means that the fuels management program would continue to be evaluated over time, based on results of the current program, with adjustments made where appropriate. Appendix C outlines the 10-year fuel treatment plan which is based on current fuel conditions and national emphasis as of March 2004.

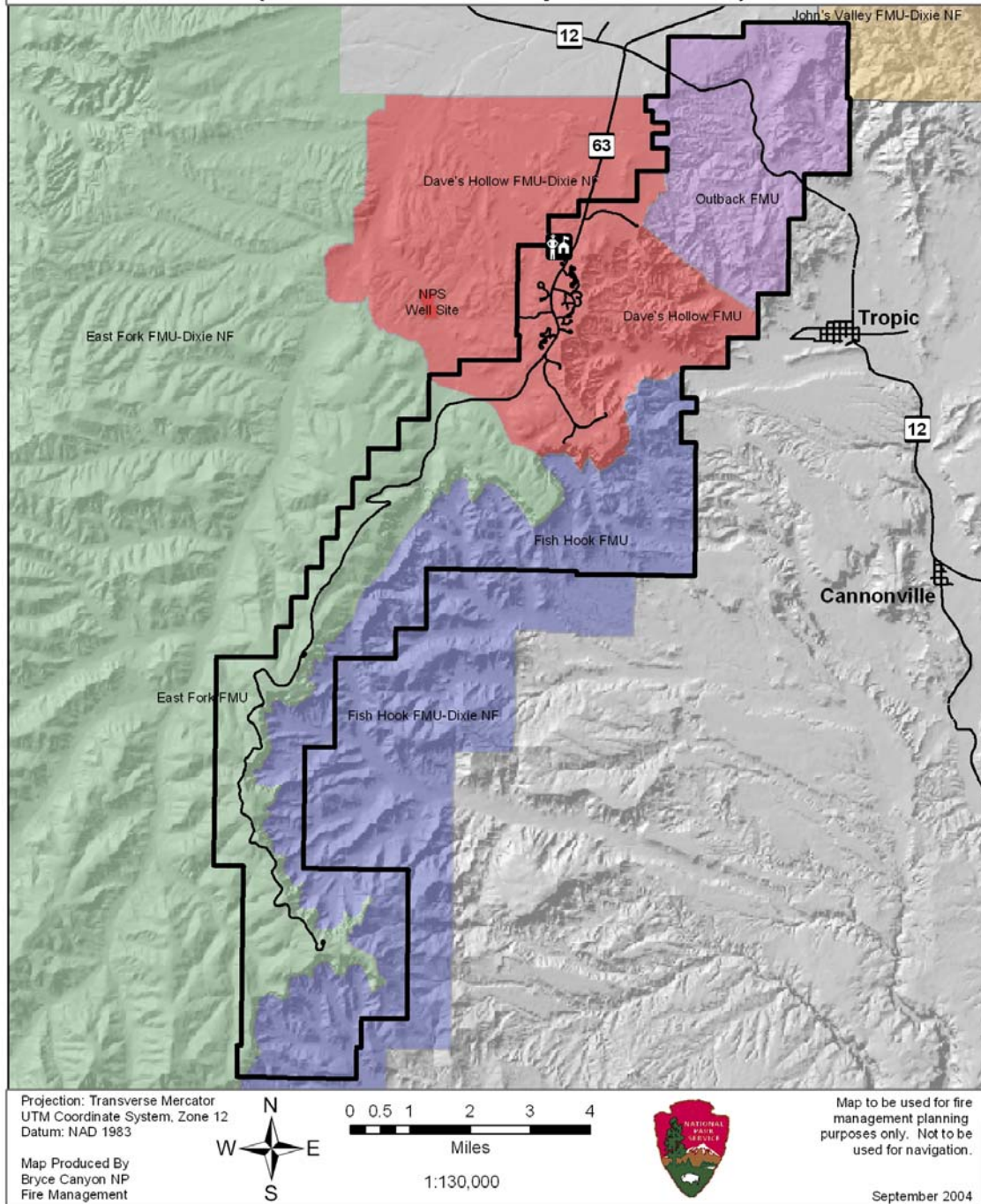
The proposed fire management plan would be implemented over the next 10 years to:

- continue to allow a return of fire as a natural process in fire-adapted ecosystems;
- recognize fire as an essential process and agent of natural change;
- increase the emphasis on wildland urban interface and interagency coordination; and
- continue to monitor fire activities and fire effects to determine if goals are being met.

The following constraints would apply to all wildland fire operations unless specifically exempt:

- Bulldozers and heavy ground disturbing equipment must be approved by the Superintendent.
- Fire Engines and vehicles would not be permitted to operate off-road within the park boundary unless approved by the Superintendent.
- Use of air tankers in sensitive areas(i.e. prairie dog habitat, wetlands, water sources), except during imminent loss of structures or in developed areas, must be approved by the Superintendent.
- Helispots must conform to the Interagency Helicopter Operations Guide, which requires minimal disturbance for landing.

Map G: Proposed Fire Management Units (Alternative B - Proposed Action)



The following actions would apply to all fire management units and strategies:

- Firefighter and public safety would be the first priority in every fire management activity.
- Minimum Impact Suppression Tactics (MIST) would be used throughout the park (Refer to Appendix D).
- Minimum Requirement Analysis and park management approval would be needed for activities using mechanized handheld tools in recommended wilderness.
- All fire management actions would take into consideration and mitigate any potential increase or spread of non-native plant species (i.e., all equipment would be decontaminated, power washed, prior to entering park lands).

Fire Management Strategies

The fire management strategies that would be implemented under this alternative include wildland fire suppression, wildland fire use, prescribed fire, mechanical treatments, and herbicide treatments. These strategies are described below.

Wildland Fire Suppression Strategy

All wildland fire suppression activities would provide for firefighter and public safety as the highest consideration. Suppression activities would strive to minimize the potential damage to natural and cultural resources, and would take into consideration economic expenditures, firefighting resources, and other fire priorities (local, regional, and national preparedness).

The concept of appropriate management response is integral to fire management policy. Management responses are programmed to accept resource management needs and constraints, reflect a commitment to safety, cost effectiveness, and accomplish desired objectives while maintaining the versatility to varying fire intensities as conditions change. The appropriate management response would be used to curtail the spread of fire and eliminate or reduce all fire threats to identified resources. Appropriate management response could include confine and contain, or aggressive suppression actions.

A confine/contain action could be used to create a fuel break around a fire, allowing the fire to burn to the fuel break. The break could include natural barriers or could consist of manually and/or mechanically constructed lines. Active firefighting actions may not be implemented in areas where natural fuel breaks exist. Using natural fuel breaks could increase fire size, but could provide for fire fighter safety and reduce disturbances on the land from ground firefighting actions caused by fire line construction. This strategy could allow managers to focus firefighting activities on an area of the fire where life, property, and natural or cultural resources are threatened, while allowing other areas to burn out naturally.

More aggressive suppression strategies could be used when critical resources are threatened. An example of an aggressive suppression strategy would be to attack along the fires edge with fire engines, hand lines, aerial resources, and in some cases dozers or heavy ground disturbing equipment used to create fire lines.

Aircraft resources could be used for all fire management activities, including reconnaissance, detection, ignition, personnel and logistical transportation, and fire control missions, such as retardant/bucket drops. The purpose of this action would be to transport personnel and equipment, as well as to facilitate implementation of fire management operations. Use of aircraft would be managed to meet all safety, wilderness, and soundscape objectives.

During suppression operations, holding actions could be implemented to prohibit the fire from crossing containment boundaries whether natural or human-made. Holding actions could include the construction of fire lines, reduction of excessive fuel concentrations, reduction of vertical fuel continuity, and creation of fuel breaks or utilization of natural barriers. These operations or actions could be implemented around critical or sensitive sites or resources. Wildland fires will follow the Wildland Fire Situation Analysis (WFSa) process in managing suppression actions.

The WFSa is a decision making process through which the line officer describes the fire situation, establishes objectives and constraints for managing the fire situation, establishes objectives and constraints for managing fire, compares various strategies for fire management alternatives, evaluates the expected effects of those alternatives against important local, regional, or national criteria, selects the preferred alternative, and documents the decision made. The seven requirements of WFSa are: 1) Identification of evaluation criteria, 2) Development of suppression alternatives, 3) Analysis of suppression alternatives, 4) Approval and notification, 5) Monitoring and evaluation, 6) Documentation, and 7) Decision tree analysis.

Wildland Fire Use Strategy

Naturally ignited wildland fires could be managed (wildland fire use) to accomplish specific resource management goals and/or objectives in pre-defined fire management zones within the park. This strategy would be implemented within the park along some park boundaries with neighboring federal or State lands, or where human or resource values at risk are minimal. Many of the suppression actions previously described could be used to manage wildland fire use fires.

Wildland fire use fires could be used to meet similar objectives as prescribed fires. The fire could be managed to reduce hazardous fuels, reintroduce fire into fire dependent plant communities, and restore natural ecosystems that have been modified by prolonged fire exclusion, restore vegetative composition, research fire effects, and maintain natural systems.

Wildland fire use fires would follow the Wildland Fire Implementation Plan (WFIP) created for each fire, describing maximum manageable areas, available resources, monitoring plans, and identified threatened resources, along with establishing trigger points for implementing suppression actions if needed.

Prescribed Fire Strategy

Prescribed fires are defined as any fire that is ignited by management to meet specific objectives. Prescribed fires could be used anywhere within the park to:

- reduce hazardous fuels,
- reintroduce fire into fire dependent vegetation communities,
- restore natural ecosystems that have been modified by prolonged fire exclusion,
- remove/reduce non-native plant species,
- improve vegetative compositions to natural levels (example enhance habitat and forage quality for wildlife),
- reduce debris or dispose of mechanically treated fuels,
- conduct maintenance burning where natural fires could not be managed.

Prescribed fire activities would use prescriptions identified in a plan that describe conditions (wind speed and direction, relative humidity, dew point, temperature, rate of fire spread, and flame length) under which the fire could be ignited. These measurable conditions would be monitored to ensure that

prescribed conditions were met. Each prescribed fire treatment would follow a written plan that would be approved by the Superintendent before implementation.

Prescribed fire treatment boundaries would be drawn in areas where fires could be contained or controlled. When identifying these boundaries the park would try to maximize the use of natural fuel breaks or areas of reduced fuels/vegetation densities. These boundaries could be augmented by mechanical treatments to create perimeter lines. Each prescribed fire would be managed and monitored by qualified personnel prior to and during all operations until the fire is declared extinguished.

It is anticipated that through the reintroduction of fire using prescribed fire applications, some natural fire ignitions could be managed to maintain natural areas, thereby reducing the need for additional prescribed fire treatments. Some areas would continue to be maintained using prescribed fire due to the proximity of values at risk.

Seeding areas burned by prescribed fire would be considered, particularly where the probability of achieving resource objectives is enhanced. This strategy could be used to increase native species, such as grasses to effectively compete with non-native plants. In most cases, areas would not be seeded, due to the risk of introducing non-native species.

Prescribed fires could be used to research or investigate the effects of these treatments. Treatments could be studied to determine if sustainable ecological conditions could be met or replicated. Long-term data collection could be associated with these treatments.

Many of the suppression resources and strategies that were described previously under the *Wildland Fire Suppression Strategy* could be used to manage prescribed fire (e.g., aviation use for ignition, management, or control; retardant use).

Mechanical Strategy

Mechanical equipment could be used to reduce fuels as a stand-alone fuels treatment method, or in combination with other treatments in preparation for a prescribed fire project, as part of a restoration project, or during wildland fire operations, including both suppression and “fire use” actions. Types of mechanical treatments could include thinning, vegetation removal, chipping, and girdling by any of the methods described below.

Mechanical methods could include:

- **non-mechanized handheld tools** (e.g., shovels, saws, axes, pulaskis, rakes, and tools currently and historically used in suppression activities),
- **mechanized handheld tools** (e.g., chainsaws, brush cutters, weed trimmers, leaf blowers, grass trimmers/cutters, clippers, and mowers), or
- **mechanized equipment (wheeled or tracked)** (e.g., light-on-the-land forestry equipment that includes all-terrain-vehicles with attachments, such as mowers, chippers and small tractors pulling/attaching similar equipment, as well as aerial equipment, such as airplanes and helicopters. Larger equipment with large, low impact tires, bull-hogs, front-end loaders, masticators, GyroTracs, feller-bunchers, chippers, or other similar equipment that is designed for large fuel removal, dispersal, elimination, or reduction).

Mechanized wheeled or track equipment could be used in wildland urban interface areas, along park boundaries, in developed areas within the park, and for resource restoration projects (e.g., aspen

restoration and regeneration, or other fire-dependant vegetation restoration projects); such use would be consistent with minimum tool procedures for recommended wilderness areas and soundscape objectives.

Heavy equipment that uses large tires or large tracks in order to result in less ground disturbances would be the first choices for use. The use of any heavy ground disturbing equipment would need to be approved by the Superintendent. Projects that require equipment that may have ground disturbing effects would be planned and implemented during times when the ground may be covered with snow or be frozen in order to reduce impacts to soil and vegetation.

This list of mechanized equipment is not inclusive. Each year, modern technology provides new equipment that can do more with lower impacts. These technological advances may be explored or utilized during the life of this plan to implement fire management activities. Cable systems and aerial removal with helicopters is a common commercial tree/fuel removal technique that could be used. The equipment selected for projects would be subject to a minimum tool selection process to meet the wilderness, soundscape, and General Management Plan objectives.

Herbicide Strategy

Herbicide treatments would be used on a limited basis and only after all other options have been considered, mainly in areas where non-native plants dominate the area along the park boundary that coincide with wildland urban interface areas.

Post-emergent herbicides could be used to reduce and remove existing non-native species. Pre-emergent herbicides could be used to prevent non-native plant seeds from germinating. These applications could be applied as the sole treatment, with no additional management strategies, or could be used in combination with other management treatments.

Herbicides could be used in conjunction with prescribed fire treatments to reduce or remove non-native plants. This strategy could be used either prior to or following plant germination. This technique may enable native perennial grasses, forbs, and shrubs to grow or re-sprout without competition from fast growing non-native plants.

Applications of herbicides could be used to reduce native plant populations in areas where other treatment methods may be impractical or inefficient. Examples of these areas include wildland urban interface areas or areas around other high value resources.

Herbicides would be applied only by certified applicators. Manufacturer specifications, Environmental Protection Agency (EPA) regulations, and NPS policies for herbicide use would be followed.

Fire Management Units

Under the proposed action the park would be divided into the following four FMUs: Dave's Hollow, East Fork, Fish Hook, and Outback. The units were delineated on the basis of geologic features, topography, vegetation, and access, and to allow management across boundaries with adjacent federal agencies (refer to Map G). Table 6 summarizes management strategies by FMU under Alternative B.

Often the goal of a particular fire management activity is to change the composition of vegetation communities to allow fire to become a functioning component of natural ecosystem processes. When this goal is achieved, unit boundaries could be adjusted to allow for more natural processes to occur. This adjustment would be made through the annual fire management planning amendments. If adjacent lands

were acquired, adjustments through the annual fire planning amendment process would be made to unit boundaries.

Wildland fire use fires crossing from one unit to another would be evaluated in the WFIP. In some cases, natural or defensible boundaries to confine and/or contain a fire might be in the neighboring unit. The daily validation of the WFIP would guide managers in evaluating boundaries, resource objectives, and public safety.

Dave's Hollow FMU

This unit (which comprises 7,827 acres, or 22 percent) corresponds with the Dixie National Forest unit of the same name. The Dave's Hollow FMU is on the Paunsaugunt Plateau in the south central portion of the Dixie National Forest on the Powell Ranger District, and includes the developed area of Bryce Canyon from the northern boundary at Fairyland Point, east below the rim to the Eastern Boundary, then south along the boundary to Yellow Creek, then west to the rim continuing to East Creek Meadow and to the park boundary.

The focus of the Dave's Hollow FMU would be to minimize the threat of fire to life and property and to ensure that ecosystems are managed to meet NPS objectives. Wildland fire is considered an unacceptable risk in these areas due to the threats to firefighter and public safety, private property, and park infrastructure. An effort would be made to reduce hazardous fuels in this zone in order to provide for firefighter and public safety and to reduce risks to park and private structures. Methods to achieve this goal could include prescribed fire, use of mechanical methods, or herbicide treatments.

The Dave's Hollow FMU encompasses the developed areas within the park and areas of high visitor use. Since this unit borders private and other state/federal lands, partnerships and interagency coordination would be fostered with neighbors along the park boundary. These partnerships could allow for cross-boundary fuel treatments. This approach could also enhance ecosystem health across the landscape and reduce visible differences on each side of the boundary, as well as reduce fire threat.

In areas with a wildland urban interface, adjacent private lands, or areas where resource values may be at risk, a treated fuels buffer could be considered if the area has continuous fuels. The buffer area could reduce the intensity of a fire that originates in or outside the park and migrates across the park boundary. This buffered area could increase the ability of firefighters to gain control of a wildland fire.

Management Strategies

Wildland fires would follow the WFSA planning process in managing suppression actions. Within this unit all wildland fires would be **suppressed** using the appropriate management response. A confine and contain action could be used if risks to life and safety of suppression personnel prohibit direct attack. Otherwise, direct attack would be used to suppress wildland fires at a minimum size.

All available firefighting tools and resources could be used, including non-mechanized and mechanized handheld tools, fire engines, fire retardants, and aviation resources. Motorized and mechanized wheeled or track equipment could be used off-road with approval from the Superintendent.

Wildland fire use for resource benefit would not be allowed in this unit. Fire could be allowed to enter the Dave's Hollow FMU from an adjoining unit, where the appropriate response would be used to reach containment and control of the fire.

Prescribed fire treatments would be allowed as part of a hazardous fuel reduction project to protect private property and park infrastructure. Treatments could also be implemented in fire dependent ecosystems within this zone or as part of a research project. Prescribed fire would be used to reduce dead and down fuel loading and decrease live fuel densities. These prescribed fires would be implemented under an approved prescribed fire burn plan which would be developed for each treatment. The most up-to-date scientific information would be used in planning and implementing prescribed fire treatments.

Firefighting tools and resources that could be used include non-mechanized and mechanized handheld tools, fire engines, aviation resources, and other typical fire management tools. Other equipment could be considered on a case-by-case basis to protect life, property, or resources with approval from the Superintendent.

Mechanical methods would be primarily implemented near developed areas and along the park boundary to protect private property and park infrastructure. Mechanical methods could also be used in vegetation restoration projects or to protect cultural or natural resources. These methods would be used to thin or reduce fuels and vegetation in and around these resources. Due to the annual nature of some non-native vegetation types within the park, some areas may need to be treated each year to maintain safe conditions.

Tools and resources that could be used include non-mechanized and mechanized handheld tools, light forestry equipment, and aviation resources. Mechanized wheeled or track equipment could be used off-road with approval from the Superintendent.

Herbicide treatments would be used where non-native plant species have replaced or have invaded natural vegetation. The focus would be near developed areas or where there are resource management concerns. Developed areas would include all areas containing structures or areas defined as wildland urban interface. Resource management concerns could include riparian areas infested with tamarisk or uplands infested with thistle, knapweed, or similar aggressive non-native species. Some resource treatments could be completed to protect native plant populations, cultural resources, or degraded wildlife habitats.

Herbicide treatments could also be used to reduce fuel density and continuity where mechanical or other methods may not be feasible due to increased costs, increased risk to nearby resources, and time constraints related to urgent factors like weather changes or significant increases in development.

Non-native plant infestations change the vegetation composition which could allow fires to enter areas that are not fire adapted or could increase the duration, frequency, or intensity of fire in vegetation communities. Due to the annual nature of some of the non-native vegetation types within the park, some areas may need to be treated each year to maintain a condition of reduced fuels. These treatments would work toward the overall decrease of the invading species, increasing ecosystem health and improving the safety (from wildland fire) in the area to visitors and employees.

Tools and resources that could be used include non-mechanized and mechanized handheld tools. Forestry equipment could be used off-road with approval from the Superintendent. These equipment types could include all-terrain-vehicles with attachments, such as boom sprayers, large balloon tractor tires, or lightweight low impact tracked machines.

East Fork FMU

The East Fork FMU (which comprises 8,840 acres, or 25 percent) is located on the Paunsaugunt Plateau in the south central portion of the Dixie National Forest on the Powell Ranger District, and consists of all

lands in Bryce Canyon south of the East Creek Meadow and bordered by the Forest Service boundary to the west and the rim plateau to the east. The East Fork of the Sevier River drains north through the center of the unit, through meadow and sagebrush flats. Ponderosa pine dominates the surrounding hills in the northern portion of the unit, while mixed conifer dominates the southern half. Public and permitted activities include dispersed recreation and camping. This is a high use area, especially during the summer season.

In the East Fork FMU managers would look for opportunities to allow fire to maintain its natural role while protecting life, property, and resources. In order to accomplish this, managers would evaluate fuel types and available fuels in relation to fire spread within natural and human-made fire barriers. An effort would be made to reduce hazardous fuels in this zone to provide for firefighter and public safety. Methods to achieve this goal could include fire use, prescribed fire activities, mechanical methods, or herbicide treatments.

The East Fork FMU includes portions of the park boundary abutting lands managed by Dixie National Forest. Since this unit borders federal lands, partnerships and interagency coordination would be fostered with the Forest Service. Partnerships could allow for cross-boundary fuel treatments. This approach could also enhance ecosystem health across the landscape and reduce the visible differences on each side of the boundary.

Management Strategies

All wildland fires would be assessed to determine if a wildland fire use strategy would be appropriate. Under this approach a WFIP would be completed. If it was determined that wildland fire use was not appropriate, the fire would be **suppressed**. Direct attack tactics could be implemented to contain and control the fire. A WFSA would be completed for these suppression actions. All available firefighting tools and resources could be used as described in the Dave's Hollow FMU, including non-mechanized and mechanized handheld tools, fire engines, fire retardants, and aviation resources. Motorized and mechanized wheeled or track equipment could be used off-road with approval from the Superintendent.

Wildland fire use for resource benefit would be considered in lieu of suppression for lightning-ignitions under favorable weather conditions. An example of a favorable weather condition would be lower temperatures and wind speeds with increasing humidity. Location, weather trends, and the time of season for each wildland fire would be considered. All actions would take place under a WFIP which would evaluate threats to public and firefighter health and safety, natural and cultural resources, fire behavior (flame length, rate of spread), fuel conditions (moisture content of vegetation), expected size and duration of the fire, fuel continuity (sparse vs. dense vegetation), the availability of resources to manage the fire, and wildland fire activity levels locally, regionally, and nationally.

All available firefighting tools and resources could be used, including non-mechanized and mechanized handheld tools, fire engines, fire retardant, and aviation resources. Motorized and mechanized wheeled or track equipment could be used off-road with approval from the Superintendent.

Prescribed fire would be allowed, as part of a hazardous fuel reduction project, to protect cultural and natural resources, as a restoration treatment in fire dependent ecosystems, or as part of a research project. The most current scientific information would be used in planning and implementing prescribed fire treatments. All available firefighting tools and resources could be used as described in the Dave's Hollow FMU, including non-mechanized and mechanized handheld tools, fire engines, aviation resources, and other typical fire management tools. Other equipment could be considered on a case-by-case basis to protect life, property, or resources with approval from the Superintendent.

Mechanical methods would be primarily used near the park boundary to protect neighboring lands, as part of a restoration project, or to protect natural or cultural resources. These methods could be used to thin or reduce hazard fuels or non-native vegetation. Some areas may need to be treated yearly because of the type of vegetation being treated. Tools and resources would be used as described in the Dave's Hollow FMU, including non-mechanized and mechanized handheld tools, light forestry equipment, and aviation resources. Mechanized wheeled or track equipment could be used off-road with approval from the Superintendent.

Herbicide treatments could be used to reduce non-native plants near park boundaries or other areas of non-native plant infestations. Herbicide treatments could also be used to reduce fuel density and continuity where mechanical methods may not be feasible or to protect important cultural or natural resources.

Non-native plant infestations change vegetation composition, which could allow fire into non-adapted fire systems. This could increase fire duration, frequency and intensity in these areas. Due to the annual nature of some non-native vegetation types within the park, these areas may need treatment each year to maintain safe conditions. Tools and resources would be used as described in the Dave's Hollow FMU, including non-mechanized and mechanized handheld tools. Forestry equipment could be used off-road with approval from the Superintendent. These equipment types could include all-terrain-vehicles with attachments, such as boom sprayers, large balloon tractor tires, or lightweight low impact tracked machines.

Fish Hook FMU

The Fish Hook FMU (which comprises 11,814 acres, or 33 percent) is an area of ponderosa pine, mixed conifer, and pinyon/juniper in the narrow fishhook area of the Powell Ranger District that wraps around and includes the southern and eastern boundaries of Bryce Canyon. Public and permitted activities generally involve dispersed recreation. Public use is infrequent.

Wildland fire would be managed as a natural role in ecosystem maintenance within the Fish Hook FMU. The primary goal of managing lightning-ignited fires within this zone would be to allow fires to function as a natural process in promoting ecosystem health.

Fire growth in these areas could be limited by natural barriers and would be managed under less restrictive prescriptive elements or indices than the East Fork FMU. The risk to life and property from fire would be low to moderate within this unit. Work would be done to reduce hazard fuels in this unit to provide for fire fighter and public safety. All strategies (including prescribed fire activities, mechanical methods, or herbicide treatments) could occur within this zone, but would be limited due to the goal of managing these areas in a pristine or primitive state.

Management Strategies

All wildland fires would be assessed to determine if a wildland fire use strategy would be appropriate. A WFIP would be completed under this approach. If wildland fire use is deemed not appropriate, the fire would be **suppressed**. A confine or contain action would be the primary method used in trying to contain and control of the fire. The secondary method used would be direct attack actions to contain and control the fire. A WFSA would be completed for the firefighting approach.

All available firefighting tools and resources could be used as described in the Dave's Hollow FMU, including non-mechanized and mechanized handheld tools, fire engines, fire retardants, and aviation

resources. Motorized and mechanized wheeled or track equipment could be used off-road with approval from the Superintendent.

As described under the East Fork FMU, **wildland fire use for resource benefit** would be considered in lieu of suppression for lightning-ignitions under favorable weather conditions. An example of a favorable weather condition would be lower temperatures and wind speeds with increasing humidity. Location, weather trends, and the time of season for each wildland fire would be considered. All actions would take place under a WFIP which would evaluate threats to public and firefighter health and safety, natural and cultural resources, fire behavior (flame length, rate of spread), fuel conditions (moisture content of vegetation), expected size and duration of the fire, fuel continuity (sparse vs. dense vegetation), the availability of resources to manage the fire, and wildland fire activity levels locally, regionally, and nationally.

All available firefighting tools and resources could be used, including non-mechanized and mechanized handheld tools, fire engines, fire retardant, and aviation resources. Motorized and mechanized wheeled or track equipment could be used off-road with approval from the Superintendent.

As described in the East Fork FMU, **prescribed fire** would also be allowed as part of a hazardous fuel reduction project to protect cultural and natural resources, as a restoration treatment in fire dependent ecosystems, or as part of a research project. The most current scientific information would be used in planning and implementing prescribed fire treatments. All available firefighting tools and resources could be used as described in the Dave's Hollow FMU, including non-mechanized and mechanized handheld tools, fire engines, aviation resources, and other typical fire management tools. Other equipment could be considered on a case-by-case basis to protect life, property, or resources with approval from the Superintendent.

All available firefighting tools and resources could be used as described in the Dave's Hollow FMU, including non-mechanized and mechanized handheld tools, fire engines, aviation resources, and other typical fire management tools. Other equipment could be considered on a case-by-case basis to protect life, property, or resources with approval from the Superintendent.

Mechanical methods would be used as described in the East Fork FMU, including non-mechanized and mechanized handheld tools, light forestry equipment, and aviation resources. Mechanized wheeled or track equipment could be used off-road with approval from the Superintendent.

Herbicide treatments would be used on a limited basis and only after all other options have been considered (such as mechanically girdling trees to reduce crown biomass) and only as part of a non-native plant control project or to protect important natural and cultural resources. Non-native plant infestations change vegetation compositions, which could allow fire into a non-adapted fire system. This could increase fire duration, frequency, and intensity in these areas. Due to the annual nature of many of the non-native vegetation types within the park, some areas may need treatment each year to maintain safe conditions.

Tools and resources would be used as described in the Dave's Hollow FMU, including non-mechanized and mechanized handheld tools. Forestry equipment could be used off-road with approval from the Superintendent. These equipment types could include all-terrain-vehicles with attachments, such as boom sprayers, large balloon tractor tires, or lightweight low impact tracked machines.

Outback FMU

The Outback FMU (which comprises 7,481 acres, or 21 percent) consists of lands north and east of the Dave's Hollow FMU. This unit is bordered by the Grand Staircase-Escalante National Monument, Dixie National Forest, Utah State lands, and some private land. Vegetation consists of ponderosa pine stands, gambel oak, pinyon/juniper, and sage/grasslands.

Wildland fire would be managed to perform its natural role in ecosystem maintenance within the Outback FMU. The primary goal of managing lightning-ignited fires within this zone would be to allow fires to function as a natural process in promoting ecosystem health.

Fire growth in these areas could be limited by natural barriers and would be managed under less restrictive prescriptive elements or indices than the East Fork FMU. The risk to life and property from fire would be low to moderate within this zone. Work would be done to reduce hazard fuels in this zone in order to provide for firefighter and public safety. All strategies including prescribed fire activities, mechanical methods, or herbicide treatments could occur within this zone, but would be limited due to the goal of managing these areas in a pristine or primitive state.

Management Strategies

As described under the East Fork FMU, **wildland fire use for resource benefit** would be the preferred strategy considered in lieu of suppression for lightning-ignitions under favorable weather conditions. An example of a favorable weather condition would be lower temperatures and wind speeds with increasing humidity. Location, weather trends, and the time of season for each wildland fire would be considered. All actions would take place under a WFIP which would evaluate threats to public and firefighter health and safety, natural and cultural resources, fire behavior (flame length, rate of spread), fuel conditions (moisture content of vegetation), expected size and duration of the fire, fuel continuity (sparse vs. dense vegetation), the availability of resources to manage the fire, and wildland fire activity levels locally, regionally, and nationally.

As described in the Fish Hook FMU, all wildland fires would be assessed to determine if a wildland fire use strategy would be appropriate. A WFIP would be completed under this approach. If wildland fire use is deemed not appropriate, the fire would be **suppressed**. A confine or contain action would be the primary method used in trying to contain and control of the fire. The secondary method used would be direct attack actions to contain and control the fire. A WFSA would be completed for the firefighting approach.

All available firefighting tools and resources could be used as described in the Dave's Hollow FMU, including non-mechanized and mechanized handheld tools, fire engines, fire retardants, and aviation resources. Motorized and mechanized wheeled or track equipment could be used off-road with approval from the Superintendent.

As described in the Dave's Hollow FMU, all available firefighting tools and resources could be used, including non-mechanized and mechanized handheld tools, fire engines, fire retardants, and aviation resources. Motorized and mechanized wheeled or track equipment could be used off-road with approval from the Superintendent.

Prescribed fire would be allowed (as described in the East Fork FMU) as part of a hazardous fuel reduction project, to protect cultural and natural resources, as a restoration treatment in fire dependent ecosystems, or as part of a research project. The most current scientific information would be used in planning and implementing prescribed fire treatments. All available firefighting tools and resources could

be used as described in the Dave's Hollow FMU, including non-mechanized and mechanized handheld tools, fire engines, aviation resources, and other typical fire management tools. Other equipment could be considered on a case-by-case basis to protect life, property, or resources with approval from the Superintendent.

All available firefighting tools and resources could be used as described in the Dave's Hollow FMU, including non-mechanized and mechanized handheld tools, fire engines, aviation resources, and other typical fire management tools. Other equipment could be considered on a case-by-case basis to protect life, property, or resources with approval from the Superintendent.

Mechanical methods would be used as described in the Dave's Hollow FMU, including non-mechanized and mechanized handheld tools, light forestry equipment, and aviation resources. Mechanized wheeled or track equipment could be used off-road with approval from the Superintendent.

Tools and resources could also be used as described in the Dave's Hollow FMU, including non-mechanized and mechanized handheld tools, light forestry equipment, and aviation resources. Mechanized wheeled or track equipment could be used off-road with approval from the Superintendent.

Herbicide treatments would be used (as described in the Fish Hook FMU) on a limited basis and only after all other options have been considered (such as mechanically girdling trees to reduce crown biomass) and only as part of a non-native plant control project or to protect important natural and cultural resources. Non-native plant infestations change vegetation compositions, which could allow fire into a non-adapted fire system. This could increase fire duration, frequency, and intensity in these areas. Due to the annual nature of many of the non-native vegetation types within the park, some areas may need treatment each year to maintain safe conditions.

Tools and resources would be used as described in the Dave's Hollow FMU, including non-mechanized and mechanized handheld tools. Forestry equipment could be used off-road with approval from the Superintendent. These equipment types could include all-terrain-vehicles with attachments, such as boom sprayers, large balloon tractor tires, or lightweight low impact tracked machines.

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Table 6: Alternative B – Summary of Fire Management Strategies by Unit

FIRE MANAGEMENT UNIT	Wildland Fire Suppression Strategy	Wildland Fire Use For Resource Benefit Strategy	Prescribed Fire Strategy	Mechanical Strategy	Herbicide Strategy
DAVE'S HOLLOW Unit includes most of the park boundary adjacent to private lands and sections within the park that are adjacent to wildland/urban interface. Focus of unit is to minimize the threat of fire to life, property, and resources, and to ensure ecosystems are managed to meet NPS objectives.	• Allowed: Fires would be suppressed using confine, contain, or direct attack tactics using all available firefighting resources. WFSA process would be used. • Tools that would be allowed: non-mechanized and mechanized handheld tools, fire engines, fire retardant, and aviation resources. • Tools that could be allowed with Superintendent approval: mechanized wheeled or tracked equipment off-road.	• Not allowed • Exception: Fire could be allowed to enter this zone from adjacent zones and would be managed to reach containment and control. • Tools that would be allowed: non-mechanized and mechanized handheld tools, fire engines, aviation resources, and other typical fire management tools. • Tools that could be allowed with Superintendent approval: mechanized wheeled or tracked equipment off-road.	• Allowed: Treatments would be used as part of a hazardous fuel reduction project to protect private property and park infrastructure, a restoration treatment in fire dependant ecosystems, or as part of a research project studying fire. • Tools that would be allowed: non-mechanized and mechanized handheld tools, fire engines, aviation resources, and other typical fire management tools. • Tools that could be allowed with Superintendent approval: on a case-by-case basis other equipment could be considered to protect life, property, or resources.	• Allowed: Treatments would be used primarily near developed areas and the park boundary to protect private property and park infrastructure. A secondary approach would be to use this method in vegetation restoration projects or to protect cultural or natural resources. • Tools that would be allowed: non-mechanized and mechanized handheld tools, light forestry equipment, and aviation resources. • Tools that could be allowed with Superintendent approval: mechanized wheeled or tracked equipment off-road.	• Allowed: Use would primarily be to reduce non-native plants near developed areas or areas of resource management concern. A secondary approach could be to use this strategy to reduce fuel density and continuity, where mechanical methods may not be feasible. • Tools that would be allowed: non-mechanized and mechanized handheld tools. • Tools that could be allowed with Superintendent approval: light on the land forestry equipment off-road.

Table 6: Alternative B – Summary of Fire Management Strategies by Unit

FIRE MANAGEMENT UNIT	Wildland Fire Suppression Strategy	Wildland Fire Use For Resource Benefit Strategy	Prescribed Fire Strategy	Mechanical Strategy	Herbicide Strategy
EAST FORK Unit includes west portion of the park boundary where adjacent land is managed by the Dixie National Forest. The unit also includes lands from the boundary east to the rim. Focus of unit is to identify opportunities to allow fire to maintain its natural role, while protecting life, property, and resources.	• Allowed: All natural ignitions would be considered for resource benefit using a WFIP. If a fire cannot be managed for these benefits, suppression would be used to reach containment of the fire. • Tools that would be allowed: Same as Dave's Hollow FMU. • Tools that could be allowed with Superintendent approval: Same as Dave's Hollow FMU.	• Allowed: This action would be considered in lieu of suppression for lightning-ignitions when temperatures and wind speeds are low and humidity is increasing¹. The primary purpose of this strategy is to maintain and conserve natural processes. All actions would occur under a WFIP. • Tools that would be allowed: same as Dave's Hollow FMU. • Tools that could be allowed with Superintendent approval: same as Dave's Hollow FMU	• Allowed: Treatments would be used as part of a hazardous fuel reduction project to protect cultural or natural resources, a treatment in fire dependant ecosystems as part of a restoration project, or as part of a research project. • Tools that would be allowed: same as Dave's Hollow FMU. • Tools that could be allowed with Superintendent approval: same as Dave's Hollow FMU.	• Allowed: Treatments would be used primarily near the park boundary, as part of a restoration project, or to protect cultural or natural resources, or neighboring lands. • Tools that would be allowed: same as Dave's Hollow FMU. • Tools that could be allowed with Superintendent approval: same as Dave's Hollow FMU.	• Allowed: Use would primarily be to reduce non-native plants near boundary areas or other areas of non-native plant infestations. A secondary approach could use herbicides to reduce fuel density and continuity where mechanical methods may not be feasible or to protect important cultural or natural resources. • Tools that would be allowed: same as Dave's Hollow FMU. • Tools that could be allowed with Superintendent approval: same as Dave's Hollow FMU.
FISHHOOK Unit includes areas within the interior of the park from the rim east to park boundary, south of Dave's Hollow FMU. Focus of unit is to allow fire to function naturally while protecting life, property, and resources.	• Allowed: All lightning-ignitions would be considered for resource benefit using a WFIP. If a fire cannot be managed for these benefits, suppression would be used to reach containment of the fire. • Tools that would be allowed include: Same as Dave's Hollow FMU. • Tools that could be allowed with Superintendent approval: Same as Dave's Hollow FMU.	• Allowed: This action would be the preferred strategy. It could be used with higher air temperatures and wind speeds and increasing humidity¹. All actions would occur under a WFIP. • Tools that would be allowed include: same as Dave's Hollow FMU. • Tools that could be allowed with Superintendent approval: same as Dave's Hollow FMU.	• Allowed: Same as East Fork FMU • Tools that would be allowed include: Same as Dave's Hollow FMU. • Tools that could be allowed with Superintendent approval: same as Dave's Hollow FMU.	• Allowed: Same as East Fork FMU • Tools that would be allowed include: Same as Dave's Hollow FMU. • Tools that could be allowed with Superintendent approval: Same as Dave's Hollow FMU.	• Allowed: Use would be limited and only after all other options have been considered and only as part of non-native plant control or to protect important natural and cultural resources. • Tools that would be allowed: Same as Dave's Hollow FMU. • Tools that could be allowed with Superintendent approval: Same as Dave's Hollow FMU.

Table 6: Alternative B – Summary of Fire Management Strategies by Unit					
FIRE MANAGEMENT UNIT	Wildland Fire Suppression Strategy	Wildland Fire Use For Resource Benefit Strategy	Prescribed Fire Strategy	Mechanical Strategy	Herbicide Strategy
OUTBACK					
Unit includes area Northeast of the Dave’s Hollow FMU. Focus of unit is to allow fire to function naturally while protecting life, property, and resources.	Same as Fish Hook FMU. Tools would be the same as those described for Dave’s Hollow.	Same as Fish Hook FMU. Tools would be the same as those described for Dave’s Hollow.	Same as Fish Hook FMU. Tools would be the same as those described for Dave’s Hollow.	Same as Fish Hook FMU. Tools would be the same as those described for Dave’s Hollow.	Same as Fish Hook FMU. Tools would be the same as those described for Dave’s Hollow.
Common to all zones and strategies	(1) Firefighter and public safety would be the first priority in every fire management activity. (2) Minimum Impact Suppression Tactics would be used throughout the park. (3) Minimum equipment analysis and park management approval would be needed for activities using motorized equipment in recommended or proposed wilderness. (4) All treatment actions would take into consideration and mitigate any potential increase or spread of invasive non-native plants (including decontaminating and power washing equipment if exposed to invasive non-native plant species before entering park lands).				
¹ Refer to the fire use description in the <i>Proposed Action</i> for more details on the weather indices, prescription parameters, and decision criteria related to this process. Refer to the <i>Glossary</i> for definitions of terminology.					

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Mitigation Measures

Mitigation is defined in the Code of Federal Regulations (40 Code of Federal Regulations (CFR) 1508.20) as:

- Avoiding the impact altogether by not taking a certain action or parts of an action.
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- Compensating for the impact by replacing or providing substitute resources or environments.

Mitigation Measures for Alternative A – No Action Alternative (Current Fire Management)

Air Quality/Smoke Management

- Comply with the *EPA Interim Air Quality Policy on Wildland and Prescribed Fires*, and *Utah State Implementation Plan and Enhanced Smoke Management Plan*.
- Evaluate smoke dispersion using modeling, collection of field level observations, and other techniques as part of planning for and managing each fire.
- Use long-range planning to minimize the cumulative effects of smoke on visibility (e.g., coordinate prescribed fire activities with other agencies to lessen impacts to the airshed.)
- Train fire management staff on current best management practices and techniques for minimizing and/or managing smoke emissions.
- Use scheduling, fuel conditions, ignition patterns, and other fire management tools to enhance smoke dispersal.
- Monitor smoke conditions during all fires.
- Burn in seasons characterized by meteorological conditions that allow for efficient smoke dispersion.
- Use ignition techniques such as aerial ignition by helicopter to produce safe, high intensity fires with short duration impacts. High intensity burning causes the rapid rise of smoke into the atmosphere where it more quickly disperses.
- Ignite burns under good to excellent ventilation conditions and suspend operations under poor smoke dispersion conditions.
- Consider smoke impacts and residual smoke on activities conducted by local communities and land users.
- Burn only those wildland fuels essential to meet management objectives.
- Minimize duff consumption, smoldering, and large fuel consumption through monitoring fuel moisture considerations.
- Burn fuels such as piles when other burns are not feasible, such as when snow or rain is present.
- Protect public health, public safety and visibility by spreading smoke impacts over a broader time period and geographic area.
- Burn during optimum periods to prevent trapping smoke in inversions or diurnal wind flow patterns.
- Consolidate burning material to enhance fuel consumption and to minimize smoke production.
- Implement maintenance burning in a periodic rotation mimicking natural fire cycles to reduce excessive wildland fuel accumulations and subsequent excessive smoke production through smoldering or wildland fires.
- Manage smoke impacts by 1) minimizing smoke impacts to roads, highways, and airports to the amounts, frequencies, and durations consistent with any guidance provided by highway and airport personnel; and 2) minimizing smoke impacts to Class I areas, or areas that are non-attainment for particulates, and/or carbon monoxide non-attainment areas, or other smoke sensitive receptors.
- Alert visitors, residents, and local communities of planned prescribed fires and fire use events.

Soils

- Minimize soil disturbances during fire operations, especially if creating fire lines.
- Use light-on-the-land forestry equipment to minimize compaction and rutting of soils.

Vegetation (including threatened, endangered, and sensitive species; and weeds)

- Consult threatened and endangered species recovery plans, specialists, and scientific literature when designing fire management objectives and prescriptions.
- Comply with the Endangered Species Act.
- Use Burn Area Emergency Rehabilitation (BAER) techniques when needed.
- Train fire staff to identify invasive weeds and weed prevention best management practices.
- Retain sufficient vegetative cover within 0.25-mile of perennial streams to minimize sediment, ash, and woody debris transport in streams.

Water Quality and Hydrology

- Avoid contaminating surface water with fire retardant by directing retardant drops away from perennial streams and springs whenever possible.
- Avoid fuel spills in or near water sources by refueling equipment at least 50 feet from standing water or stream courses and use a containment pan.
- Install portable toilet facilities at spike camps for type 1-3 incidents. Consider bag disposal where access for portable toilets is not practical or for type 4-5 incidents.
- Evaluate post-fire erosion and vegetation recovery potential to determine if secondary treatments for watershed protection are necessary.

Natural Soundscapes

- Minimize noise associated with fire management activities by limiting the scope and area, and by timing the use of mechanical equipment to meet essential fire management requirements.
- Minimize impacts of fire management aircraft overflights, consistent with natural soundscape objectives.

Wilderness

- Minimum tool process would be required for non-emergency fire management activities within the recommended wilderness.
- Minimize use of motorized equipment or mechanical means of transport (refer Appendix D). In some situations equipment/mechanical activities would only be allowed with the approval of the Superintendent.
- Ensure aviation use is consistent with the Minimum Impact Suppression Techniques (refer to Appendix D).
- Restrict the number of flights to the minimum necessary consistent with the threats or risks to soundscapes, resources, public health, safety, and property.
- Use planned flight routes to avoid recommended wilderness or noise sensitive areas/resources.
- Use ground access for fire management activities whenever possible.

Wildlife (including threatened, endangered, and sensitive species)

- Comply with the Endangered Species Act.
- Limit disturbances above nest sites/eyries for peregrine falcon and goshawks (March-September).
- Consult threatened and endangered species recovery plans and scientific literature to design fire objectives and prescriptions.

- Ensure burn plans and prescriptions consider multi-species habitat needs and spatial variables (home range, mobility). If possible, attempt to maximize habitat patchiness instead of a single-intensity burn.
- Leave snags and cavity-bearing trees in place when reducing fuel loads. These resources may be removed when there is potential for fire to spread to park developed areas, or private property, or for human safety and resource concerns (i.e., archaeological sites).
- Avoid removing all coarse woody debris that is important to small mammal species, [amphibians](#), and [reptiles](#). Fuels greater than or equal 3 inches in diameter would be removed within 20 feet of values at risk. Fuels greater than or equal to 6 inches in diameter would be removed within 50 feet of values at risk.

Cultural Resources

- Conduct intensive archeological survey in areas identified for planned treatments.
- Remove or thin vegetation around historic structures and/or significant landscape features (telephone poles, etc.), and archeological sites to reduce fire intensity.
- Avoid surface disturbing suppression techniques within cultural resource boundaries (sites, historic districts, landscapes, structures) unless techniques are warranted for resource protection and supervised by a cultural resource advisor.
- Carry, rather than drag, mechanically removed fuels to reduce surface disturbance within cultural resource boundaries. Remove slash from thinning areas to designated locations for off-site disposal.
- Shield sites and structures (rock art, dendroglyphs, structures, etc.) from flame contact, limit exposure to fog spray, foam, backpack pumps, low pressure sprinklers, and damaging high temperatures or lengthy heavy smoke exposures with fire shelters or wrap, and reduce fuel loads as mentioned above or apply other techniques.
- Avoid using retardant, other additives, or high pressure streams directly on rock art. These techniques could be applied as an indirect protective measure.
- Avoid direct applications of bucket or air tanker drops. Water drops could be applied as an indirect protective measure for cultural resources.

Visitor Use and Experience/Public Health and Safety/Economic Considerations

- Inform visitors of planned and current area closures due to fire management activities through press releases, notices at trailhead and visitor facility bulletin boards, backcountry permitting, the park website, and other means as necessary.
- To protect visitors, temporarily close trails and/or roads, use cautionary signing on trails and/or roads, and close facilities if warranted.
- Plan prescribed fires when smoke is unlikely to impact high visitor use areas.
- Minimize use of aircraft, or route aircraft around high-use or sensitive areas.

Mitigation Measures for Alternative B – Proposed Action/Preferred Alternative

Mitigation under Alternative B would include **all those for Alternative A, plus the following additional mitigating measures:**

Vegetation (including threatened, endangered, and sensitive species; and weeds)

- In most cases, avoid seeding to reduce erosion because catastrophic erosion events following a fire are typically not a major problem in this area. The risk of non-native seeds being introduced generally outweighs the risk of accelerated erosion.
- If restoration requires seeding, use native plant seed only and, to the extent possible, acquire seed from the local area.

- When fire operations occur in weed infested areas, stage a power wash station at or near incident and/or helibases, if possible. Wash all vehicles and equipment upon arrival from and departure to each incident.
- Inspect clothing for weed seeds if foot travel has occurred in infested area. Clean/remove seed to the extent possible upon arrival and departure to the park.

Water Quality and Hydrology

- Coordinate with the Utah Division of Wildlife Resources to identify emergency water sources around the park that are free of noxious exotic species.

Natural Soundscapes

- Use tools that reduce noise impacts, such as non-motorized tools and equipment, and use quiet technology for motorized equipment.
- Explore options for use of quiet aircraft technologies.

Wilderness

- Use restoration techniques that mimic natural fire regime occurrences.

Wildlife (including threatened, endangered, and sensitive species)

- Follow recovery plan recommendations for use of fire aircraft (horizontal and vertical distance).

Visitor Use and Experience/Public Health and Safety/Economic Considerations

- Limit the number, area, and duration of trail and areas closures in order to maintain opportunities for solitude and primitive, unconfined recreation.
- Develop interpretive themes and educational messages that inform the public (both inside and outside the park) about the aesthetic and ecological value of fire. Implement using a variety of media and methods, such as park publications, the park website, visitor contact stations, roving contacts, interpretive programs, community outreach, and school programs.

Environmentally Preferred Alternative

As stated in Section 2.7.D of *Director's Order #12 and Handbook* (USDI, NPS 2001a), the environmentally preferred alternative is the alternative that will promote the national environmental policy expressed in the National Environmental Policy Act (Sec. 101 (b)). This includes alternatives that:

- Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
- Ensure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings.
- Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.
- 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.
- Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities.
- Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Simply put, "this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural,

and natural resources” (Question 6a in Council on Environmental Quality 1981). In the NPS, the No Action Alternative may also be considered in identifying the environmentally preferred alternative.

Alternative A represents the current fire management practices at Bryce Canyon. While both prescribed fire and limited mechanical vegetation clearing in WUI areas for fuels management are part of the current management situation, Alternative A relies more heavily on prescribed fire alone and is less aggressive in the use of integrated fuels treatments. Alternative A also does not allow wildland fire use and supports suppression of all wildland fires. Therefore, Alternative A could allow for the continued buildup of woody fuels, with an accompanying risk of uncontrolled wildland fire. This type of event would result in adverse affects to many of the park’s resources.

The Proposed Action/Preferred Alternative, Alternative B, would reduce the risk of uncontrolled wildland fire by allowing for wildland fire use in three FMUs, and reducing the buildup of woody fuels in treatment areas through more aggressive and strategic use of mechanical fuels reduction and prescribed fire. The Preferred Alternative as compared to current management/No Action Alternative would:

- Provide an environment with low fuel loads that would mimic the appearance and behavior of natural, fire-adapted communities and enhance the protection of resources for succeeding generations.
- Reduce the risk to human health and safety and other undesirable consequences of wildland fire.
- Improve the safety, healthfulness, and aesthetics of the surroundings.
- Provide better protection of historic, cultural, and natural resources.

Therefore, Alternative B, the Proposed Action/Preferred Alternative, is the environmentally preferred alternative.

Alternatives Considered but Dismissed From Further Analysis

The following alternatives were identified by the public through scoping (for a complete description of scoping, refer to the *Consultation and Coordination* section of this document). For the reasons stated below they will not be analyzed further in this document.

Using Domestic Livestock to Reduce Fuels

The use of domestic livestock to reduce fuels was dismissed from further analysis for the following reasons:

- The regulations outlined in *36 CFR – Parks, Forests, and Public Property* outlines the rules the parks must follow in managing lands within the National Park System. The regulations do not allow the parks to graze livestock for any purpose, unless the use is specifically identified by park in 36 CFR or in the park’s enabling legislation (refer to Appendix B).
 - *36 CFR Part 2 – Resource Protection, Public Use, and Recreation §2.60 Livestock and Agriculture* states that: (a) the running-at-large, herding, driving across, allowing on, pasturing or grazing of livestock of any kind in a park area or the use of a park area for agricultural purposes is prohibited, except: (1) As specifically authorized by Federal statutory law; or (2) As required under a reservation of use rights arising from acquisition of a tract of land; or (3) As designated, when conducted as a necessary and integral part of a recreational activity or required in order to maintain a historic scene. Bryce Canyon National Park does not meet any of the exceptions.

Selling Trees for Firewood or Lumber

The legislation designating or adding lands to Bryce Canyon (refer to Appendix B) does not specifically allow for the selling of trees for firewood or lumber, so selling trees is subject to the rules published in *36 CFR– Parks, Forests, and Public Property*.

- *Part 2 – Resource Protection, Public Use, and Recreation §2.1 Preservation of natural, cultural, and archeological resources. (c) which states (3) The following are prohibited: (v) Sale or commercial use of natural products.*

There is nothing in existing federal regulation that would allow Bryce Canyon to sell wood for commercial purposes; therefore, this alternative will not be analyzed further in this document.

Federal agencies have been directed to reduce risk to firefighters, communities and municipal watersheds, and to restore health to forests and rangelands. *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment, 10-year Comprehensive Strategy* (USDI/USDA 2001) was completed in August 2001, along with a memorandum from the Secretary of the Department of the Interior, January 2003, that outlines strategies and hazardous fuel treatment priorities for federal agencies. One of the national fuel treatment priorities states “Contracted fuels treatment work should receive preference over work performed by the federal workforce. Whenever possible, projects should use third-party contracting that support rural community stability. This is consistent with Congressional direction and Goal Four of the *10-year Implementation Plan*.”

Hazardous fuel projects in Bryce Canyon have been small in scale. Historically the discarded vegetation has been piled and burned on site. Larger scale projects proposed in the 10-year plan would focus on service contracts that could potentially use the vegetation. These projects have clear objectives to reduce hazard fuel risk. In some instances, removal of fuels from the site may be necessary as part of the hazard fuel project. Options for removal of this vegetation would continue to be explored under existing laws and regulations. However, these contracted hazardous fuel reduction projects would not be construed as or based upon sale of trees for commercial purposes as prohibited by law.

Table 7: Comparison of Fire Management Strategies by Alternative

Fire Management Strategy	Alternative A: No Action	Alternative B: Proposed Action/Preferred Alternative
Suppression	Allowed in all fire management units.	Allowed in all fire management units, utilizing the best combination of confine, contain, direct attack tactics or utilization of the appropriate management response to improve safety and reduce impacts.
Wildland Fire Use For Resource Benefit	Not Allowed.	Allowed to start in all units except the Dave’s Hollow FMU. Fire could enter Dave’s Hollow FMU when better containment or control boundaries are defined within the unit to improve safety and reduce impacts.
Prescribed Fire	Allowed in all fire management units.	Allowed in all fire management units.
Mechanical Treatments	Limited allowance around administrative and boundary locations and in identified wildland urban interface areas.	Allowed in all fire management units, with emphasis on boundary and wildland urban interface protection. New direction and importance on identifying fire/vegetation condition class and highlighting needs for modification/restoration of stand structure as a stand alone treatment or in conjunction with

Table 7: Comparison of Fire Management Strategies by Alternative		
Fire Management Strategy	Alternative A: No Action	Alternative B: Proposed Action/Preferred Alternative
		prescribed fire or other treatments.
Herbicide Treatments	Not allowed.	Allowed in all fire management units. This strategy would only be used after other treatments have been considered. Focus would be primarily on exotic plants in wildland urban interface areas, newly/recently treated or disturbed areas to reduce exotics from becoming established. Limited use could be considered in other areas of units to improve safety and protect resources.

Table 8: Comparison of the Achievement of Fire Management Goals by Alternative		
Fire Management Plan Goal	Alternative A: No Action	Alternative B: Proposed Action/Preferred Alternative
Ensure that fire fighter and public safety is the first priority in every fire management activity and that these activities comply with established fire-safe management practices.	Meets the goal to some degree, but does not address wildland urban interface issues in all areas.	Meets the goal by adding additional management strategies that could decrease fire intensities, which could increase fire fighter and public safety.
Prevent and suppress unwanted fires using effective strategies and methods under the decision process of sound risk management.	Meets the goal.	Meets the goal by improving fire management guidance, and better defines fire management units with pre-determined suppression responses.
Allow for naturally ignited wildland fires to function within their role as an essential ecological process and natural agent of change in maintaining and restoring vegetation communities.	Does not meet the goal.	Meets the goal by allowing wildland fire use and identifying more realistic boundaries to manage fire within the park, such as use of natural fuel breaks to confine fire within and between units.
Use prescribed fire treatments as a naturally functioning process and to achieve vegetation management objectives that support land and resource management plans.	Partially meets the goal, but does not specifically address vegetation management objectives.	Meets the goal by linking fire management treatments with vegetation management objectives outlined in the NPS's resource management policy. The proposed fire plan also addresses how fire management actions tie to general management plan and resource management plan for all ecosystem components in the park.
Document and analyze both short-term and long-term fire effects data in evaluating the effectiveness of fire activities in meeting program objectives and developing scientifically-based management decisions.	Meets the goal.	Meets the goal by continuing to monitor the effectiveness of fire treatments and provides more flexibility to adapt to new technologies and management practices.
Promote understanding and acceptance of the natural role of wildland fire in maintaining and restoring ecosystem functions through a proactive public education program.	Partially meets the goal, since wildland fire use is not allowed under the current fire management plan.	Meets the goal by identifying information, education, and prevention methods and programs to better facilitate outreach.

Table 8: Comparison of the Achievement of Fire Management Goals by Alternative

Fire Management Plan Goal	Alternative A: No Action	Alternative B: Proposed Action/Preferred Alternative
Participate, contact, coordinate, and cooperate in interagency programs (federal, Tribal, State and local agencies) as part of the essential process in developing agreements, standardizing policies/procedures, and increasing cross-boundary programs.	Meets the goal, but is limited in scope.	Meets the goal by providing enhanced flexibility and management support with cooperating neighboring land owners and agencies. Provides for better cross-boundary management and decision making under the interagency fire management plan.

Table 9: Comparative Summary of Impacts

Impact Topic	Alternative A, No Action	Alternative B, Proposed Action
Air Quality	Alternative A would result in short-term, minor to moderate adverse impacts to air quality, including visibility, due to use of prescribed fire, slash pile burning and more intense wildland fires that would be expected to occur during the prime summer burning period, resulting in emissions of air pollutants, smoke, and odors. Cumulative impacts to air quality have the potential to be short- to long-term, minor to moderate, and adverse.	Alternative B would result in minor to moderate, adverse impacts to air quality, but these would be short-term and localized. Slash pile burning and prescribed fire would cause some adverse, direct, short-term, localized smoke and particulate matter emissions. However, there would be less chance of a severe or extensive wildland fire, resulting in long-term, moderate, beneficial effects that would offset the minor to moderate, short-term, adverse effects to air quality. Cumulative adverse effects are anticipated to range from minor to moderate, and there would be long-term, moderate, beneficial effects due to the reduction in fuel loading.
Threatened, Endangered, and Sensitive Plant Species	Alternative A would result in no adverse impacts on federally listed plant species, since none is present in the park; and short-term, negligible, localized adverse impacts on other sensitive plant species. Cumulative impacts to sensitive plants would be negligible to minor, localized, and adverse.	Alternative B would result in no adverse impacts to federally listed plant species, since none is present in the park; and short-term, negligible, localized adverse impacts to other sensitive plant species. There would be increased long-term benefits due to the reduced possibility of uncontrolled wildland fire throughout the park. Cumulative impacts to sensitive plant species would be negligible to minor, localized, and adverse.
Threatened, Endangered, and Sensitive Animal Species	Alternative A would result in negligible to minor, short-term, adverse impacts to the Utah prairie dog, with potentially long-term moderate adverse impacts due to loss of habitat from encroachment of woody species in meadows. Minor to moderate, beneficial effects to this species would occur due to creation of open grassland habitat as a result of prescribed fires. Other federally listed species would experience no or negligible to minor, short-term adverse effects. Other sensitive animal species that are not federally listed would be affected in the short-term, with minor to potentially moderate impacts. Precautions would be taken to survey for all these species prior to any prescribed fire or thinning. Cumulative impacts would be minor to moderate and adverse, but limited to certain areas of the park.	Alternative B would result in negligible, adverse impacts to the Utah prairie dog, with moderate beneficial effects due to the creation of open grassland habitat from prescribed fires and wildland fire use. Other federally and state listed species would experience negligible to minor adverse impacts. Most impacts would be short-term and limited to the duration of the fire events. Long-term, minor to moderate beneficial impacts would result from the reduction in fuel loads, reduced possibility of catastrophic wildland fire, and the opening up of closed canopy forest to create open meadows that would support various prey species. Cumulative impacts would be negligible to minor and adverse, and limited to certain areas.

Table 9: Comparative Summary of Impacts

Impact Topic	Alternative A, No Action	Alternative B, Proposed Action
Soils	Alternative A would result in short-term, minor to moderate, adverse impacts to soil resources, with long-term, minor to moderate, beneficial impacts in areas targeted for prescribed fires. Cumulative effects would be short- to long-term, minor, and adverse.	Alternative B would result in negligible to minor, adverse effects to soils in the short term, with moderate, beneficial long-term impacts from the re-establishment of a fire-driven nutrient cycle and increased stability of the soil strata, given increased native herbaceous ground cover and the reduced frequency of unplanned fire suppression activities. Cumulative effects would be localized, short- to long-term, minor and adverse.
Vegetation and Wetlands	Alternative A would result in short-term, direct, minor to moderate adverse impacts to vegetation, including higher degrees of plant mortality from high severity fuels in or near the park as a result of continued fuel buildup in certain areas. Fuel reduction treatments would result in short-term, minor to moderate, direct adverse impacts to the target community, but with long-term, moderate beneficial impacts as the community recovered over time. Mitigation measures would be implemented to rehabilitate burned areas and limit spread of exotics. Cumulative impacts would be moderate and adverse.	Alternative B would result in short-term, minor to moderate impacts to vegetation in very localized areas for the most part, with much less chance of higher intensity fires and related higher levels of impacts. Increased prescribed fire and mechanical thinning would reduce fuel loads and open areas previously containing high densities of trees and brush, resulting in long-term benefits from restoring a more natural fire regime and ecological processes. Mitigation measures would limit adverse impacts from burning, thinning, and herbicide use. Cumulative impacts would be minor to moderate and adverse.
Water Quality and Hydrology	Alternative A would result in short-term, minor to moderate, adverse impacts to water quality because of the increased chance of wildland fire, resulting in increased runoff of soil and ash into streams, an increase in stream temperature, higher temporary nutrient loading, and possible increased channel erosion. Locally long-term, minor to moderate adverse effects would be expected in case of more extreme and/or widespread fire. Cumulative effects would be short- to long-term, minor, and adverse.	Alternative B would result in short- to long-term, negligible to minor, more localized adverse impacts to water quality. Long-term, moderate beneficial effects would result because of the reduced area that would be affected by extensive wildland fires, the lower fire potential, and the controlled and limited locations of prescribed fires that can result in a thick regrowth that limits erosion and sedimentation. Cumulative effects would be short-term, negligible to minor and adverse, with long-term benefits.
Natural Soundscapes	Alternative A would result in localized, short-term, minor adverse impacts on natural soundscapes due to noise from prescribed fire activities, limited mechanical clearing, and fire suppression activities, including noise from helicopters, mechanical equipment and vehicle use. Cumulative effects would be to be short-term, minor and adverse, but localized.	Alternative B would result in localized, short-term, minor to moderate, adverse impacts on natural soundscapes due to the use of fire suppression, wildland fire use, and mechanical removal equipment, including the presence of fire crews, helicopters, chainsaws, and off-road vehicles. Cumulative effects would be localized, short-term, minor and adverse.
Wilderness	Alternative A would result in minor to moderate, short-term, direct, adverse impacts on wilderness values due to the risk of a catastrophic wildland fire and the increased human presence in wilderness areas required to support fire suppression efforts. Cumulative effects would be long-term, minor to moderate, and adverse. Analysis of minimum tool requirements would be used in all wilderness areas to keep adverse impacts to minimal levels.	Alternative B would result in short-term, negligible to minor, adverse impacts to wilderness values due to the presence of work crews, the additional noise associated with fire use and firefighting activities, and the potential use of mechanized tools in or bordering wilderness. The effects to wilderness character would be moderate and beneficial due to the reduction in fuel loads, which would reduce the risk of catastrophic wildland fire. Cumulative effects would range from negligible to minor and adverse to long-term, minor to moderate, and beneficial. Analysis of minimum tool requirements would be used in all wilderness areas to keep adverse impacts to minimal levels.

Table 9: Comparative Summary of Impacts

Impact Topic	Alternative A, No Action	Alternative B, Proposed Action
Wildlife	Alternative A would result in minor to moderate, adverse impacts to wildlife and wildlife habitat, with short-term adverse impacts giving way to longer-term benefits for some species in areas that have burned but recover with new regrowth and a more open canopy. Cumulative impacts would be moderate and adverse.	Alternative B would result in minor to moderate adverse impacts to wildlife and wildlife habitat, with conditions improving over time, and long-term, moderate beneficial impacts from the restoration of more natural conditions and the reduction of the possibility of catastrophic wildland fire. Cumulative impacts would be minor to moderate and adverse.
Cultural Resources	Alternative A would result in minor to moderate, adverse impacts on cultural resources in the park. Short-term impacts may occur, but most impacts would be considered long-term due to the non-renewable nature of these resources. Cumulative impacts would be minor to moderate, long-term and adverse from fire, collecting, erosion, and soil/ground disturbance.	Alternative B would result in long-term, minor, adverse impacts to cultural resources, with some moderate, long-term beneficial impacts from eliminating the threat of extensive, high-intensity fires and reducing damaging fuels. Cumulative impacts would be short-term, minor, and adverse, with long-term, moderate beneficial effects.
Economic Considerations	Alternative A would result in short- and long-term, indirect adverse impacts to local socioeconomic conditions, with some beneficial short-term impacts resulting from the revenue generated by the presence of fire crews. Adverse impacts would include loss of revenue and the cost of suppression, as well as costs associated with fighting a possibly extreme wildland fire. These impacts would be minor to moderate, depending on the length and severity of the fire, the location of the fire, and when it occurred. Cumulative effects from Alternative A would be short- to long-term, minor to moderate, and adverse.	Alternative B would result in short-term, minor to potentially moderate, adverse impacts to the local economy during the periods of some fuels reduction activities or wildland fire use, which would require restrictions on park use. However, long-term, beneficial impacts would result from the increased protection from costly wildland fires, including both the direct firefighting costs and the indirect costs to the local economy from the reduction in tourism and recreation revenues. Short-term, beneficial impacts would result from the increases in wages and work activities associated with fuel reduction projects or wildland fire use. Cumulative effects to the local economy would range from short-term, minor, adverse to long-term, beneficial impacts from the reduced potential of a large-scale wildland fire.
Public Health and Safety	Alternative A would result in short- to long-term, minor to moderate, adverse impacts that have more potential to be more severe if fuels buildup reaches levels that could support an extreme wildland fire. Cumulative effects of this alternative would be short-term, minor to moderate, and adverse primarily because of the risk of a large wildland fire.	Alternative B would result in more localized, short-term, negligible to minor, adverse impacts from the fire and fuels reduction activities expected, but would also provide long-term, beneficial impacts resulting from the increased protection from extreme wildland fires, which can create situations with higher health and safety risks. Cumulative effects of this alternative would be short-term, minor, and adverse.
Visitor Use and Experience	Alternative A would result in short-term, minor to moderate, adverse impacts to visitor use and experience, with long-term, minor to moderate, beneficial impacts where the effects of prescribed fires and limited clearing have created a more diverse, natural landscape in the long-term. Cumulative effects on visitor use and experience would be short-term, minor to moderate, and adverse.	Alternative B would result in short-term, minor to moderate, adverse to visitor use and experience, as well as moderate, beneficial impacts. Cumulative effects would include short-term, minor adverse impacts, as well as long-term, minor to moderate and beneficial impacts.

AFFECTED ENVIRONMENT & ENVIRONMENTAL CONSEQUENCES

Methodology for Assessing Impacts

In order to analyze the environmental consequences of the alternatives proposed in this document, three factors must be examined for each resource: type of impact, duration of impact, and intensity of impact. After the environmental consequences of the alternatives are examined for separate topics, the impact of implementing the alternative is considered along with the impacts of other relevant actions in the area.

The type of impact describes a relative measure of beneficial or adverse effects on biological or physical systems, cultural resources, or the social environment. Because impacts could have short-term adverse impacts while having long-term, beneficial impacts, it is important to look at the duration of the effect of an impact.

However, examining the type and duration of an impact is not enough because an impact could cover a large area or a large portion of a population or could be highly noticeable or even irreversible. Impacts can vary in intensity, from small and imperceptible to large and substantial. Measures of intensity consider whether an impact would be negligible, minor, moderate, or major. These measures are used to describe both beneficial and adverse impacts.

Cumulative Impacts

Cumulative impacts are also considered in this analysis. A cumulative impact is described in the Council on Environmental Quality regulations (1508.7) as “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 what agency (federal or non-federal) or person undertakes such other actions.” Cumulative impacts can result from individually minor but collectively major actions taking place over a period of time.

Cumulative impacts of each alternative were addressed by considering the effects of the alternative, combined with the effects of the following past, present, and reasonably foreseeable future actions that were identified in and around the project area:

- Existing and proposed power plants in the region, which contribute to regional haze.
- Vehicle use and associated emissions in and around the park (cars, RVs, etc.).
- Use of wood stoves in the surrounding areas.
- Use of the diesel-fueled shuttle system within the park.
- Visitor use of the park (related disturbances to soils, soundscapes, vegetation, campfires etc.).
- Development and maintenance of park roads and other facilities.
- Wildland Fires on adjacent lands.
- BLM, U.S. Forest Service (USFS), and other neighboring landowners’ use of prescribed fire and other fuel reduction treatments on lands surrounding the park.
- BLM, USFS actions to protect listed species on lands surrounding the park.
- Increasing spread of exotic plant species within the region.
- The continued use of adjacent land for ranching over the years.
- Periodic presence of plague and other wildlife diseases in and around the park.
- Presence of pests and disease that affects trees (e.g., mistletoe, fir engraver beetle).
- Agricultural uses on neighboring lands, including grazing.

- Non-firefighting aircraft use over and near the park, including Federal Aviation Administration (FAA)-permitted helicopter tours.
- Expected continued growth in the population of neighboring counties and communities, including increased use of water for domestic and agricultural purposes.
- Expected continued increasing visitation.
- Dangers to health and safety from use of the park, especially in the backcountry (e.g., falls, snakes).
- Increasing use of ATV's "roadless" areas bordering park boundaries.
- Rezoning of the town of Tropic to include a more pristine "buffer"/recreational residential zone around the park (a change from residential/commercial).
- Varying effects of regional economy and gas prices fluctuations.

Impairment Analysis Method

National Park Service Management Policies (USDI, NPS 2001c) requires analysis of potential effects to determine whether or not actions would impair park resources or values.

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. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, actions that would adversely affect park resources and values.

These laws give the NPS the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of the park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the NPS the management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirements that the NPS 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 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 and values. An impact to any park resource or value may constitute impairment. Impairment may result from NPS management activities, visitor activities, or activities undertaken by concessionaires, contractors, and others operating in the park. An impact would be more likely to constitute impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- identified as a goal in the park's general management plan or other relevant NPS planning documents.

A determination on impairment is included in the impact analysis section for all impact topics relating to park resources and values.

Air Quality

Affected Environment

Bryce Canyon National Park is designated a Class I area under the Clean Air Act. This designation means that the least amount of degradation is allowed in air quality characteristics, including visibility, as compared to other Clean Air Act designations. Air quality in the park is generally very good. Due to the fact that Bryce Canyon is in a Class I Airshed and that artificial light is practically non-existent, the night sky has become one of the most popular elements in the park's interpretive program.

Current local sources of pollution include vehicle emissions, wood burning, and fires. Most air pollution that degrades visibility at the park is from long-distance transport of emissions from regional pollution sources, such as coal-fired generating plants and other sources in large urban areas, including those as far away as northern Utah, southern Nevada, southern California, Arizona, and northern Mexico.

Activities that could lead to a significant impact to air resources, visibility, and other related values of the Class I area must be permitted by the state and certified by the federal land manager (in this case, the Assistant Secretary of the Interior for Fish, Wildlife and Parks) as having no significant impact. Additionally, the NPS works actively to identify large sources of regional haze and to use the provisions of the Clean Air Act to reduce their emissions.

National Ambient Air Quality Standards are established under the Clean Air Act to protect public health. Federal and state governments have established regulations under the Clean Air Act specifically to address emissions from wildland fires, and the park is required to work within this regulatory framework. The U.S. Environmental Protection Agency has established an *Interim Air Quality Policy on Wildland and Prescribed Fires*, and the State of Utah has established a *State Implementation Plan and Enhanced Smoke Management Plan* (2002). These guidelines provide a process for evaluating the impact of smoke emissions in planning for management fires, state review prior to ignition, public notification before and during fires, and monitoring of emissions during fires.

When wildland fire or prescribed fires are burning, daytime smoke is normally carried to the northeast by the prevailing southwest winds and is usually diluted quickly enough that it is not visually detectable from background levels within a few miles.

Impact Threshold Definitions

Negligible	Changes in air quality would be below or at the level of detection, and if detected, would have effects that would be considered slight.
Minor	Changes in air quality would be measurable, although the changes would be small and the effects would be localized. No air quality mitigation measures would be necessary.
Moderate	Changes in air quality would be measurable and would have consequences, although the effect would be relatively local. Air quality mitigation measures would be necessary and the measures would likely be successful.
Major	Changes in air quality would be measurable, would have substantial consequences, and be noticed regionally. Air quality mitigation measures would be necessary and the success of the measures could not be guaranteed.
Duration	Short-term – occurs only through the duration of the fire Long-term – continues beyond the duration of the fire
Area of Analysis	The Utah listed Smoke Management Airshed surrounding the park

Effects of Alternative A – No Action Alternative

Under Alternative A, fuel loading would continue to increase, with a continued potential for high-intensity wildland fires during a high-severity fire season and resulting increased emissions periodically originating on park land. The potential for these high intensity fires is based on the continuing variance from historical conditions, creating greater uncontrolled smoke production from the burning of an accumulation of fuels (such as dense tree canopies, deadfall, ladder fuels, pine needle duff, and grass thatch) that were historically removed by frequent wildland fires. These emissions of air pollutants, including nitrogen oxides (NO_x), carbon monoxide (CO), and particulates would result in short-term, minor to moderate direct adverse impacts on air quality, including visibility, due to localized exceedences of some air quality standards.

Limited-sized prescribed fires and slash pile burning would be used to accomplish fuels reduction objectives. These prescribed fires would have direct and mostly localized, short-term, minor to moderate adverse impacts to air quality, including visibility, and indirect negligible to minor beneficial effects in terms of reduced wildland fire emissions over the long-term. Before undertaking any prescribed fire, a permit application would be prepared that would include the location, size, type of fuels to be treated, estimates of emissions, modeling results showing plume direction, duration of burn, and whether air quality standards would be exceeded for any period of time.

On a regional basis, effects to air quality from both prescribed fires or wildland fire use would generally include minor to moderate, short-term adverse impacts, as large quantities of pollutants, primarily particulates, are released to the atmosphere and travel past park boundaries. Indirect effects from these air emissions would include reduced visibility along roadways, reductions in recreation values due to visibility limitations, smoke and odors, and possible health effects to sensitive residents and visitors. Mitigation actions to minimize smoke would be conducted under this alternative, including scheduling to avoid high visitor use periods and other scheduled fires in the region, as well as an assessing fuel conditions, ignition patterns, and other fire management tools to enhance smoke dispersal. With the use of these mitigation measures, adverse effects would decrease to minor levels as fuel levels are slowly reduced.

Cumulative Effects

Cumulative effects would include smoke from other wildland fires originating on the surrounding BLM and USFS lands, agricultural and local leaf burning and woodstove use, regional haze resulting from current and proposed coal fired generating plants, minor emissions from maintenance projects planned for the park, motorized vehicle use in and around the park (including the diesel-powered shuttle), and the potential for increased recreational and private development near the park. The severity and duration of impacts would largely depend on the extent of fires in the area and whether or not these occurred at the same time. Overall, impacts of actions described under Alternative A, combined with impacts of other actions that could affect regional air quality, would result in minor to moderate, direct and indirect adverse cumulative impacts to air quality.

Conclusion

Alternative A would result in short-term, minor to moderate adverse impacts to air quality, including visibility, due to use of prescribed fire, slash pile burning and more intense wildland fires that would be expected to occur during the prime summer burning period, resulting in emissions of air pollutants, smoke, and odors. Cumulative impacts to air quality have the potential to be short- to long-term, minor to moderate, and adverse.

Because there would be no major, adverse impacts to air quality whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Bryce Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's air quality resources or values.

Effects of Alternative B – Proposed Action/Preferred Alternative

Alternative B would include either management or suppression of wildland fire and would allow for fuel reduction activities within the park, including mechanical thinning, slash piling, slash pile burning, and prescribed fire. Direct impacts of Alternative B to air quality, including visibility, would be short-term, minor to moderate, and adverse; however, best available control technology would be applied to minimize emissions, and overall impacts would depend on fuel loading and burn intensity and duration.

Short-term, minor to moderate, indirect adverse air quality impacts would occur in the area because of potential for wildland fires, coupled with prescribed fire activities. However, the potential for more intense impacts and longer-term impacts would decrease, since fewer areas would have high wildland fire potential due to the allowance of wildland fire use and the scheduled prescribed fire treatments, thinning, and establishment of fuel breaks to accomplish suppression activities. Also, coordination of fire management planning with the Dixie National Forest would reduce the risk of a catastrophic fire — a moderate beneficial impact. Wildland fire use would be conducted at optimum smoke dispersal periods to keep adverse impacts to a minimum. Also, wildland fire use fires produce fewer emissions than wildland fires of similar duration because they are carried out under less extreme conditions.

Prescribed fires ignited to meet resource and protection objectives (i.e., hazard reduction, etc.) and naturally ignited wildland fires managed for resource benefits would collectively reduce years of fuel accumulation, resulting in long-term benefits to regional and local air quality through reduced emissions. Before undertaking any prescribed fire, a permit application would be prepared that would include the location, size, type of fuels to be treated, estimates of emissions, modeling results showing plume direction, duration of burn, and whether air quality standards would be exceeded for any period of time.

Smoke Management. Prescribed fire would be conducted in a manner to minimize local effects to visibility and air quality from smoke production. Smoke production and air quality would be monitored prior to ignition and monitored during the operation to ensure that smoke impacts are minimized. Prescribed fire activities would ensure that activities comply with the *Utah Smoke Management Plan* (2002) and the National Ambient Air Quality Standards (NAAQS) pursuant to 40 CFR Part 50. Smoke dispersion models would be used to reduce impacts, and mitigation methods would be planned to reduce emissions and increase smoke dilution.

Cumulative Effects

Cumulative effects would include smoke from other wildland fires originating on the surrounding BLM and USFS lands, agricultural and local leaf burning and woodstove use, regional haze resulting from current and proposed coal fired generating plants, minor emissions from maintenance projects planned for the park, motorized vehicle use in and around the park (including the diesel-powered shuttle), and the potential for increased recreational and private development near the park.

When combined with burns from adjacent landowners and agencies and regional haze, there is potential for minor to moderate, short-term, adverse cumulative effects on air-quality-related values under Alternative B. Fire management activities in the surrounding area, emissions from local vehicular traffic, and management activities in the park, when viewed together, would result in minor to moderate, short-term, adverse impacts on air quality. However, protocols are in place to coordinate smoke emissions from

all sources within the area to minimize cumulative effects. Long-term moderate, beneficial cumulative effects would be expected to occur as fuels are managed to lower levels. Overall, impacts of actions under Alternative B, combined with impacts of other actions that could affect regional air quality, would result in short-term, minor to moderate, direct adverse cumulative impacts to air quality, with long-term, moderate, beneficial, cumulative effects due to the reduction in fuels and reduced risk of a catastrophic wildland fire.

Conclusion

Alternative B would result in minor to moderate, adverse impacts to air quality, but these would be short-term and localized. Slash pile burning and prescribed fire would cause some adverse, direct, short-term, localized smoke and particulate matter emissions. However, there would be less chance of a severe or extensive wildland fire, resulting in long-term, moderate, beneficial effects that would offset the minor to moderate, short-term, adverse effects to air quality. Cumulative adverse effects are anticipated to range from minor to moderate, and there would be long-term, moderate, beneficial effects due to the reduction in fuel loading.

Because there would be no major, adverse impacts to air quality whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Bryce Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's air quality resources or values.

Threatened, Endangered, and Sensitive Plant Species

Affected Environment

The following list (Table 10) was provided through consultation with the US Fish and Wildlife Service (USFWS) (Appendix E). These species may occur within the two counties in which the park lies.

Table 10: Federally Listed Plant Species			
Common Name	Scientific Name	Federal Status	Found in Bryce Canyon*
Autumn Buttercup	<i>Ranunculus aestivalis</i>	Endangered	No
Kodachrome Bladderpod	<i>Lesquerella tumulosa</i>	Endangered	No
Navajo Sedge	<i>Carex specuicola</i>	Threatened	No
Siler Pincushion Cactus	<i>Pediocactus sileri</i>	Threatened	No
Welsh's Milkweed	<i>Asclepias welshii</i>	Threatened	No
Jones Cycladenia	<i>Cycladenia humilis</i> var. <i>jonesii</i>	Threatened	No
McGuire Daisy	<i>Erigeron maguirei</i>	Threatened	No
Ute's Ladies Tresses	<i>Spiranthes diluvialis</i>	Threatened	No
Aquarius Paintbrush	<i>Castilleja aquariensis</i>	Candidate	No

*Based on staff knowledge, various plant surveys documented by the Utah State Conservation Data Center, and/or lack of preferred habitat in the park.

As noted in Table 10, none of the species listed above are known to occur in Bryce Canyon. Specific notes for each species are listed below.

Autumn buttercup (*Ranunculus agestivalis*) is a narrow endemic and occurs only in the Sevier River Valley, Garfield County, in wet meadows.

Kodachrome bladderpod (*Lesquerella tumulosa*) is a narrow endemic and occurs only in Kane County on shallow soils intermixed with shale fragments derived from the Windsor Member of the Carmel Formation.

Navajo sedge (*Carex specuicola*) occurs in canyons in Kane County but is restricted to seeps, springs, and hanging garden habitats in Navajo sandstone.

Siler pincushion cactus (*Pediocactus sileri*) occurs in Kane County on sandy or clay soils derived from the various members of the Moenkopi Formation.

Welsh's milkweed (*Asclepias welshii*) occurs in Kane County on dunes derived from Navajo sandstone.

Jones cycladenia (*Cycladenia humilis* var. *jonesii*) is restricted to the canyonlands of the Colorado Plateau and grows in gypsum soils derived from the Summerville, Cutler, and Chinle Formations.

McGuire daisy (*Erigeron maguirei*) grows on the sand and detritus weathered from Navajo sandstone in crevices, on ledges, and bottoms of washes.

Ute's ladies tresses (*Spiranthes diluvialis*) occurs in several Utah counties, but is found only in moist to very wet meadows, along streams, and near seeps, springs, or lake shores.

Aquarius paintbrush (*Castilleja aquariensis*) occurs on the Aquarius Plateau and on the Boulder Top in Garfield and Wayne Counties, in clay loam or gravelly clay soils.

Bryce Canyon also hosts nine plant species considered sensitive or of special concern because of their limited distribution (endemism) or because they are disjunct from more abundant population centers. These species are recognized by park staff or past studies as being rare (Peabody 1995; 1997), and/or are listed by the State of Utah National Heritage Program and documented on the list of “Endemic and Rare Plants of Utah: An Overview of their Distribution and Status” (State of Utah 2004). In 1997, Dr. F. Peabody completed a field survey of eight of these species that were formerly “Candidate — Priority 2” (C2) federal species. Many of these species are found only on barren areas along the breaks and in open pine woodland habitats on bare, gravelly soils that are not susceptible to fire. Table 11 lists Bryce Canyon’s sensitive plants according to habitat and their associated state status, if applicable.

Table 11: Sensitive Plant Species			
Common Name	Scientific Name	State Status Category ¹	State Heritage Program Classification ²
Paria Breadroot	<i>Lomatium minimum</i>	Watch	G3/S3
Painted Desert Beard-Tongue	<i>Penstemon caespitosus</i>	Watch	G5T3/S2
Reveal Paintbrush	<i>Castilleja parvula</i> var. <i>revealii</i>	--	--
Yellow-White Cryptanth	<i>Cryptantha ochroleuca</i>	--	--
Jones Goldenaster	<i>Heterotheca jonesii</i>	--	--
Jones Oxytrope	<i>Oxytropis oreophila</i> var. <i>jonesii</i>	--	--
Platy Penstemon Or Red Canyon Beardstongue	<i>Penstemon bracteatus</i>	--	--
Maguire Champion	<i>Silene petersonii</i>	Watch	G2G3/S2S3
Least Townsendia	<i>Townsendia montana</i> var. <i>minima</i>	Watch	G3/S3

¹ Watch = plants regionally endemic but without rangewide viability concern.

² G = Global

S = State

Numbers indicate rarity, with lower numbers (1, 2) indicating extreme rarity or vulnerability to extinction.

Impact Threshold Definitions

Negligible	No federally listed species or sensitive species would be affected or the alternative would affect an individual of a listed species, its critical habitat, or a sensitive species, but the change would be so small that it would not be of any measurable or perceptible consequence to the protected individual or its population.
Minor	The alternative would affect an individual(s) of a listed species, its critical habitat, or a sensitive species, but the change would be small.
Moderate	An individual or population of a listed species, its critical habitat, or a sensitive species would be noticeably affected. The effect would have some consequence to the individual, population, or habitat.
Major	An individual or population of a listed species, its critical habitat, or a sensitive species would be noticeably affected with a vital consequence to the individual, population, or habitat.
Duration	Short-term - recovers in less than one year
	Long-term - requires more than one year to recover
Area of Analysis	Within park boundary

Effects of Alternative A – No Action Alternative

Federally Listed Species

None of the nine federally listed plant species that occur within Garfield or Kane counties is known to occur within Bryce Canyon. Therefore, Alternative A would have no effect on federally listed plant species.

State-Listed or Other Sensitive Species

The other sensitive plant species (i.e., those that are not federally listed, but are recognized as rare or of special concern) would be expected in habitats that are not susceptible to fire. All these species are found along the breaks or on bare, gravelly soils in or near open pine woodlands, where fuels are minimal or non-existent; therefore, fire is rare. Also, these areas would not be targeted for prescribed fires. If any burns were proposed in or near areas that would contain these species, pre-burn surveys would be conducted to ensure that sensitive species are identified and protected. Access to adjacent treatment sites would be limited to foot or vehicle traffic on established trails, thereby avoiding impacts to these plants. Therefore, adverse impacts to these species under Alternative A would be short-term, negligible, and localized.

Cumulative Impacts

Because no federally listed plant species occur within the park, Alternative A would result in no cumulative effects on these species. Cumulative impacts to other sensitive plant species include the actions described under Alternative A, plus effects of other disturbances in and outside the park, such as the slight potential for trampling or disturbance from visitor use in the park, which is expected to increase over time if visitation increases. However, most visitors stay on trails and do not encroach onto the breaks or barren rocky areas where these species are present. Beneficial cumulative impacts have occurred from the protective measures taken by the park and other surrounding federal and state land agencies to identify and protect habitats of sensitive plant species. Overall, impacts from actions described under Alternative A, combined with impacts of other actions that could affect sensitive plant species, would result in negligible to minor, localized, adverse cumulative impacts to these species.

Conclusion

Alternative A would result in no adverse impacts on federally listed plant species, since none is present in the park; and short-term, negligible, localized adverse impacts on other sensitive plant species. Cumulative impacts to sensitive plants would be negligible to minor, localized, and adverse.

Because there would be no major, adverse impacts to threatened and endangered plant species or other sensitive plant species whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Bryce Canyon; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant NPS planning documents, there would be no impairment of the park's threatened and endangered plant species or other sensitive plants.

Effects of Alternative B – Proposed Action/Preferred Alternative

Federally Listed Species

Similar to Alternative A, Alternative B would have no effect on federally listed plant species, since none is known to occur within the park.

State-Listed or Other Sensitive Species

Similar to Alternative A, Alternative B would have negligible adverse impacts to other sensitive plant species, since these are generally limited to barren habitats along the breaks or in gravelly soils in open pine woodlands, where fire or fuel reduction activities would be rare. If any fuel reduction treatment areas are located near known locations or likely habitat for these species, the areas would be surveyed for the presence of these sensitive species before treatments progressed, and appropriate steps would be taken to avoid or minimize adverse impacts before treatment proceeded. Also, the actions taken under Alternative B would result in minor to potentially moderate, long-term, beneficial impacts to these species, based on the reduced chance of catastrophic wildland fire.

Cumulative Impacts

Cumulative impacts to listed plant species under Alternative B would be very similar to those described for Alternative A, with no cumulative effects on federally listed plant species and potential short-term, negligible to minor, localized and adverse impacts to other sensitive plant species. However, in the long-term, the increased use of wildland fire to reduce fuels, and other fuel reduction activities planned for various areas in the park, would help to limit adverse impacts from catastrophic wildland fires that could spread to any vegetated areas. Also, fire use under Alternative B may improve habitat for some species, a minor beneficial long-term impact. Overall, impacts from actions described under Alternative B, combined with impacts of other actions that could affect listed species, would result in negligible to minor, localized, adverse cumulative impacts to sensitive plant species.

Conclusion

Alternative B would result in no adverse impacts to federally listed plant species, since none is present in the park; and short-term, negligible, localized adverse impacts to other sensitive plant species. There would be increased long-term benefits due to the reduced possibility of uncontrolled wildland fire throughout the park. Cumulative impacts to sensitive plant species would be negligible to minor, localized, and adverse.

Because there would be no major, adverse impacts to threatened and endangered plant species or other sensitive plant species whose conservation is (1) necessary to fulfill specific purposes identified in the

establishing legislation of Bryce Canyon; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant NPS planning documents, there would be no impairment of the park's threatened and endangered plant species or other sensitive plants.

Threatened, Endangered, and Sensitive Animal Species

Affected Environment

Federally Listed Species

The animal species listed in Table 12 and described below either occur or have the potential to occur within Bryce Canyon. The list is based on consultation with the USFWS (Appendix E). If the species is also listed by the State of Utah, its state status is indicated.

Table 12: Federally Listed and Candidate Animal Species					
Common Name	Scientific Name	Federal Status	State Status	Found in Bryce Canyon?*	Comments
Mexican Spotted Owl	<i>Strix occidentalis lucida</i>	Threatened	S-ESA (sensitive)	No	None found during several park surveys
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Threatened	S-ESA (sensitive)	Yes	Winter resident/migrant
California Condor	<i>Gymnogyps californianus</i>	Endangered	S-ESA (sensitive)	Yes	Intermittent visitor; experimental population
Western Yellow-billed Cuckoo	<i>Coccyzus americanus occidentalis</i>	Candidate	S-ESA (sensitive)	Yes	One sighting in Sheep Creek; no known nesting
Southwestern Willow Flycatcher	<i>Empidonax traillii extimus</i>	Endangered	S-ESA (sensitive)	Yes	A few sightings along Sheep and Yellow Creeks; no nesting
Utah Prairie Dog	<i>Cynomys parvidens</i>	Threatened	S-ESA (sensitive)	Yes	Breeds in park; several colonies
Kanab Ambersnail	<i>Oxyloma haydeni kanabensis</i>	Endangered	S-ESA (sensitive)	No	Limited habitat
Coral Pink Sand Dune Tiger Beetle	<i>Cincindela limbata albissima</i>	Candidate	S-ESA (sensitive)	No	No habitat
Colorado Pikeminnow	<i>Ptychocheilus lucius</i>	Endangered	S-ESA (sensitive)	No	Limited habitat
Razorback Sucker	<i>Xyrauchen texanus</i>	Endangered	S-ESA (sensitive)	No	Limited habitat
Humpback Chub	<i>Gila cypha</i>	Endangered	S-ESA (sensitive)	No	Limited habitat
Bonytail	<i>Gila elegans</i>	Endangered	S-ESA (sensitive)	No	Limited habitat

*Based on surveys, park staff knowledge, presence of preferred habitat, and known range.

The **Mexican spotted owl** (*Strix occidentalis lucida*), which is federally-listed as a threatened species and a state-listed sensitive species, is not found within Bryce Canyon. Surveys were performed from 1993 to 1995 in several areas predicted to be suitable habitat for the owl in order to identify the extent of the Utah Range for this species. No Mexican spotted owls were seen or heard along any of the surveyed transects in the park (Bryce Canyon National Park 2002a). Another survey was completed in 2003, and no owls were documented at that time (K. Legg, personal communication 2004). Bryce Canyon contains very limited preferred habitat for the owl, so these results are not unexpected.

The **bald eagle** (*Haliaeetus leucocephalus*), a federally threatened species and state-listed sensitive species, is a winter resident and migrant, and does not breed in the park. Bald eagles are more commonly seen along the cliffs and breaks of the park and along some streams and reservoirs outside of the park.

The federally endangered and state sensitive **California condor** (*Gymnogyps californianus*) is an intermittent visitor in the park and is part of an experimental population in Utah. They are not known to use the park consistently, and do not use the park as a breeding area.

The **western yellow-billed cuckoo** (*Coccyzus americanus occidentalis*) is a federal candidate species and state-listed sensitive species. It is considered a rare visitor in the park, and there has been only one sighting of this bird along Sheep Creek in 2002 (Bryce Canyon National Park 2002b). Their primary breeding habitat is an overstory of cottonwood canopy, which is rare in the park.

The **southwestern willow flycatcher** (*Empidonax traillii extimus*) is federally endangered and a state-listed sensitive species. It nests primarily in mid-to-low elevation riparian habitat along rivers, streams, or other wetlands where a dense growth of willows or other plants are present, and this habitat is very rare in Bryce Canyon. Several surveys for southwestern willow flycatcher were conducted along riparian areas in the park since 1995. A few sightings were recorded along the Yellow Creek and Sheep Creek/Swamp Canyon drainages, but no signs of nesting or nesting behavior have been observed (Bryce Canyon National Park 1996-2002).

The **Utah prairie dog** (*Cynomys parvidens*), a federally threatened species and state-listed sensitive species, occurs in several colonies in the central and northern portions of the park that contain open, grassy meadows. The Utah prairie dog, a burrowing rodent in the squirrel family (Sciuridae), occurs only in southwestern Utah. It is a member of the white-tailed prairie dog group that once inhabited vast areas of the western Great Plains. The Utah prairie dog is the most restricted of the three members of this group. Its total numbers declined drastically from the 1920s to 1976. This decline was caused by human-related habitat alteration and by intentional poisoning, which resulted from the belief that prairie dogs compete with domestic livestock for forage. At present, the Utah prairie dog is still threatened over much of its range by loss of habitat. Despite the problems listed above, the Utah prairie dog increased in overall population numbers between 1976 and 1991 (USFWS 1991). However, the population numbers have fluctuated over time and have not continued on an upward trend (Utah Prairie Dog Recovery Implementation Team 1997). At Bryce Canyon National Park, Utah prairie dog reintroductions occurred between 1976 and 1988 after being absent from the park since the 1960's. Since the reintroduction program, prairie dog population numbers at Bryce Canyon have fluctuated from under 50 animals to over 200 (Wallen 1999). Colonies are found in the meadows of the park, including a relatively large colony along the western border of the park near staff housing and maintenance facilities. Other smaller colonies are found to the north, including one near park campgrounds.

The **Kanab ambersnail** (*Oxyloma haydeni kanabensis*), a federally endangered and state-listed sensitive species, is not known to occur in the park. Kanab ambersnails are found in three distinct localities: Three Lakes and Kanab Creek in Utah, and another population in Arizona (UDWR 2001). All of these areas are disjunct from the park.

The **Coral Pink Sand Dunes tiger beetle** (*Cincindela limbata albissima*), a federally endangered and state-listed sensitive species, is not found in Bryce Canyon. Its distribution is limited to the sand dunes within Coral Pink Sand Dunes State Park and also on adjacent lands managed by the Bureau of Land Management (USDI, USFWS 1997).

The remaining species listed as endangered by the USFWS for Garfield and Kane Counties are fish, including the **Colorado pikeminnow** (*Ptychocheilus lucius*), **razorback sucker** (*Xyrauchen texanus*), **humpback chub** (*Gila cypha*), and **bonytail** (*Gila elegans*). None of these is found within Bryce Canyon, primarily due to a lack of appropriate habitat (K. Legg, personal communication 2004).

State Listed or Other Sensitive Species

Three other species that occur in Bryce Canyon are listed by the State of Utah or recognized by park staff as sensitive or rare as discussed below.

The **peregrine falcon** (*Falco peregrinus anatum*) was removed from the federal list of endangered and threatened species in 1999 and is not on the state list, but Bryce Canyon staff continue to keep data on nesting sites. There are 7 known nesting sites/territories within the park, all located along the breaks or cliffs. Falcons nest on cliff ledges, but hunt in surrounding open woodlands and grasslands.

The **northern goshawk** (*Accipiter gentilis*), a state-listed species that is under a Conservation Agreement, is known to nest in the park and hunt over open grasslands. Before prescribed fires are ignited, goshawk surveys would be conducted in areas of likely goshawk habitat.

The **fringed myotis** (*Myotis thysandes*) is listed as a state wildlife species of concern and has been documented in and near the park. A bat survey performed in 1995 using mist nets caught fringed myotis at two of six locations in the park, along East Creek and Yovimpa Pass. Habitat along these drainages was characterized as montane grassland and montane forest/woodland (Foster et al. 1995).

Impact Threshold Definitions

Negligible	No federally listed species or sensitive species would be affected, or the alternative would affect an individual of a listed species, its critical habitat, or sensitive species, but the change would be so small that it would not be of any measurable or perceptible consequence to the protected individual or its population.
Minor	The alternative would affect an individual(s) of a listed species, its critical habitat, or sensitive species, but the change would be small.
Moderate	An individual or population of a listed species, its critical habitat, or sensitive species would be noticeably affected. The effect would have some consequence to the individual, population, or habitat.
Major	An individual or population of a listed species, its critical habitat, or sensitive species would be noticeably affected with a vital consequence to the individual, population, or habitat.
Duration	Short-term - recovers in less than one year
	Long-term - requires more than one year to recover
Area of Analysis	Within park boundary

Effects of Alternative A – No Action Alternative

Federally Listed Species

Twelve federally listed species are known to occur or have the potential to occur in Bryce Canyon, based on correspondence with the USFWS (Appendix E; Table 12). The potential impacts of Alternative A are described for each of these below.

Mexican spotted owl (Threatened): This species is not known to occur within the park, so Alternative A would have no effect on the Mexican spotted owl.

Bald eagle (Threatened): This species is occasionally seen in the park as a winter resident or visitor only. Because large numbers do not occur in the park and no breeding occurs, adverse impacts on the bald eagle would be negligible. Alternative A would have no effect on the bald eagle.

California condor (Endangered): The California condor is an uncommon visitor only and does not breed in the park. Aircraft use during firefighting activities could disturb condors, but those encounters would be very rare and short-term. Adverse impacts would be negligible, and Alternative A would have no effect on the California condor.

Western yellow-billed cuckoo (Candidate): This bird is a rare summer visitor, and only one documented sighting has occurred in the park. Its preferred breeding habitat of mature cottonwood trees is very rare in Bryce Canyon, and this species is not known to breed in the park. Any fires that would occur in the limited riparian areas of the park are unlikely to be sustained because of the wetter conditions there, and would be suppressed. Therefore, adverse impacts would be negligible, and Alternative A would have no effect on the western yellow-billed cuckoo.

Southwestern Willow Flycatcher (Endangered): This bird also prefers riparian habitat, but is found primarily in dense willows or other riparian shrubs. This habitat is very limited in the park, and surveys done since 1995 found only a few Southwestern willow flycatchers along two drainages. Any area that could support these birds would not be targeted for fuel treatment projects, except for exotic plant treatments, and surveys for listed species would be conducted prior to any implementation. Any fires in riparian areas would likely be very limited and suppressed. Given all these considerations, adverse impacts would be negligible, and Alternative A would have no effect on the Southwestern willow flycatcher.

Utah Prairie Dog (Threatened): This species breeds in several area of the park, including open grassy meadows, some of which are adjacent to developed sites. Fuel reduction treatments (e.g., prescribed fires) in wildland urban interface areas would eliminate the threats of fire to colonies bordering these areas, resulting in a beneficial impact. Fires in all areas of the park would be suppressed, so that direct impacts would be minimal. Alternative A would result in minor to moderate beneficial effects on the Utah prairie dog, with negligible to minor adverse impacts. However, encroachment of woody species due to lack of fire is reducing available habitat, which could result in a long-term moderate adverse impact if this continues overtime. Overall, Alternative A may affect, but is unlikely to adversely affect, the Utah prairie dog.

All Other Listed Species: Kanab ambersnail (Endangered), Coral Pink Sand Dune tiger beetle (Candidate), Colorado pikeminnow (Endangered), razorback sucker (Endangered), humpback (Endangered), bonytail (Endangered). None of these species is known to occur in Bryce Canyon, based on staff knowledge and past surveys. Four of these are fish (Colorado pikeminnow, razorback sucker,

humpback chub, and bonytail), and none of these is known to occur in park waters or in immediate downstream areas. Therefore, Alternative A would have no effect on these other federally listed species.

State-Listed or Other Sensitive Species

Three other species that are considered sensitive, but are not federally listed, could be affected by fire and fire management activities under Alternative A.

Peregrine falcon: There are 7 historic peregrine falcon territories within Bryce Canyon, many of which are located along the breaks and along cliff ledges, which are not susceptible to fire. Peregrine falcons nesting in or near areas subject to fire could be adversely affected by smoke and fire-fighting activities such as aircraft; however, most would vacate the affected area and return later. Measures would be taken to limit adverse impacts from nearby burns by limiting use of aircraft near eyries during breeding season. Burning may result in better habitat for the peregrine's prey species as herbaceous and shrub cover returns — a beneficial impact. Adverse impacts to the peregrine falcon from Alternative A would be short-term, minor, and localized.

Northern goshawk: This species nests in the park, and several nest locations have been recorded. Noise and smoke impacts from fire and fire-fighting activities in the nesting areas would have short-term, minor impacts. Any fires that would occur in nesting habitat would result in short-term, minor to moderate impacts on individuals, but these impacts would not cause widespread effects on the species. Measures would be taken to limit adverse impacts from nearby prescribed fires by avoiding the breeding season and removing burnable fuels for improved protection around nest trees prior to burning. Burning may result in better habitat for the goshawk's prey species as herbaceous and shrub cover returns, resulting in a beneficial impact. Adverse impacts to the Northern goshawk from Alternative A would be mostly short-term, minor, and localized.

Fringed myotis: The fringed myotis has been found within the park, in and near montane grasslands and forests. If wildland fires were to occur and become widespread or severe prior to suppression, the associated smoke, noise, general disturbance from suppression activities, and direct habitat destruction could result in indirect and direct adverse impacts to this species. However, it would be expected that the myotis would vacate affected areas immediately, and relocate to other nearby montane forest habitat. If fire occurred during or before breeding, minor to moderate, short-term adverse impacts to breeding colonies could occur from smoke, fire, disturbance, and direct mortality of young. Prescribed fire would be done in limited areas, and surveys would be conducted prior to burns to ensure that any myotis that are present are identified and protected. Overall, because of the increased possibility of catastrophic wildland fire under Alternative A, there could be minor to moderate, short-term impacts to this species in certain areas of the park.

Cumulative Impacts

Cumulative impacts to listed animal species include the actions described under Alternative A, plus disturbances from other activities in and outside the park, including other fires. Suppression of fire in the region over the years has led to condition of high fuel buildup, which can affect federally-listed or state sensitive species. However, the proactive fuels reduction activities now occurring on public and neighboring lands are serving to decrease this potential adverse impact. Other impacts to listed animals include the slight potential for disturbance from both park staff and visitors using the park; however, most visitors stay on trails and do not encroach into habitats that support these species, and park staff avoid disturbance to listed species that occur near developed areas (e.g., the Utah prairie dog). Other adverse impacts could occur to the Utah prairie dog from the presence of plague and vehicle collisions where colonies are adjacent to roads. Helicopter air tours can also cause adverse impacts, especially to nesting raptors, but these impacts would be temporary. Beneficial cumulative impacts have occurred from the

protective measures taken by the park and other surrounding federal and state land agencies to identify and protect habitats. Overall, impacts of actions under Alternative A, combined with impacts of other actions that could affect listed species, would result in minor to moderate, adverse cumulative impacts to listed animal species, limited to certain areas.

Conclusion

Alternative A would result in negligible to minor, short-term, adverse impacts to the Utah prairie dog, with potentially long-term moderate adverse impacts due to loss of habitat from encroachment of woody species in meadows. Minor to moderate, beneficial effects to this species would occur due to creation of open grassland habitat as a result of prescribed fires. Other federally listed species would experience no or negligible to minor, short-term adverse effects. Other sensitive animal species that are not federally listed would be affected in the short-term, with minor to potentially moderate impacts. Precautions would be taken to survey for all these species prior to any prescribed fire or thinning. Cumulative impacts would be minor to moderate and adverse, but limited to certain areas of the park.

Because there would be no major, adverse impacts to threatened and endangered animal species or other sensitive animal species whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Bryce Canyon; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant NPS planning documents, there would be no impairment of the park's threatened and endangered animal species or other sensitive animals.

Effects of Alternative B – Proposed Action/Preferred Alternative

Federally Listed Species

Under Alternative B, the additional fuel reduction treatments and use of wildland fire in appropriate situations would reduce fuel loads in many critical areas over time, resulting in a substantial decreased chance of catastrophic wildland fire and a long-term, beneficial impact for all federally listed species that occur within the park. Specific species impacts related to specific actions proposed under Alternative B are addressed below.

Mexican spotted owl: Similar to Alternative A, Alternative B would result in no effect on the Mexican spotted owl, since it does not occur in the park.

Bald eagle, California condor: Adverse impacts under Alternative B would be the same as described under Alternative A (negligible) for both of these species, since they are visitors only and do not breed in the park. Prescribed fire, mechanical thinning, and/or suppression activities would not affect these species, since they can easily vacate the affected areas and use nearby areas for feeding, perching, and nesting. Prescribed fire and thinning may result in beneficial effects if these treatments create better habitat for prey species such as small rodents, mice, and voles. Overall, Alternative B would result in no effect to either the bald eagle or the California condor.

Yellow-billed cuckoo and southwestern willow flycatcher: As previously noted, neither of these species is known to breed in the park, and neither has been frequently sighted. Also, their preferred riparian habitat is very limited within the park and would not be a priority target for thinning or burning, although some treatment for control of exotics may occur in selected riparian areas. If any treatments were proposed in riparian areas, surveys would be done to determine if either species were present, and actions would be taken to limit impacts to either species, including avoidance of nesting seasons and limits on use of herbicides. Adverse impacts would be negligible, and Alternative B would have no effect on either the yellow-billed cuckoo or the Southwestern willow flycatcher.

Utah prairie dog: Under Alternative B, the use of wildland fire and increased fuel reduction treatments in forested areas adjacent to prairie dog colonies would result in long-term benefits, since such actions would reduce the possibility of a wildland fire reaching prairie dog habitat and would likely create new open grassland that could be colonized. Also, fire use would reduce the encroachment of woody species into existing colonies, resulting in long term minor to moderate beneficial impacts to the Utah prairie dog. Any fire activities used to improve Utah prairie dog habitat would be based on the best available data and in consultation with the USFWS. Therefore, Alternative B would result in negligible adverse impacts, with moderate beneficial effects. Alternative B may affect, but is not likely to adversely affect, the Utah prairie dog.

Other Federally Listed Species: Kanab ambersnail (Endangered), Coral Pink Sand Dune tiger beetle (Candidate), Colorado pikeminnow (Endangered), razorback sucker (Endangered), humpback chub (Endangered), bonytail (Endangered). Similar to Alternative A, Alternative B would have no effect on any of these species, because they are not known in the park or in immediate downstream reaches. Any herbicides used that could reach waterways would be approved for use near water and would not be applied if they presented a potential damage to aquatic life. In the long-term, there would be beneficial impacts due to the reduced possibility of extreme wildland fire and the associated erosion and resulting impacts to water quality.

State-Listed or Other Sensitive Species

Peregrine falcon: Impacts to the peregrine falcon under Alternative B would be similar to Alternative A, but with a reduced possibility of more extreme wildland fire and the associated smoke and noise-related short-term, adverse impacts. Long-term, beneficial impacts would result from the herbaceous and shrub cover that would be stimulated in burned or cleared areas, resulting in new habitat for the peregrine's prey, some as small rodents, mice, and voles. Overall, Alternative B would have minor, short-term, and localized adverse impacts on the peregrine falcon, with some long-term benefits in localized treated areas.

Northern goshawk: Impacts to the Northern goshawk under Alternative B would be similar to Alternative A, but with a reduced possibility of more extreme fire and the associated impacts that would occur if fire were to start in areas of goshawk nesting. Impacts would include short-term, minor adverse effects from fire-related activities in localized areas, and long-term, beneficial impacts from the creation of better prey habitat in treated areas.

Fringed myotis: Impacts to the fringed myotis would be similar to Alternative A, but with a much reduced possibility of catastrophic wildland fire destroying montane woodland habitat that is inhabited by the bat. Wildland fire use or prescribed fires would not be conducted in or immediately adjacent to known bat colonies, and the use of herbicides would not be permitted if colonies could be adversely affected. Therefore, adverse impacts to the fringed myotis would be expected to be short-term, negligible to minor, and localized.

Cumulative Impacts

Cumulative impacts to listed animal species under Alternative B would be very similar to those described for Alternative A, with potential short-term, minor to moderate adverse impacts if wildland fire use inadvertently affected some species that were not known to exist in areas affected. However, in the long-term, the use of wildland fire in most areas of the park outside the Dave's Hollow FMU, and the additional fuel reduction activities proposed for all FMUs, would help to limit adverse impacts from catastrophic wildland fires and provide improved soil and canopy conditions for increased undergrowth in areas treated, including maintaining open meadows for Utah prairie dogs. Overall, impacts of actions

under Alternative B, combined with impacts of other actions that could affect listed species, would result in negligible to minor, adverse, cumulative impacts to listed animal species, limited to certain areas.

Conclusion

Alternative B would result in negligible, adverse impacts to the Utah prairie dog, with moderate beneficial effects due to the creation of open grassland habitat from prescribed fires and wildland fire use. Other federally and state listed species would experience negligible to minor adverse impacts. Most impacts would be short-term and limited to the duration of the fire events. Long-term, minor to moderate beneficial impacts would result from the reduction in fuel loads, reduced possibility of catastrophic wildland fire, and the opening up of closed canopy forest to create open meadows that would support various prey species. Cumulative impacts would be negligible to minor and adverse, and limited to certain areas.

Because there would be no major, adverse impacts to threatened and endangered animal species or other sensitive animal species whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Bryce Canyon; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant NPS planning documents, there would be no impairment of the park's threatened and endangered animal species or other sensitive animals.

Soils

Affected Environment

Bryce Canyon contains numerous spectacular natural amphitheaters cut into the pink cliffs on the eastern edge of the Paunsaugunt Plateau. Along this 20-mile escarpment, erosion has carved a multitude of delicate ridges, pinnacles, spires, and monuments from the soft limestone of the Wasatch formation. The intricate badland forms are mainly the work of running water cutting down through hard and soft strata along an extensive system of vertical cracks called joints.

Generally the park's soils are poorly developed, contain very little topsoil, and are not well bound by vegetation. On the plateau, surface soils are developed from the limestones of the underlying Wasatch formation. These soils are shallow, except where alluvium builds up in swales and major drainages. Because precipitation is low, these soils are unleached and contain a variety of minerals, including calcium, iron, phosphate, potash, and magnesium. On steep badland slopes, vegetation is sparse or nonexistent. As a result, debris from eroded or weathered bedrock is swept away by runoff rather than accumulated to form soil. There are large areas of bare rock, talus, and slope wash. Along valley floors at the base of the cliffs, slope angles are low and soil material is moderately thick.

Bryce also contains areas of biological soil crusts where the soil surface is bound together by a community of algae, fungi, lichen, and other microorganisms. This soft crust greatly increases the soil's ability to capture and hold water, fix nitrogen from the atmosphere, and resist erosion from wind, raindrop impact and flowing water (Belnap et. al. 2001). These soils are sensitive to compression, especially when the crusts are dry and brittle. The time necessary for recovery depends on the magnitude and frequency of disturbance and the weather conditions. Minor disturbances can recover function within a few storm cycles, while areas of extensive disturbance can take several decades to fully recover.

These crusts are typically associated with open canopies and sandy soil usually found in pinyon-juniper woodlands and desert-shrub communities. Using existing vegetation and soils information, a model of the

distribution of biological soil crusts in the park predicts that they occur below the rim at an elevation of 4,000 to 6,500 feet (K. Legg, personal communication 2004).

Impact Threshold Definitions

Negligible	Soils would not be affected or the effects to soils would be below or at the lower levels of detection. Any effects to soil productivity or fertility would be slight.
Minor	The effects to soils would be detectable. Effects to soil productivity or fertility would be small, as would the area affected. If mitigation were needed to offset adverse effects, it would be relatively simple to implement and likely successful.
Moderate	The effect on soil productivity or fertility would be readily apparent and result in a change to the soil character over a relatively wide area. Mitigation measures would probably be necessary to offset adverse effects and would likely be successful.
Major	The effect on soil productivity or fertility would be readily apparent and would substantially change the character of the soils over a large area in and outside of the park. Mitigation measures to offset adverse effects would be needed and would be extensive, their success could not be guaranteed.
Duration	Short-term - recovers in less than 3 years
	Long-term - requires more than 3 years to recover
Area of Analysis	Within park boundary

Effects of Alternative A – No Action Alternative

Under Alternative A, prescribed fire would have short-term, minor to moderate, adverse impacts on park soil resources. Although it is not anticipated that the short-term impacts of these treatment would impact soil productivity and overall stability, there would be long-term adverse impacts to soils from the increased risk of high intensity wildland fires.

Under Alternative A, soils would be affected by the duration and intensity of a wildland fire and the fire suppression activities used to control the fire. The more severe fires expected under Alternative A would have several impacts on the soils of the park. McNabb et al. (1996) state that “natural wildfires ... have a far greater potential to seriously affect soil fertility than current prescribed burns ... because the weather is usually more severe and fuel moistures are normally lower.” Erosion resulting from decreased vegetative cover after high-intensity fires (particularly on those lands with steep slopes) or following intense rainfall events, would result in both short-term and long-term, minor to moderate, direct adverse impacts to soil stability. Fires of high intensity and severity eliminate organic cover, decrease soil nutrients, kill soil microorganisms that are critical to soil fertility, increase pH, and alter the soil structure (Walstad 1990). Intense fire can create hydrophobic soils, which repel water and result in decreased infiltration that can alter soil hydrology and promote erosion. These direct effects of wildland fire are generally short-term and localized, but accelerated erosion and increased sedimentation may impact the area over the long-term, depending on soil types and fire severity.

Equipment used to suppress, control, or contain wildland fire, including use of heavy equipment or the construction of firebreaks, would also have both short-term and long-term, moderate adverse impacts to park soil resources. The use of heavy equipment would result in increased soil compaction and decreased infiltration, especially where the biological soil crusts exist, and the construction of firebreaks would directly disturb the soil. However, the use of suppression tactics and strategies would help to reduce impacts to soil resources by limiting soil disturbance during fire operations, and rehabilitation efforts following any treatment activity or suppression effort would mitigate adverse effects.

Low intensity prescribed fires that might occur under Alternative A would have long-term, minor to moderate, localized, beneficial impacts to soil resources from increased nutrients and improved infiltration, which would promote new vegetation growth. However, prescribed fires could have short-term, minor, adverse impacts due to pre-burn preparations and the use of fire suppression equipment. Additional mitigation used to limit soil impacts during prescribed fires includes no line building, aerial ignition, use of light-on-the-land vehicles, and use of existing trails.

Cumulative Impacts

Other activities that would affect the park's soils include general maintenance of roads, campsites, and trails within the park; visitor use and trampling; and fuel reduction treatments carried out on public or private lands near the park, which can influence the spread of fire into the park. High-intensity wildland fires resulting from continued fuels buildup are more probable under the Alternative A and would likely result in more severe impacts to soil stability and productivity. Overall, impacts of actions under Alternative A, combined with impacts of other actions that could affect soils, would result in short- to long-term, minor, adverse cumulative impacts on soil productivity and stability that would be reduced over time with rehabilitation and revegetation of burned or treated areas.

Conclusion

Alternative A would result in short-term, minor to moderate, adverse impacts to soil resources, with long-term, minor to moderate, beneficial impacts in areas targeted for prescribed fires. Cumulative effects would be short- to long-term, minor, and adverse.

Because there would be no major, adverse impacts to soils whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Bryce Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's soil resources.

Effects of Alternative B – Proposed Action/Preferred Alternative

Under Alternative B, similar types of adverse effects to soils from wildland fires and prescribed fire would occur, but the effects would be lessened due to the use of more frequent but less severe fires and fuel reduction in the forest. As wildland fire use and additional prescribed fire and fuel reduction would occur, the resultant reduction in severe fires would help protect soils. Soils may experience short-term disturbance in areas where fuels are being treated due to the presence of staff, vehicles, the removal of slash, and prescribed fire. However, these direct impacts would be very localized, short-term, and minor. Prescribed fire can also lead to sudden increases in nutrient charge to soils from the creation of ash in the immediate vicinity of the burn. Such increases may provide favorable conditions for many plant species, nitrogen-fixing microbes, and nitrifying bacteria. Water infiltration capability could be enhanced in areas where native herbaceous plants become established after surface fires. Soil and microclimatic conditions following prescribed fire or wildland fire use would favor establishment and growth of native herbaceous and shrub species. Overall, Alternative B would result in short-term, negligible to minor adverse impacts to soils.

Long-term impacts to soils would be largely beneficial, due to the reduction in intense, unplanned wildland fires and the expected increased productivity and subsequent plant diversity. For several years following low-intensity surface fire, the generally warmer soil temperatures may increase soil microbial activity. In contrast to Alternative A, the increased coordination with the Dixie National Forest, along with the increased area open to prescribed fire, would reduce the amount of fuels and the risk of a high-intensity wildland fire. If wildland fire use fires and prescribed fires are kept to lower intensities and

remain on the ground surface, then it is anticipated that long-term benefits to soils and soil chemistry/nutrients would result. Also, with fewer wildland fires, any unplanned need to use heavy equipment on the landscape would be reduced, resulting in a long-term benefit to soils.

Cumulative Impacts

Cumulative impacts under Alternative B are similar to Alternative A and include minor compaction from recreation and wilderness users, planned maintenance projects, and some limited vehicle use.

However, as fire would be restored to a more natural role over the long term, vehicle use for fuels management and related wildland fire projects would decline, offsetting impacts from non-fire related activities. Overall, impacts of actions under Alternative B, combined with impacts of other actions that could affect soils, would result in short- to long-term, minor, adverse and relatively localized cumulative impacts, with reclamation and revegetation of burned areas providing beneficial effects over time.

Conclusion

Alternative B would result in negligible to minor, adverse effects to soils in the short term, with moderate, beneficial long-term impacts from the re-establishment of a fire-driven nutrient cycle and increased stability of the soil strata, given increased native herbaceous ground cover and the reduced frequency of unplanned fire suppression activities. Cumulative effects would be localized, short- to long-term, minor and adverse.

Because there would be no major, adverse impacts to soils whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Bryce Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's soil resources.

Vegetation and Wetlands

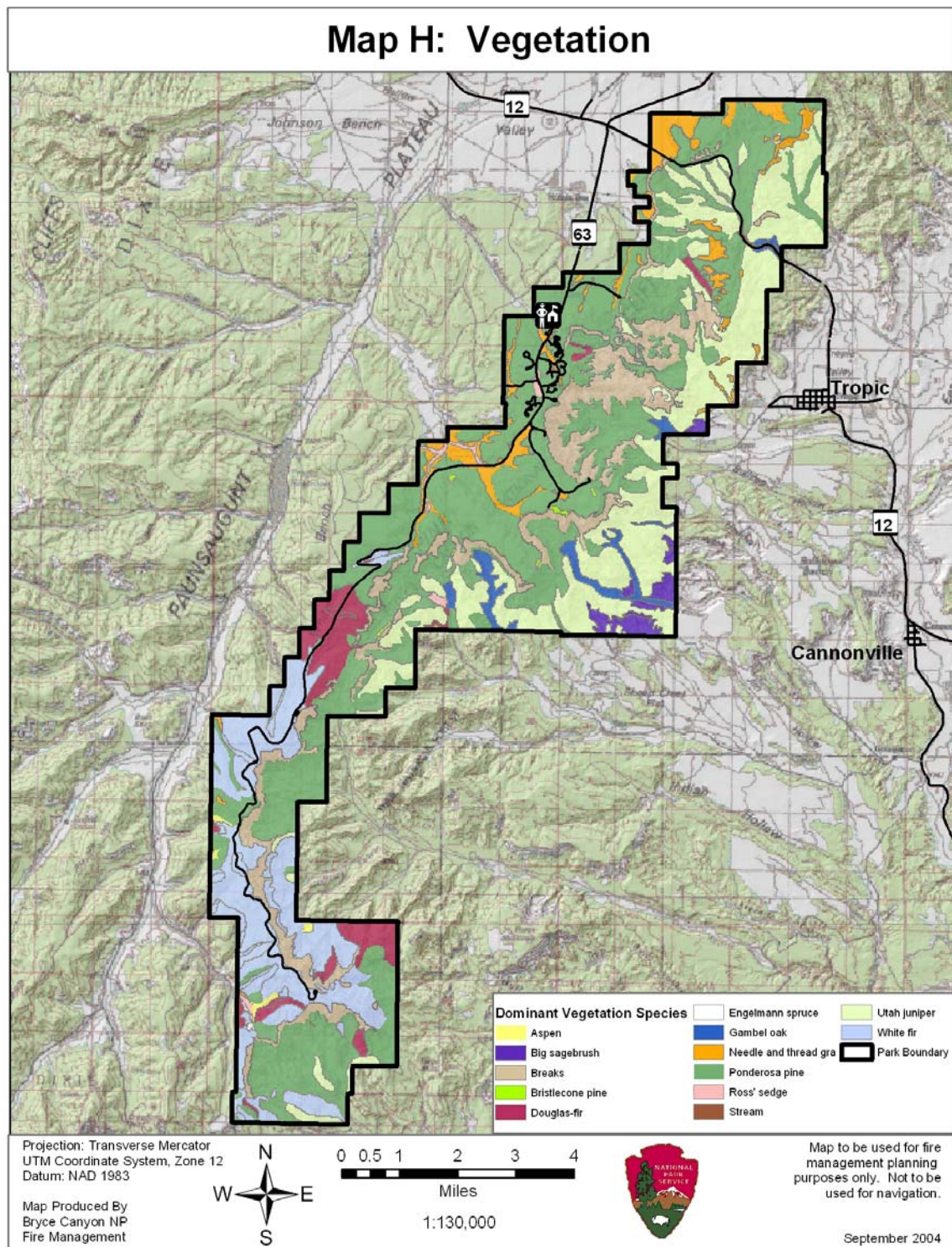
Affected Environment

Bryce Canyon has an elevational range of 6,580 feet above sea level on the eastern side of the park, climbing to 9,115 feet at its southern end. The vegetation of Bryce Canyon reflects the changes in elevation and topography, as well as the geology, soils, and water availability within the park. The park includes three life zones: Upper Sonoran, Transition, and Canadian. These life zones are characterized by distinct vegetation cover types, which are depicted on Map H and are described below (bolded names correspond to the map legend).

The Sonoran life zone begins on the eastern side of the park, in the semi-arid eastern slopes below the rim. Summer temperatures occasionally exceed 100° F, and the potential evapotranspiration may be more than twice the 12-15 inches of annual rainfall received there. Winters can be snowy and cold, with temperatures to 20° below zero (Bezy 2004). This zone is characterized by low-growing pinyon-juniper "dwarf forests" and sagebrush grasslands. The pinyon-juniper woodlands are depicted on Map H as **Utah juniper** (*Juniperus osteosperma*).

Both Utah juniper and pinyon pine (*Pinus edulis*) thrive under the relatively dry, hot conditions that are common in these lower elevations of the park. The trees are less dense than other forest habitats because of the competition for water, creating an open woodland. Sagebrush, manzanita, serviceberry, and cliffrose form an understory of scattered shrubs. Grasses and forbs, such as paintbrush, larkspur, and nightshade, form a discontinuous ground cover between the trees and shrubs. Thickets of **gambel oak**

(*Quercus gambelii*) are also common in this zone, and cottonwoods, willows, and birch occur along the banks of wet-weather streams where water is available. In other locations, a sagebrush-dominated community is found, dominated by **big sagebrush** (*Artemisia tridentata*). Many of the sagebrush grasslands have been invaded by pinyon-juniper as a result of continued fire suppression over the years.



As elevation increases in the Transition life zone, the pinyon-juniper woodlands are gradually replaced by forest of **ponderosa pine** (*Pinus ponderosa*). Scattered meadows consisting of **needle and thread grass** (*Stipa comata*) and black sagebrush (*Artemisia nova*) exist in open valleys between the forested slopes. This community covers a relatively large area in the north end of the park, and extends into the central portion of the park along drainages (Roberts et al. no date). A few small wetlands with seasonally saturated soils support rushes or sedges (**Ross' sedge** or *Carex rossii*) (see *Wetlands* discussion below). However, above 6,000 feet ponderosa pine forest is the predominant vegetation cover type. Ponderosa pine grows in open stands in the lower part of its range, with typically wide spacing due to competition for water. In the higher, wetter parts of the zone, individual ponderosa pines are larger and grow more closely together. Undergrowth consists of manzanita, Antelope bitterbrush, elderberry, barberry, and ceanothus. In some areas where fire has been suppressed over the years, the usually open understory has filled in and presents a danger of extreme fire that can damage even mature, fire-resistant trees.

Above 8,500 feet, the vegetation shifts to that of the Canadian life zone near the southern end of the park. Ponderosa pine forests are gradually displaced by dense stands of **Douglas fir** (*Pseudotsuga menziesii*), **white fir** (*Abies concolor*), **aspen** (*Populus tremuloides*), and **Englemann spruce** (*Picea engelmannii*). Ponderosa pine can still be found along the sunnier slopes, and a few wetlands exist along the drainages. **Limber pine** (*Pinus flexilis*) and **bristlecone pine** (*Pinus longaeva*) fringe the rims of the plateau. In this area, vegetation must withstand bitter winter cold and the weight of snow and ice. Much of the 25 inches of annual precipitation is lost to evaporation, and dehydration is a stressor for all vegetation species (Bezy 2004). In the fir-aspen-spruce forest, the shade and acidic nature of the decomposing needle duff restricts the undergrowth to mosses, lichens, fungi, and shade-tolerant shrubs. Manzanita, common juniper, mountain lover, Oregon grape, and ceanothus are common.

Wetlands

Wetlands are rare in the park due to the lack of water and generally dry conditions. Park wetlands occur in small pockets and limited areas near drainages (see map H). They are often found in depressions and near seeps and springs, and depend on runoff and locally high groundwater conditions to sustain their wetland species. Typical species found are rushes and sedges (e.g., Ross' sedge). Two of the larger wetlands are the Dave's Hollow Meadow and the wetlands located southeast of East Creek. Dave's Hollow meadow, located along the main entrance road near the developed area of the park, is approximately 15 acres in size. It is classified as a palustrine emergent narrow leaf persistent seasonally flooded wetland under the USFWS National Wetlands Inventory (NWI) classification, and the dominant species is the Baltic rush, *Juncus balticus*. The wetlands along East Creek have been partially drained or ditched due to the installation of a culvert, and one part of this wetland is now classified as temporarily flooded (Bryce Canyon National Park 2003). Efforts were made during the recent road construction project to mitigate the continued alteration of the South East Creek wetland.

Fire Behavior Characteristics of Some Major Vegetation Types

The following describes general fire behavior characteristics of some of the major vegetation types in Bryce Canyon, as described in the current FMP (Bryce Canyon National Park 1994).

Ponderosa Pine Vegetation Types

Ponderosa pine (*Pinus ponderosa*) is the most fire-resistant conifer in the park. It is found on approximately 15,093 acres within the park. Seedlings and saplings withstand high temperatures from hot, dry, exposed slopes or from light surface fires. Fire encourages regeneration if a seed source is present by exposing mineral soil and temporarily reducing competition. Mature trees have thick, fire-resistant bark. Fire-caused mortality requires significant damage to cambial tissue; i.e., exposure to

temperatures of 140 degrees Fahrenheit or higher. Exposure time required has been found to be two times the square of the bark thickness (18 minutes for bark three inches thick). Crown scorch is not a good indicator of mortality, because stands with 100% crown scorch can have 60% survival. There is less resistance to crown scorch in spring than in the fall, probably because of stress resulting from higher bud kill at that time.

On good sites, lower limbs self-prune, keeping foliage above surface fires; on poor sites, this may not occur. The loosely arranged foliage has a high moisture content and does not readily carry fire to canopies. Litter build-up around trunks increases burn-out time of surface fires, often resulting in “cat face” scars — as resin is deposited around the wound, the tree becomes more susceptible to subsequent fires. Dense understories in moist habitats can create fuel ladders into the crowns. A short grass-forb state immediately follows fire. Density of the subsequent pine reproduction depends upon seed sources and site moisture.

Ponderosa pine is climax at favorable sites on the high plateau of the park, often associated with pinyon pine, juniper, aspen, Douglas fir, and Gambel oak. Common understory species include greenleaf manzanita, serviceberry, mountain mahogany, and snowberry.

Juniper, Pinyon/Juniper and Pinyon Forest

Utah juniper (*Juniperus osteosperma*) and Pinyon pine (*Pinus edulis*) are common at lower elevations or on drier sites than ponderosa pine forests. Utah juniper generally dominates the low elevations of its range; pinyon pine, the upper. The lower edge adjoins desert grass/shrublands, which provides common understory species. This vegetation type covers approximately 7,476 acres within the park.

Mature pinyon trees are short with open crowns. Dead branches remain on the trunk and create a fuel ladder into crowns. Open stands on relatively good sites are most susceptible to fire. Usually sites contain trees of different ages, although several good seed years followed by extra moisture can produce a dense, even-aged stand. Such closed stands with little understory only carry fire under extreme conditions. Trees over four feet tall in open pinyon-juniper stands are difficult to kill without heavy accumulations of fine fuel under the trees. Old trees with thick bark and foliage far from the ground survive most surface fires, even though low branches may carry fire into the crowns. Phenolic compounds in Utah juniper litter inhibit grass growth, reducing fuels under the trees. To carry a fire, stand density must be over 400 trees/acre; generally over 60% crown scorch is needed to kill trees.

Oakbrush associations (Gambel oak)

Oak woodlands make up approximately 664 acres in the park; gambel oak (*Quercus gambelii*) is the dominant species in oakbrush. In much of Utah, oakbrush dominates at elevations where ponderosa pine forests would normally be expected, apparently because the late spring and summer are mostly dry. The range of oakbrush is limited by persistent sub-freezing temperature at high elevations and by high temperatures at the low end.

Gambel oak is most often found with ponderosa pine, and frequently with aspen and pinyon-juniper. In Douglas fir and mixed forests it persists for years as a low, understory shrub. It is commonly found with serviceberry, snowberry, antelope bitterbrush, chokecherry, and wood rose. True mountain mahogany can dominate oakbrush in the upper elevations. On good sites, where gambel oak develops into a small tree, the understory is open with grasses, sedges, and forbs. On poor sites, it remains in shrub form even when physiologically mature. Differences in soil conditions seem to determine this development. Fires are much less frequent in oak stands than in ponderosa pine stands with oak understory.

Gambel oak is a very fire tolerant species, with fire having no significant role in sustaining the community or extending its range. Fire encourages vigorous suckering (up to 18 inches in the first growing season) from rhizomes or root crowns stimulated by heat. However, as oak is protected from fire, it thins out and retreats. By the end of 18 years, both burned and unburned areas may be equal in cover. Recurrent low intensity fires can result in the union of scattered small stands into a continuous large stand. Recurrent moderate to high severity fires could eventually deplete the rhizomes' stored energy and remove it from a site, opening it for grasses and forbs. The lack of carrier fuels at a mature site and the number of fires needed (probably annual) to exhaust rhizome reserves make the above scenario fairly unlikely. Where oak and pine grow together, infrequent, hot fires can give oak an advantage, creating a climax stand of gambel oak. Fall fires occurring after the leaves have died but before they fall carry most readily through pure oak stands. Frost-killed oak leaves that are still attached to the branches have been known to produce extreme fire behavior.

Douglas Fir/White Fir

Mature Douglas fir (*Pseudotsuga menziesii*) and white fir (*Abies concolor*) are the dominant species on 6,157 acres in the park. They are moderately resistant to fire largely because of thick, corky-textured bark. In a closed stand the lower branches die from shading but the dead limbs may remain for many years. The foliage is highly flammable and the bark contains moderate amounts of resin.

Following fire, the seed is carried by wind as far as half a mile, allowing Douglas fir to readily re-seed after a disturbance. Saplings are susceptible to surface fires because their bark, bud scales, and twigs are thin, their branches are low, and foliage is flammable.

Douglas fir will dominate and is a climax species in most associations, and is more shade tolerant than ponderosa pine, a common seral species in Douglas fir climax stands. Fire exposes soil and reduces competition, thereby enhancing fir populations. Coarse soils limit this species' growth. Douglas fir can be eliminated by extensive fires that destroy seed trees and favor species like aspen.

Like ponderosa, Douglas fir can become a fire recorder. Once a fire scars the tree, resin deposits usually enlarge the scar and subsequent fires may also scar it.

Quaking Aspen

Aspen (*Populus tremuloides*) is very shade-intolerant, and can be a climax or a seral species. Individual stems have thin bark with a green photosynthetic layer and are easily killed by fire. Fire can also cause basal scarring, making aspen susceptible to fungal disease. As a stand matures, growth slows and there is increased susceptibility to disease. There is a relationship between site quality and the age (between 45 and 200 years) at which the decay process begins. However, aspen clones are long-lived systems of individual stems with lateral roots.

Reproduction is primarily by suckering resulting from fire or other disturbance. Normally roots within 3 to 4 inches of the surface produce suckers; however, roots 3 feet down may produce shoots. Some suckers are produced by undisturbed clones, but, under a canopy, the suckers are suppressed by auxins from the buds of existing stems and decay. This is especially influenced by soil temperature. Fire kills stems, removing the auxin inhibition, and it increases heat absorption by removing canopy and removing and blackening duff. A moderate to severe fire can rejuvenate a deteriorating stand. In the absence of fire, the stand may revert to shrubs or grassland if no young conifers are present.

In climax stands, suckering following the death of decadent stems is sufficient to maintain the stand. However, in areas where aspen follows conifers, fire is often needed to promote sufficient suckering to maintain the aspen stands. Currently, 74 acres of the park have dominant aspen stands.

Mountain Grasslands

Bryce Canyon contains approximately 2,309 acres of grasslands. The primary species found in these grasslands include *Carex* sedges, wildrye, buckwheat, cinquefoil, and needle n'thread.

A mountain grassland is a grass-covered opening within an otherwise continuous coniferous forest. Mountain grasslands may act as firebreaks and can be maintained as grasslands by light fires, but usually their fire ecology is less obvious. The boundaries between grassland and forest may be attributed to topography and soils. It is also possible that these are natural grasslands that have little potential for forest development.

Deciduous Riparian, Flood Plain and Ravine Communities

These easily recognized areas are riparian deciduous associations of cottonwood, box elder, birch, willow, and maple. Conifers are either entirely absent or in the minority. These areas frequently act as fire breaks, although in dry conditions they can burn severely. Many species found here resprout after fire. The park contains approximately 38 acres of this habitat.

The ecology of these communities is driven by predictable disturbances like spring floods and resultant changes in stream course, water tables, and soil depth and composition following floods. Fire is an infrequent event in these areas.

Invasive Exotic Plant Species

Over 60 species of non-native plants have been identified within Bryce Canyon, and there is concern about the potential for their continued spread in the park and the surrounding region. Tamarisk (*Tamarix ramossissima*) and Russian olive (*Eleagnus angustifolia*) are the primary invasive species along riparian areas. Both these non-native tree species are increasing throughout the West and are able to effectively displace native riparian communities, creating monocultures in formerly biologically diverse habitats. Tamarisk, in particular, alters riparian communities, which typically have moderate fire severity and intensity, to a vegetation community type with a high or extreme fire severity and intensity. Other exotics that are present in the park include various exotic thistle taxa, sweet clover, and several brome grasses. Exotic plant control techniques used have included manual removal, cutting, and chemical herbicide use (NPS 1996).

Fire management activities can be a useful tool for controlling non-native plant invasions when paired with monitoring and other control treatments. However, activities related to fire suppression or prescribed fire also have great potential to distribute weed seed and aggravate weed problems.

Vegetation Monitoring

Fire Effects Monitoring: Bryce Canyon recently finalized a fire effects vegetation monitoring plan to study the response of dominant vegetation types to fire (NPS 2004a). Specific plant communities to be monitored include ponderosa pine, black sagebrush, and white fir. Other major vegetation types will be identified as the fire program grows to encompass new areas.

Mechanical Treatment Monitoring: Document and monitor treatments to determine vegetation changes associated with hazard fuel reduction.

Rare Plant Monitoring: If determined necessary surveys and monitoring may be completed prior to and after fire management treatments to document presence or absence of plants across the project areas.

Vegetation Mapping Plots: Comprehensive mapping project of all vegetation in Bryce Canyon and surrounding area. This information can be used to classify and map the vegetation/fuel characteristics of the park. Field validation plots offer the opportunity for long-term vegetation monitoring and ecological change. A new survey is underway and, when completed, will be used to update the Park's existing vegetation map.

Exotic Plant Monitoring: Bryce Canyon maintains a database of exotic plants containing: locations, number of plants, eradication dates and methods, size of treated areas, hours for treatments, herbicide name and amount used and personnel involved. The purpose of the program is to maintain records of exotic plant locations and effectiveness of control treatments.

Impact Threshold Definitions

Negligible	No native vegetation would be affected, or some individual native plants could be affected as a result of the alternative, but there would be no effect on native species populations. The effects would be on a small scale.
Minor	The alternative would temporarily affect some individual native plants and would also affect a relatively minor portion of that species' population. Mitigation to offset adverse effects could be required and would be effective.
Moderate	The alternative would affect some individual native plants and would also affect a sizeable segment of the species' population over a relatively large area. Mitigation to offset adverse effects could be extensive, but would likely be successful.
Major	The alternative would have a considerable affect on native plant populations and would affect a relatively large area in and outside of the park. Mitigation measures to offset the adverse effects would be required and extensive; success of the mitigation measures would not be guaranteed.
Duration	Short-term - recovers in less than 3 years
	Long-term - requires more than 3 years to recover
Area of Analysis	Within park boundary

Effects of Alternative A – No Action Alternative

Under Alternative A, vegetation would continue to be managed as it is under the current FMP, which does not allow wildland fire use and requires that suppression be used throughout the park. Prescribed fire is done to reduce fuels, but mechanical clearing is limited to developed areas, and herbicide use is not permitted for fire management purposes. These practices have resulted in the condition of continued fuel buildup in some areas of the park over time. Pinyon pine and juniper have invaded lower grasslands and sagebrush communities and represent an increased fire hazard. Aspens that have not been burned now comprise older stands that are more susceptible to extreme fires. Ponderosa pine and Douglas fir/white fir forests have developed a closed canopy and dense understory growth, which provides ladder fuels and creates a large fuel load. Where this type of fuel buildup continues, there would be a greater chance of severe crown fires and widespread wildland fire, with substantive consequences for vegetation and wildlife in these areas.

Bryce Canyon's vegetation communities would experience varying impacts and reactions to the fire regime expected under Alternative A. Any plant communities that are directly affected by wildland fire would experience immediate and direct short-term, moderate adverse impacts, depending on the severity and extent of the fire. In the case of a catastrophic event, there would be the potential to lose populations of some species. Over time, there would be with a shift to early successional species and a change in the

structure and function of the community. In the long-term, beneficial impacts to the overall vegetation community could occur, with the creation of a more diverse, open woodland and a return to a natural fire regime.

For example, ponderosa pine is one of the predominant vegetation communities in the park. Fire has historically played an important role in the ponderosa pine forest, maintaining open stand conditions by periodically thinning the understory and providing a mineral seedbed for pine seed germination. With suppression of fire over time, the buildup of fuels has created fuel ladders that can allow development of a more severe crown fire, decreasing the chance of mature tree survival. A stand-destroying wildland fire would result in an initial herb-shrub stage, and the area would undergo succession over time, with the successional species depending on site-specific conditions. If ponderosa pine return, a more even-aged stand would result (Bradley et al. 1992).

Actions to suppress wildland fires would also have direct but short-term adverse impacts on vegetation. Suppression activities, such as creation of fire lines and use of heavy equipment would result in the removal of vegetation and the other impacts to vegetation from trampling, destruction of root systems, and compaction or removal of soils. These short-term, minor to moderate adverse impacts would be mitigated by limiting fire line construction and conducting site rehabilitation.

Another potential adverse impact from wildland fire is the creation of open, disturbed areas that can be invaded by exotic plants. The exposed mineral soil provides a seed bed for exotics, and various species have been spreading rapidly in the general region of the park. Conversely, fire may in some cases help to promote denser growth of native plants on the newly exposed seedbed, which can compete with exotics and preclude exotic plant invasions. Mitigation to control exotics during fire rehabilitation would be implemented according to the current FMP to minimize the spread of exotics.

Fuel reduction activities under Alternative A would have moderate long-term benefits, but short-term minor to moderate direct adverse impacts, limited to the target vegetation community. Prescribed fires would have varying effects, depending on the fire resistance of the vegetation community, stand structure, existing fuel loads, burn size and intensity, and post-burn conditions that may favor or hinder site recovery. Effects include mortality of young plants and injury to some adult tree and shrub species. Site recovery would depend on each species' resistance or resilience when exposed to disturbance. For example, ponderosa pine is a fire adapted/resistant species due to its thick bark, high resin content, deep roots, and relatively high and open growth habit. Also, ponderosa pine seedling establishment is favored when fire removes forest floor litter (Bradley et al. 1992). Therefore, a ponderosa pine community would recover relatively quickly from prescribed burns. Conversely, open stands of smaller pinyon-juniper are less fire resistant and would take longer to recover. The community would revert back to grassland and eventually a grass/shrub community would become established. Overall, in the long term, fire-adapted communities (such as ponderosa pine and Douglas fir) would benefit from prescribed fire, since the understory would be thinned, litter converted to nutrients, and initial steps taken to re-establish a natural fire regime. Mitigation measures would be implemented to limit adverse effects of prescribed fire and would include rehabilitation of fire lines and other ground disturbance.

Mechanical clearing under Alternative A would be limited to developed areas only, such as WUI locations. Clearing and burning of slash piles would result in short-term, direct, minor adverse impacts to the affected vegetation in the treatment area. Vegetation would experience a minor to moderate long-term beneficial effect because fire has been a missing natural process in the treated areas. Mitigation measures to limit adverse impacts would be implemented (see Chapter 2, *Mitigation Measures for Alternative A*).

In all cases where prescribed fires or clearing are planned, surveys would be conducted to determine the presence of exotic plant species and to ensure that these areas would not be susceptible to invasion by

exotics if disturbed. Exotic species would be controlled on a site-by-site basis during project implementation. Burned areas would be seeded only with native seed and only when necessary.

Cumulative Impacts

Cumulative impacts to vegetation would result from the fire management actions described under Alternative A, combined with other actions in and around the park that affect vegetation. Such actions include other fires in the region, as well as the fire-management activities being implemented by other agencies and landowners outside and along the park's boundary. Previous fire suppression has created unwanted fuel buildup outside the park, which would be augmented by future fire suppression and contribute to the potential for adverse impacts from wildland fire that could spread into the park. Continued planning for fuel reduction and wildland fire use by all parties would gradually reduce that risk over time and result in indirect beneficial impacts to vegetation communities in the area. Exotic plants have also spread throughout the area, and the continued disturbance of land in and outside park boundaries from grazing, construction, and maintenance activities can contribute to adverse impacts from exotic plant invasion. Other factors that contribute minor adverse impacts to vegetation include disease, parasitic mistletoe, visitor use (trampling), and the removal and disturbance of vegetation by construction and maintenance crews (e.g., repairing or upgrading roads or campgrounds). Overall, impacts of actions under Alternative A, combined with impacts of other actions that could affect vegetation, would result in moderate, adverse, cumulative impacts to vegetation.

Conclusion

Alternative A would result in short-term, direct, minor to moderate adverse impacts to vegetation, including higher degrees of plant mortality from high severity fuels in or near the park as a result of continued fuel buildup in certain areas. Fuel reduction treatments would result in short-term, minor to moderate, direct adverse impacts to the target community, but with long-term, moderate beneficial impacts as the community recovered over time. Mitigation measures would be implemented to rehabilitate burned areas and limit spread of exotics. Cumulative impacts would be moderate and adverse.

Because there would be no major, adverse impacts to vegetation whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Bryce Canyon; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant NPS planning documents, there would be no impairment of the park's vegetation.

Effects of Alternative B – Proposed Action/Preferred Alternative

Under Alternative B, several actions would be taken to reduce the potential for extreme wildland fires by implementing more fuel reduction projects (especially mechanical thinning), emphasizing appropriate use of wildland fire use in all FMUs (except Dave's Hollow FMU), and conducting more fuel treatments/wildland fire use across park boundaries with neighboring landowners. Within Dave's Hollow FMU (22% of the park), the park would continue to utilize aggressive suppression in developed and WUI areas, but prescribed fire would continue and other fuel reduction actions (mechanized handheld, possibly tracked vehicle use) would be implemented where appropriate and approved, and in partnership with neighbors. In the East Fork FMU, wildland fire use would be permitted to leave the unit, per an approved Wildlife Fire Implementation Plan (WFIP) and following natural fuel breaks rather than jurisdictional boundaries, thereby reducing risks from neighboring lands in the long term. In both the Fish Hook and Outback FMUs, wildland fire use would be the preferred method of fuels reduction and habitat improvement, although prescribed fire and some mechanical thinning would continue. In general, the creation of the four FMUs and allowance of wildland fire use in over 78% of the park would serve to proactively reduce fuel loads over much more of the park as the plan is implemented.

Under Alternative B impacts to vegetation from fires would be similar to those described for Alternative A, but with a much reduced chance of catastrophic wildland fire over time, limiting adverse impacts from wildland fires to minor to moderate levels and reducing the extent of effects. The decision to use prescribed fire, as well as wildland fire for resource benefit or fuel reduction, would result in minor to moderate, short-term adverse effects to plant communities from direct mortality. However, long-term benefits would result as a more open overstory and a perennial herbaceous forb/grass understory developed on the site. Over time, more pronounced increases in species richness, diversity, and resiliency would occur, with a tendency toward fire-tolerant plant species across the affected landscape. Fire regimes would be reduced to a lower condition class within the park boundary.

As mentioned in Alternative A, most native plant associations are adapted to the effects of periodic surface fires, and prescribed fire would produce beneficial impacts in these communities. Prescribed fire typically benefits ponderosa pine through reduction in stem density, temporary reduction of understory shrubs (releasing nutrients for the pine), and reduction of ground and ladder forests (protecting ponderosa pine from more severe fires).

Mechanical thinning under Alternative B would include the use of handheld saws, light forestry equipment and chainsaws, and mechanized wheeled or tracked equipment with the Superintendent's approval and would be permitted in all units, although thinning would be more limited in the Outback FMU. Impacts to vegetation would be minimized through implementation of mitigation measures, such as using the least damaging tool for the job, and use of light-on-the-land vehicles to minimize crushing and soil compaction.

Herbicide use would be permitted in all FMUs for both exotic weed control and fuel reduction. Such use would also occur where other measures not feasible, and with more limited use in the Fish Hook and Outback FMUs. Herbicide use would be confined to small areas and applied by certified applicators in accordance with label instructions.

Cumulative Impacts

Cumulative impacts under Alternative B would be similar to Alternative A, but with added long-term, beneficial impacts from increased fuel reduction and appropriate use of wildland fire across park boundaries. Overall, impacts of actions under Alternative B, combined with impacts other actions that could affect vegetation, would result in minor to moderate, adverse, cumulative impacts to vegetation.

Conclusion

Alternative B would result in short-term, minor to moderate impacts to vegetation in very localized areas for the most part, with much less chance of higher intensity fires and related higher levels of impacts. Increased prescribed fire and mechanical thinning would reduce fuel loads and open areas previously containing high densities of trees and brush, resulting in long-term benefits from restoring a more natural fire regime and ecological processes. Mitigation measures would limit adverse impacts from burning, thinning, and herbicide use. Cumulative impacts would be minor to moderate and adverse.

Because there would be no major, adverse impacts to vegetation whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Bryce Canyon; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant NPS planning documents, there would be no impairment of the park's vegetation.

Water Quality and Hydrology

Affected Environment

The park occupies the headwaters of two primary watersheds: the East Fork Sevier drains the Paunsaugunt Plateau, flowing north to the Great Basin, and the Paria River drains areas below the plateau rim, flowing south to the Colorado River. Three perennial streams — Yellow Creek, Willis Creek, and Sheep Creek — are located in the park. All other streams are intermittent or ephemeral. The Tropic Ditch is an irrigation canal constructed in the 1890s that crosses the northern part of the park. It is listed on the National Register of Historic Places. Map I depicts the main drainages and water bodies in and adjacent to the park.

Important groundwater resources include several primary aquifers and one aquitard. Recharge of groundwater on the Paunsaugunt Plateau is principally from percolation of snowmelt. Many perennial seeps and springs throughout the area issue from saturated aquifers underlying the park.

Sediment and turbidity are the most considerable water quality characteristics of the river and streams in and near the park. While most streams are relatively clear during periods of low flow, high flows are accompanied by large increases in sediment transport and turbidity. Most of the sediment movement occurs during spring runoff, which may last several weeks, and during very brief runoff events following summer thunderstorms. Most of this appears to be natural, although it may be increased somewhat by road building and grazing on the watershed.

Impact Threshold Definitions

Negligible	Neither water quality nor hydrology would be affected, or changes would be either non-detectable or, if detected, would have effects that would be considered slight and local.
Minor	Changes in water quality or hydrology would be measurable, although the changes would be small and the effects would be localized. No mitigation measure associated with water quality or hydrology would be necessary.
Moderate	Changes in water quality or hydrology would be measurable, but would be relatively local. Mitigation measures associated with water quality or hydrology would be necessary and the measures would likely succeed.
Major	Changes in water quality or hydrology would be readily measurable, would have substantial consequences, and would be noticed on a regional scale. Mitigation measures would be necessary and their success would not be guaranteed.
Duration	Short-term – would occur within the first year following treatment
	Long-term – would continue more than one year following treatment
Area of Analysis	Within park boundary and downstream drainages

Effects of Alternative A – No Action Alternative

Effects to water resources from Alternative A would depend on the fire incident rate, location and size of fires, and the time needed for suppression. Water flow and turbidity, temperature, and other attributes can be affected by high-severity fire, which would be more likely under Alternative A due to the continued buildup of fuels in the park. If more severe, widespread wildland fires were to occur, there would be physical and chemical changes in the water from the heat of the fire itself, dumping of slurry during suppression, and sedimentation and ash input. Soils that are severely burned do not allow water to infiltrate into the soil (they become “hydrophobic,” or water-repellent), which in turn increases run-off that can carry substantial amounts of ash into downstream waterways. In addition, the removal of vegetation as a result of fire or suppression activities, especially riparian vegetation, removes a sediment

buffer, increasing the chance for water quality degradation due to sediment/ash input and associated increases in water temperatures. The amount of runoff would also increase stream or river flows, changing the hydrologic regime and possibly increasing channel erosion in the short term. Flows from springs could increase locally if the removal of vegetation that would normally use the water from shallow aquifers allows for more water flow; this could be a minor beneficial effect.

Adverse, long-term impacts from fire, either prescribed fire or catastrophic wildland fire, could be minor to moderate, depending on the location, severity, and duration of the fire. After the fire event, there could be continued loss of soils and sedimentation into streams, which could carry downstream. Following a severe wildland fire, it may take many years for the watershed to recover.

Cumulative Effects

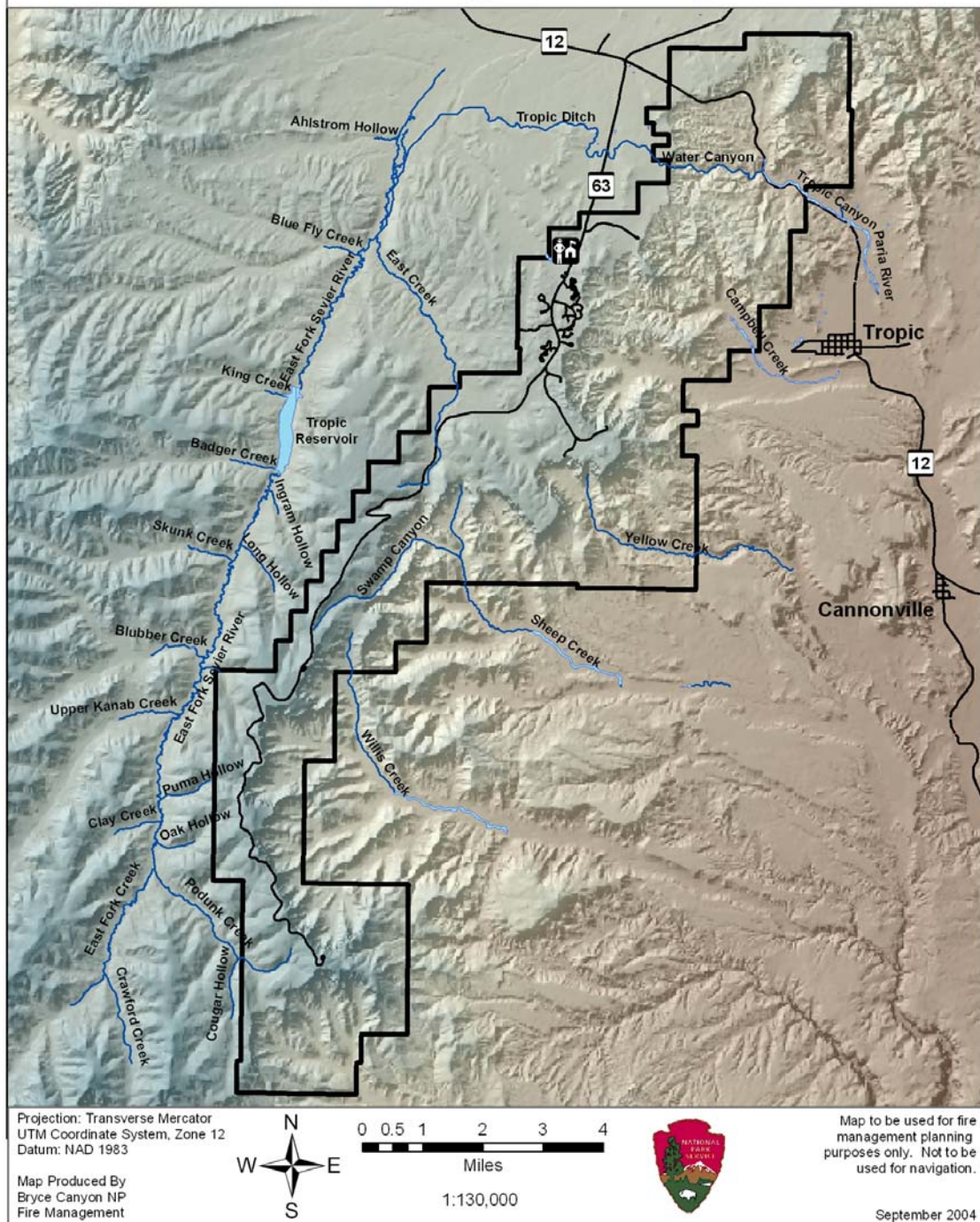
Cumulative impacts to water quality would result from the park's existing practices, plus the wildland fire use in neighboring forests, and effects from other sources of point and non-point pollutants from surrounding communities and ranches. There are no substantial sources of industrial pollution in or near park waterways. Fire-related activities would result in the same types of effects described in the analysis above, but would be intensified if fire spread and affected more of the watershed. With recovery of the area, adverse cumulative impacts to water quality would be reduced. Overall, impacts of actions described under Alternative A, added to the impacts of other actions affecting water quality, would result in minor, cumulative adverse impacts to water quality in park and downstream waters.

Conclusion

Alternative A would result in short-term, minor to moderate, adverse impacts to water quality because of the increased chance of wildland fire, resulting in increased runoff of soil and ash into streams, an increase in stream temperature, higher temporary nutrient loading, and possible increased channel erosion. Locally long-term, minor to moderate adverse effects would be expected in case of more extreme and/or widespread fire. Cumulative effects would be short- to long-term, minor, and adverse.

Because there would be no major, adverse impacts to water and aquatic resources whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Bryce Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's water and aquatic resources.

Map I: Major Drainages



Effects of Alternative B – Proposed Action/Preferred Alternative

Under Alternative B, impacts to water quality and hydrology would be similar to those under Alternative A, but with a reduced possibility of more severe adverse impacts since there would be a reduced possibility of more extensive or catastrophic wildland fire. Short-term, adverse impacts from loss of vegetation due to wildland fire use and/or prescribed fires in areas bordering park waterways would be negligible to minor, with limited effects due to the more controlled nature of the burn. Long-term, moderate beneficial impacts would be expected following fire or thinning, as denser ground cover would regrow and bind soils, providing erosion control and preventing runoff to waterways. Also, long-term minor beneficial impacts would occur since the reduced density of trees following fire would increase the amount of water in the system.

Adverse impacts from mechanical clearing may include soil disturbance and possible minor fuel spills, but these impacts would be very localized, short-term, and negligible. Use of light-on-the-land vehicles and proper spill prevention and cleanup would minimize impacts. Any herbicides used in or near riparian areas or waterways would be labeled for use in such area, and buffers would be maintained to ensure that chemicals did not enter park drainages. (Additional mitigation measures to prevent or reduce adverse impacts to water quality can be found in Chapter 2, *Mitigation Measures for Alternative B.*)

Cumulative Effects

Cumulative impacts under Alternative B would be similar to those described under Alternative A, but reduced in intensity and duration since fuels reduction activities and use of controlled, lower intensity fires would help limit extensive burns that could spread beyond the park boundary and affect more of the watershed or create more severe erosion and sedimentation. Overall, impacts of actions described under Alternative B, combined with the impacts of other actions that could affect water quality, would result in short-term, negligible to minor adverse impacts to water quality in park and downstream waters, with long-term, beneficial impacts due to the recovery of streamside vegetation and the gradual increase in pioneer ground cover in areas treated.

Conclusion

Alternative B would result in short- to long-term, negligible to minor, more localized adverse impacts to water quality. Long-term, moderate beneficial effects would result because of the reduced area that would be affected by extensive wildland fires, the lower fire potential, and the controlled and limited locations of prescribed fires that can result in a thick regrowth that limits erosion and sedimentation. Cumulative effects would be short-term, negligible to minor and adverse, with long-term benefits.

Because there would be no major, adverse impacts to water and aquatic resources whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Bryce Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's water and aquatic resources.

Natural Soundscapes

Affected Environment

Natural soundscapes are comprised of the natural sound conditions in a park that exist in the absence of any human-produced noises. These conditions are actually composed of many natural sounds, near and far, which often are heard as a composite, not individually. Natural sound conditions include the sounds

of running water, blowing wind, chirping birds, and many other sounds found in nature. The opportunity to experience Bryce's natural soundscape unimpaired by the sounds of human civilization is an important part of the overall visitor experience, especially as it contributes to the solitude and wilderness experience that is integral to much of the park.

NPS's Director's Order #47 (DO-47), Soundscape Preservation and Noise Management, mandates strong consideration of soundscape and noise issues on park planning and management. DO-47 calls on parks to develop Soundscape Management Plans. The NPS may also need to develop Air Tour Management Plans for several of its parks with a large number of aircraft flying overhead, including Bryce Canyon. As part of an acoustic study at Bryce in 2003, acoustic data was collected from May 2002 to April 2003 at Fairyland Point and Farview Point (NPS 2004). The ambient noise levels in the park during the daytime ranged from an average of 23.7 dBA in the winter months of October to February, to 28.0 dBA in the spring, summer, and fall months of March to September. Ambient noise levels at night ranged from an average of 20.9 dBA in the winter months to 22.5 dBA in the spring, summer, and fall months (Ambrose 2004).

Noise studies were also conducted in the mid-1990's in conjunction with studies of impacts from the proposed development of the Alton coal mine, located four miles south of Yovimpa Point. Results of the noise studies indicated natural sound levels in the park to be as low as those in a sound recording studio. Threats to natural quiet in the park come from aircraft flying overhead, vehicles driving park roads, road construction, and potential for external development (NPS 1996).

Sound monitoring conducted in 1995 indicated that aircraft could be heard an average of 19 percent of the time. The amount of time an aircraft was heard varied by location throughout the park, with Fairyland Point (located in the north end of the park near the more developed area) having the highest percentage, and the Bristlecone area (located in the southern, less developed portion of the park) having the lowest percentage. Sources of aircraft noise include helicopter tours based out of Ruby's Inn, low elevation fixed wing planes that include private and commercial sightseeing operations, and high altitude commercial jet traffic (NPS 1996). Air tour operators in Bryce Canyon, working with NPS officials, established informal flight corridors through the park in 1999. The corridors were based on two primary uses. The general tour flights that cover the most scenic and important areas of the parks originate and end at the airport two miles north of the park. The second corridor is over Fairyland viewpoint, which is used to access the park amphitheaters (NPS 2003).

A large percentage of the park is noted for its extremely low noise level. The majority of the park is in recommended wilderness, which identifies noise levels as being "very low" (NPS 2003). Such noise levels have been identified as an important park element, especially for those visitors seeking opportunities for solitude. The elevation of the park in relation to the surrounding topography makes it highly vulnerable to impacts on solitude. As development increases, noise levels will increase, creating impacts on the solitude of the park (NPS 1987).

Impact Threshold Definitions

Negligible	Noise created by fire management activities may be present in the park's more developed areas during the daylight hours, but would rarely be audible between sunset and sunrise. Natural sounds would predominate in the backcountry, where noise created by fire management activities would rarely be audible. When noise is present, it would be at low levels and occur for only short durations in a small geographic area. Visitors would almost always have the opportunity to experience the natural soundscape free from noise created by fire management activities.
Minor	Noise created by fire management activities may predominate in the park's more developed areas during the daylight hours, but the majority of the time the noise would be at low levels, and only rarely at greater than medium levels. Noise created by fire management activities would rarely be audible between sunset and sunrise. Natural sounds would usually predominate in the backcountry, and noise created by fire management activities would be infrequent and occur for only short durations in most of the backcountry area. Visitors would almost always have the opportunity to experience the natural soundscape free from noise created by fire management activities most of the time in most of the area.
Moderate	Noise created by fire management activities would predominate in the park's more developed areas during the daylight hours, but only at medium or lower levels a majority of the time. Localized areas may experience noise at medium to high levels half of the daylight hours. Noise created by fire management activities would occasionally be audible between sunset and sunrise. Noise created by fire management activities would be present infrequently to occasionally in the backcountry at low to medium levels and durations. Portions of the backcountry often experience noise at low or medium levels and durations. Noise created by fire management activities would occasionally be audible between sunset and sunrise.
Major	Noise created by fire management activities would predominate in the park's more developed areas during daylight hours, and would be at greater than medium levels a majority of the time that noise is present. Large areas may experience noise at medium to high levels during the majority of the daylight hours. This noise would often be audible between sunset and sunrise. In the backcountry, natural sounds would commonly be masked by noise created by fire management activities at low or greater levels for extended periods of time. Portions of the backcountry would often experience noise at medium levels and durations, and noise levels in these areas would occasionally be high. Noise created by fire management activities would frequently be audible between sunset and sunrise.
Duration	Short-term – effects extend only through the duration of the proposed project Long-term – effects extend beyond the period of the proposed project
Area of Analysis	Within park boundary

Effects of Alternative A – No Action Alternative

The majority of the park has extremely low noise levels. The baseline natural ambient sound levels within the park for the spring, summer, and fall months of March to September is 28.0 dBA, and is 23.7 dBA for the winter months of October to February. The use of mechanized hand tools and fire suppression equipment, including fire pumps, helicopters, dozers, or other heavy soil moving equipment, would increase noise levels in the vicinity of the treatment area. Most of the equipment used for fire suppression or vegetation removal ranges in noise level from 88 dBA for mowers to 125 dBA for chainsaws. This equipment would be used for very short durations and in limited areas. Also, sound created would dissipate quickly (approximately half the noise level per doubling of distance), and variations in vegetation and topography will also minimize sound impacts with distance. The effects of Alternative A on natural soundscapes would therefore be short-term, minor, localized and adverse due to noise from prescribed fire activities, some limited mechanical clearing in wildland urban interface areas, and fire suppression activities.

Cumulative Effects

Cumulative effects to soundscapes would result from actions described under Alternative A, plus other disturbances from park maintenance, road construction, commercial aircraft flights over the park, motorized vehicle use in and around the park, and increased recreational development near the park. These actions can cause sound levels in the park to rise, but in limited areas for short periods that will rarely impact visitor's enjoyment of park. Overall, impacts of actions under Alternative A, combined with other actions that could affect soundscapes, would result in minor adverse cumulative effects to park soundscapes.

Conclusion

Alternative A would result in localized, short-term, minor adverse impacts on natural soundscapes due to noise from prescribed fire activities, limited mechanical clearing, and fire suppression activities, including noise from helicopters, mechanical equipment and vehicle use. Cumulative effects would be to be short-term, minor and adverse, but localized.

Because there would be no major, adverse impacts to natural soundscapes 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, there would be no impairment of natural soundscapes as a result of the implementation of Alternative A.

Effects of Alternative B – Proposed Action/Preferred Alternative

Noise from natural fire is considered a natural sound. The activities associated with wildland fire use, prescribed fire, and mechanical fuel reduction would involve the presence of humans and (for mechanical clearing) the use of chainsaws for several days or weeks in specific locations. Under Alternative B, there would be increased use of prescribed fire in the interior of the park, which would increase the potential for noise impacts to visitors using the backcountry. However, these impacts would be managed by limiting the scope, area of use, and timing of mechanical equipment used to meet essential fire management requirements. The use of aircraft and helicopters for fire management and suppression activities would impact noise levels throughout the park, but the park would explore options for the use of quiet aircraft technologies to mitigate these impacts. Noise from wildland fire use and prescribed fire, including preparation, would have minor, short-term, site-specific adverse impacts to natural soundscapes. Mechanical fuel reduction would have minor to moderate, short-term site-specific adverse impacts.

Cumulative Effects

Cumulative effects to soundscapes as a result of actions under Alternative B, plus other disturbances from park maintenance, commercial aircraft flights over the park, motorized vehicle use in and around the park, and increased recreational development near the park would be short-term, minor, localized and adverse. These actions would cause sound levels in the park to rise, but in limited areas for short periods that would rarely impact enjoyment of the park during the entire duration of a visit. Overall, impacts of actions under Alternative B, combined with other actions that could affect soundscapes, would result in minor, adverse, cumulative effects to park soundscapes.

Conclusion

Alternative B would result in localized, short-term, minor to moderate, adverse impacts on natural soundscapes due to the use of fire suppression, wildland fire use, and mechanical removal equipment, including the presence of fire crews, helicopters, chainsaws, and off-road vehicles. Cumulative effects would be localized, short-term, minor and adverse.

Because there would be no major, adverse impacts to natural soundscapes 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, there would be no impairment to natural soundscapes.

Wilderness

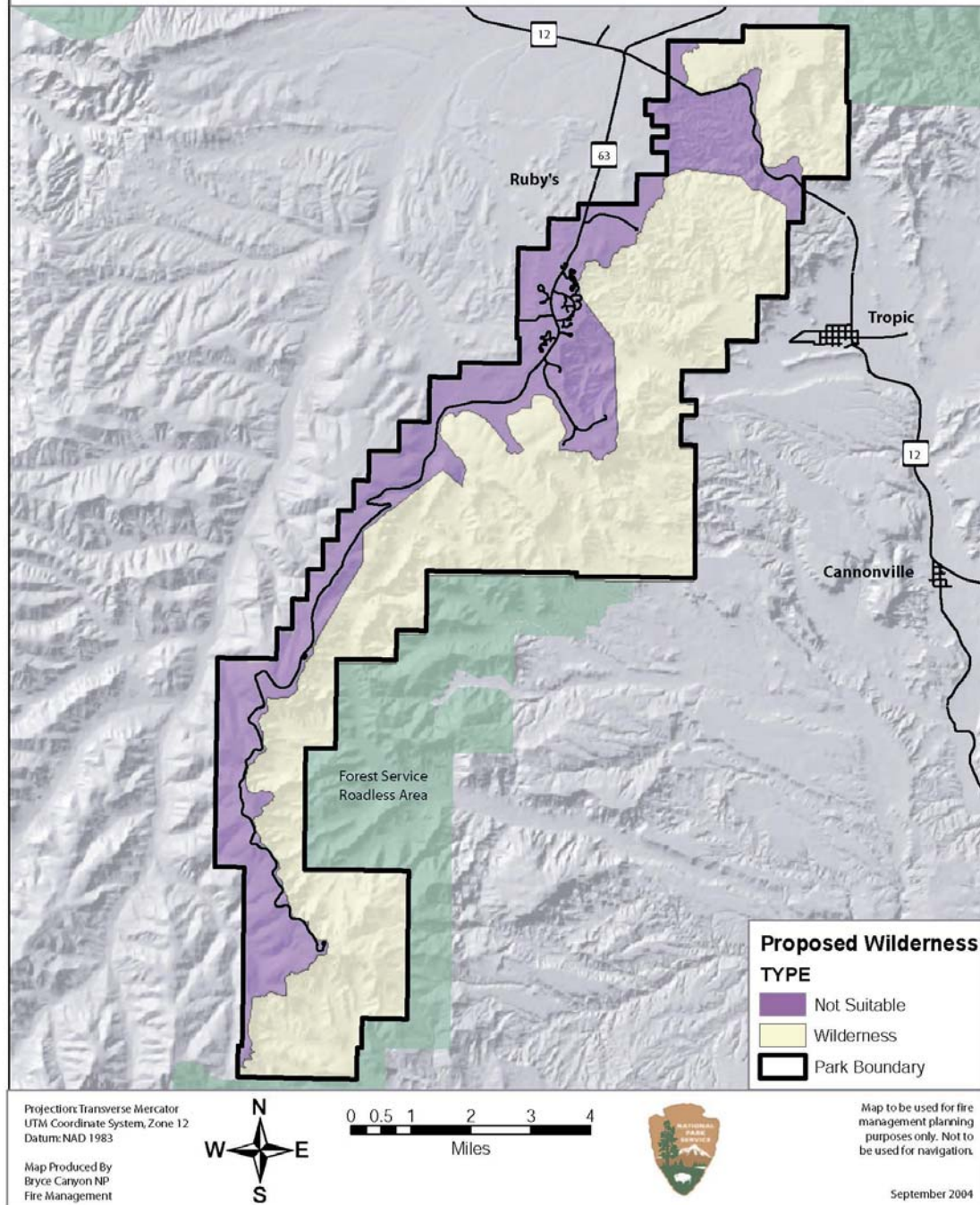
Affected Environment

A total of 22,325 acres (62 percent) of the park has been recommended as wilderness (Refer to Map J). These lands are primarily located below the rim of the canyon along the eastern side of the park. The Bryce Amphitheater and several other parcels of land below the rim are excluded (NPS 1989). While not yet legislatively designated, this recommended wilderness (which was proposed in 1974) is managed as wilderness in accordance with NPS Management Policies (USDI, NPS 2001c). These areas provide visitors an opportunity to experience Bryce's backcountry unimpaired by the sounds of development and human civilization.

The 1964 Wilderness Act defined wilderness as "an area where the earth and its community of life are untrammeled by man." In addition, the Act states that "except as necessary to meet the minimum requirements for the administration of the area for the purposes of this act, there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area." The Act also contains a special provision allowing for the use of aircraft in the control of fire.

All fire management activities affecting wilderness would be consistent with the minimum requirement concept. This concept is a documented process used to determine if administrative activities effecting wilderness resources or the visitor experience are necessary and how to minimize impacts. The minimum requirement concept would be applied as a two-step process that determines (1) whether or not the proposed fire management action is appropriate or necessary for administration of the area as wilderness and does not pose a significant impact to wilderness resources and character; and (2) the techniques and type of equipment needed to ensure that impact to wilderness resources and character is minimized.

Map J: Proposed Wilderness Areas



Under ideal conditions, natural fire should be considered a fundamental component of the wilderness environment. Natural processes would be allowed to continue in these areas, as much as possible, to shape and control wilderness ecosystems.

Impact Threshold Definitions

Negligible	A change in the wilderness character could occur, but it would be so small that it would not be of any measurable or perceptible consequence.
Minor	A change in the wilderness character and associated values would occur, but it would be small and, if measurable, would be highly localized.
Moderate	A change in the wilderness character and associated values would occur. It would be measurable but localized.
Major	A noticeable change in the wilderness character and associated values would occur. It would be measurable and would have a substantial or possibly permanent consequence.
Duration	Short-term – effects extend only through the duration of the proposed project
	Long-term – effects extend beyond the period of the proposed project
Area of Analysis	Within park boundary

Effects of Alternative A – No Action Alternative

Under this alternative, fuels would continue to buildup, increasing the potential for more catastrophic wildland fire. In the event of a wildland fire, adverse effects on wilderness resources could be extensive, depending on the size and intensity of the burn and the level of suppression efforts. Fire damage to large tracts of land in the proposed wilderness area would adversely affect the visual character, soils, vegetation, wildlife, and would degrade the air quality. Fire suppression efforts would additionally adversely affect soil resources and disrupt the natural quiet from human presence, use of aircraft, and the use of mechanized hand tools. All wildland fires within wilderness would be effectively managed considering wilderness resource values while providing for public and firefighter safety using the full range of strategic and tactical options. Wildland fire management response would include aggressive initial attack to suppress wildland fires at minimum size using the appropriate suppression response. Alternative A would have long-term, direct, minor to moderate, adverse impacts on wilderness resources.

Cumulative Effects

Cumulative effects to wilderness would occur as a result of actions described under Alternative A, plus other disturbances from park maintenance, commercial helicopter flights over the park, and increased recreational and private development near the park. The Town of Tropic has recently initiated rezoning areas bordering the Bryce wilderness on the eastern side of the park in order to limit development in these areas and keep them in a more pristine state. This buffer will provide additional protection to park wilderness values. However, in general, the continued buildup of fuel under this alternative, in combination with high fuel loads on adjacent property, would increase the potential for wildland fire to spread within and across park boundaries. Firefighter presence in wilderness and use of prescribed fires would have a negligible to minor, short-term, adverse cumulative effect. Aircraft overflights associated with fire management activities and other administrative and commercial uses may temporarily detract from the user experience. Overall, impacts of actions under Alternative A, combined with impacts of other actions that could affect wilderness, would result in long-term, minor to moderate, adverse cumulative impacts to wilderness values in the park.

Conclusion

Alternative A would result in minor to moderate, short-term, direct, adverse impacts on wilderness values due to the risk of a catastrophic wildland fire and the increased human presence in wilderness areas

required to support fire suppression efforts. Cumulative effects would be long-term, minor to moderate, and adverse. Analysis of minimum tool requirements would be used in all wilderness areas to keep adverse impacts to minimal levels.

Because there would be no major, adverse impacts to proposed wilderness whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Bryce Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's proposed wilderness resources or values.

Effects of Alternative B – Proposed Action/Preferred Alternative

Under Alternative B, wildland fire use would be the preferred method of fuel reduction within proposed wilderness, although some areas could be targeted for limited prescribed fire or clearing, depending on the nature of the area and the fuel conditions. The presence of work crews, fuels reduction activities (such as thinning and clearing vegetation) and the potential use of power tools could have short-term, minor impacts to wilderness values and resources, such as wildlife and natural quiet. Use of mechanized tools would be determined based on the outcome of a minimum requirement analysis. Management activities associated with this alternative would result in short-term, minor impacts because work crews would only be present for a brief period of time, areas affected would be small, and with implementation of mitigation measures, recovery of the areas' soils and vegetation would be rapid.

The Minimum Requirement Analysis is a two-part process. Part A helps determine whether or not the proposed management action is appropriate or necessary for administration of the area as wilderness, and does not pose a significant impact to wilderness resources and character. Part B describes alternatives for the proposed action in detail, and evaluates each in order to determine the techniques and/or types of tools and equipment (minimum tool) needed to ensure that overall impacts to wilderness resources and character are minimized. The Minimum Requirement Concept is not intended to limit choices. It challenges managers to examine every planned management action to determine if it is appropriate and necessary in wilderness and to choose the best alternative that would least impact unique wilderness resources and character. The purpose and philosophy of wilderness must be considered when evaluating alternatives. Since the majority of Bryce Canyon (62 percent) is located in proposed wilderness, the Minimum Requirement Analysis would be used when planning fire management actions in the park.

Impacts to wilderness character and values over the long-term would be beneficial and moderate in intensity as fire is restored to areas of the park and the wilderness returns to a more natural range of variability in regards to fire. Fires of mixed severity would be more typical of the historic fire regime and would add to the wilderness character as being shaped and maintained by natural disturbance events such as fire.

Cumulative Effects

Implementation of the proposed action would, in the short-term, continue the cumulative minor adverse effects that currently exist due to human activities in the proposed wilderness areas. However, the plan provides for long-term, beneficial effects to wilderness through the reduced potential for wildland fire and associated fire-suppression activities, which can cause adverse impacts. Along with the presence of backcountry users, firefighter presence during wildland fire use events and prescribed fires would have a negligible to minor short-term adverse cumulative effect. Aircraft overflights associated with fire management activities and other administrative and commercial uses may temporarily detract from user experience. Reasonably foreseeable future actions would be anticipated to contribute minor to moderate cumulative effects on wilderness character long-term, as fire is restored as a natural disturbance event

across the landscape and increasingly offsets effects associated with non-fire related activities. Overall, impacts of actions under Alternative B, combined with impacts of other actions that could affect wilderness, would result in negligible to minor, short-term, adverse, cumulative impacts and minor to moderate long-term beneficial effects.

Conclusion

Alternative B would result in short-term, negligible to minor, adverse impacts to wilderness values due to the presence of work crews, the additional noise associated with fire use and firefighting activities, and the potential use of mechanized tools in or bordering wilderness. The effects to wilderness character would be moderate and beneficial due to the reduction in fuel loads, which would reduce the risk of catastrophic wildland fire. Cumulative effects would range from negligible to minor and adverse to long-term, minor to moderate, and beneficial. Analysis of minimum tool requirements would be used in all wilderness areas to keep adverse impacts to minimal levels.

Because there would be no major, adverse impacts to wilderness whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Bryce Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's wilderness resources or values.

Wildlife

Affected Environment

The diverse habitats within Bryce Canyon support a variety of wildlife species. The park is home to 4 species of amphibians, 11 species of reptiles, 59 mammal species, and 175 bird species. Bryce does not support a large number of fish or amphibians due to the limited aquatic resources in the park. No rigorous studies of fish populations or aquatic habitats have been conducted. Surveys for amphibians have shown that their abundance may be correlated with summer rainfall and drought conditions (Kershaw et al. 1998). Also, many species of birds and some mammal species, such as bats, are migratory. Consequently, the number of species and the size of populations vary considerably from season to season. Wildlife species and their habitats are outlined in Appendices F and G.

Common mammals of Bryce Canyon include mule deer, striped skunk, badger, gray fox, mountain cottontail, red squirrel, golden-mantled ground squirrel, and various small rodents. Elk, pronghorn, mountain lion, and black bear use the park, as well as neighboring lands. Common birds include Stellar's jay, pinyon jay, common raven, mountain chickadee, pygmy nuthatch, flicker, mountain bluebird, western bluebird, white-throated swift, violet-green swallow, and blue grouse. Raptors known to nest in the park include golden eagle, red-tailed hawk, kestrel, prairie falcon, goshawk, Cooper's hawk, peregrine falcon, and great-horned owl (NPS 1996; Hirshmann 1991; Bezy 2004). Little is known about the insects of Bryce Canyon. Butterflies and moths have been collected and are in the museum collections.

Pinyon nuts, juniper berries, manzanita fruits, grasses, and forbs form the base of the food chain for Bryce Canyon wildlife. These are eaten by ground squirrels, deer mice, chipmunks, wood rats, and other small herbivores and a variety of birds, which are in turn prey for the park's raptors, coyotes, foxes, bobcats, and other predators. Insects that inhabit park meadows and forests support a wide variety of birds, as well as reptiles and some amphibians. Pine nuts and berries supply food for large herbivores such as mule deer and black bear (Bezy 2004).

Impact Threshold Definitions

Negligible	Wildlife would not be affected or the effects would be at or below the level of detection and the changes would be so slight that they would not be of any measurable or perceptible consequence to the wildlife species' population.
Minor	Effects to wildlife would be detectable, although the effects would be localized, small, and of little consequence to the species' population. Mitigation measures, if needed to offset adverse effects, would be simple and successful.
Moderate	Effects to wildlife would be readily detectable, localized, and with consequences at the population level. Mitigation measures, if needed to offset adverse effects, would be extensive and likely successful.
Major	Effects to wildlife would be obvious and would have substantial consequences to wildlife populations in the region. Extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed.
Duration	Short-term - recovers in less than one year
	Long-term - requires more than one year to recover
Area of Analysis	With park boundary

Effects of Alternative A – No Action Alternative

Impacts to wildlife under Alternative A may be direct, as in mutilation or injury from fire or fire treatment projects, but most impacts would be indirect and related to the effects on vegetation from fire activities. Fire can create, destroy, or enhance wildlife habitat, causing changes in the subsequent abundance and occurrence of animal species on a burned area. The nature and extent of impacts to wildlife would depend on the fire intensity, duration, frequency, location, extent, season, site, fuels, and soils present (Bradley et al. 1992).

Under Alternative A, there would be the increased chance of more extreme wildland fire and/or more uncontrolled amount of area burned, due to the continuation of fuel buildup in certain areas of the park, with subsequent effects on vegetation and wildlife habitat (see *Vegetation* section for additional details). Short-term impacts from wildland fires and suppression activities would range from negligible to moderate for wildlife species present, depending on the season, magnitude and extent of fire, and intensity of suppression effort. Some small mammals (e.g., mice, shrews) and birds may be temporarily eliminated from severely burned areas due to the elimination of habitat (nest sites, surface cover) and food. Some mortality of less mobile species or nestlings may occur. However, many of these species would eventually benefit from the results of fire, due to the openings created and the new undergrowth of forbs and grasses that would regenerate on burned sites.

Some wildlife species prefer older age stands or late successional woodlands (e.g., porcupines, tree squirrels, owls). In time, any woods that are not burned and continue to exist as forests would benefit these animals. Fire may adversely affect these species, causing them to move to other, more suitable habitats within the park, but these effects would be short-term minor impacts only.

Amphibians would be less affected by fire because of the wet nature of their habitat. However, there is very limited aquatic habitat in Bryce, and any burning or ash deposition could cause habitat loss and indirect minor to moderate adverse impacts on local amphibian populations. Reptiles (lizard, snakes) may experience short-term, minor to moderate adverse impacts due to reduction in ground cover and food, with some direct mortality possible for less mobile species. However, long-term, moderate benefits would result from creation of a more open canopy and the eventual regeneration of a forb/grass ground cover that provides food and cover for these species.

Fire management activities would also have similar effects on wildlife, with some short-term, adverse effects, but generally long-term benefits for many animals. Areas targeted for prescribed fire would be planned to limit effects during breeding seasons, and prescribed fires would be less intense and/or widespread than potential wildland fires. Short-term impacts to some wildlife species include negligible to minor disturbance from the presence of humans and equipment during prescribed fire. Small mammal cover would be exposed over localized areas, but would eventually regrow as lush cover, which can benefit predator species. Sprouting of canopy species and regrowth of grasses, forbs, and shrubs, would generally occur within one to two growing seasons and would moderately enhance habitat conditions for many species of wildlife. Again, those species that are more dependent on denser, mature woodlands would be displaced.

Mechanical clearing under Alternative A would be limited to more developed areas and WUI areas, where wildlife may also be limited, localized, and more adapted to disturbance. The noise and disturbance from use of chainsaws and burn piles would cause minor adverse impacts.

Mitigation measures would be implemented during prescribed fires or mechanical clearing to reduce adverse impacts to wildlife. These measures include timing prescribed fires or thinning operations to avoid key breeding seasons, ensuring that prescribed fire allows for low intensity surface burns, providing adequate cover and travel corridors, and leaving important snags or logs in place.

Cumulative Impacts

Cumulative impacts to park wildlife arise from fires and fire management activities in and around the park, as well as other past, present, and future actions. Such actions include fires that occur on neighboring lands and the results of fire management actions implemented by other public agencies, which would have similar effects to wildlife as described above. The past history of suppressing wildland fires in the general region has created more fuel loading, which can lead to more catastrophic fires without the increase in fuel reduction activities that have begun to be implemented. Currently, prescribed fire and wildland fire use are coordinated with neighboring land management agencies so that burns are timed to avoid more severe effects that could result if multiple fires occurred simultaneously.

Other actions affecting wildlife in the park and surrounding areas include disturbance from visitors, residents, hunting, (deer, elk, antelope, bear, mountain lions, turkeys, migratory waterfowl), and predator control (coyote). In addition, wildlife are impacted by reduction of habitat due to construction and maintenance activities, and noise from vehicles and aircraft can cause adverse impacts. Air tour helicopter use over the park can cause very short-term but intense disruption to wildlife on a local basis, including flight response or disturbance of breeding if the craft approaches close enough to wildlife areas. Overall, impacts of actions under Alternative A, combined with impacts of other actions that could affect wildlife, would result in moderate, adverse, cumulative impacts to wildlife species.

Conclusion

Alternative A would result in minor to moderate, adverse impacts to wildlife and wildlife habitat, with short-term adverse impacts giving way to longer-term benefits for some species in areas that have burned but recover with new regrowth and a more open canopy. Cumulative impacts would be moderate and adverse.

Because there would be no major, adverse impacts to wildlife whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Bryce Canyon; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant NPS planning documents, there would be no impairment of the park's wildlife.

Effects of Alternative B – Proposed Action/Preferred Alternative

Alternative B would result in similar impacts to wildlife as described for Alternative A. However, because of the emphasis on the restoration of the natural role of fire in the park, habitat diversity would eventually increase and more natural ecological conditions would return. Species that would benefit from fire would include those that forage for insects in recently burned stands (e.g., woodpeckers), those that prey on mice, voles, and other small mammals that would thrive on newly established herbaceous cover (e.g., foxes, coyotes), and those that eat fresh browse (deer, elk). As with Alternative A, species that prefer the older even-aged stands would experience displacement to more suitable habitat — a short-term minor adverse impact. Also, fire events under Alternative B would be done so that the amount of area burned would be more controlled, which would limit impacts to wildlife habitat. Areas would remain for breeding, foraging, sleeping, etc., and the extent of adverse impacts would be reduced compared to Alternative A.

Overall, Alternative B would provide long-term, moderate beneficial impacts. Habitat conditions after prescribed fire, clearing, or wildland fire use would be expected to gradually improve. Prescribed fires would result in improved forage vigor by increasing sunlight and releasing nutrients. Snags would be left for wildlife use where appropriate if not a safety concern. Impacts from noise generated by prescribed fires and clearing would be reduced using noise-reducing devices or hand-held equipment as needed.

Many wildlife species would experience short-term, minor to moderate impacts from planned wildland fire use and prescribed fires as well as the increased use of mechanical clearing equipment, as described for Alternative A. With mechanical equipment, there could be more soil compaction and actual damage to less mobile ground-dwelling species, such as mice, snakes, lizards. However, light-on-the-land equipment would be used in sensitive areas, and this equipment exerts a relatively small amount of pressure on the ground.

Cumulative Impacts

Cumulative impacts from Alternative B would be similar to Alternative A, but with more regionally-based reduction in fuel loading and the creation of more varied, healthy forest habitats, with a mosaic of openings and denser woodlands, resulting in long-term beneficial effects. Additional use of fuel treatments and wildland fire use in more areas would add to the cumulative effects of noise and disturbance from personnel, equipment and possibly aircraft. Overall, impacts of actions under Alternative B, combined with impacts from other actions that could affect wildlife, would result in cumulative adverse minor to moderate impacts to wildlife species.

Conclusion

Alternative B would result in minor to moderate adverse impacts to wildlife and wildlife habitat, with conditions improving over time, and long-term, moderate beneficial impacts from the restoration of more natural conditions and the reduction of the possibility of catastrophic wildland fire. Cumulative impacts would be minor to moderate and adverse.

Because there would be no major, adverse impacts wildlife whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Bryce Canyon; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant NPS planning documents, there would be no impairment of the park's wildlife.

Cultural Resources

Affected Environment

Human use of what is now Bryce Canyon dates back to about 9,500 years B.P. (before present). During the late Paleoindian/early Archaic period transition (approximately 7500 B.C.), small, mobile groups hunted game and collected wild plants, seeds, and nuts across the Great Basin and western Colorado Plateau, leaving behind only a few traces in the archaeological record. By about 50 B.C., groups had begun to supplement wild foods in their diets by cultivating vegetables, which marks the beginning of the Formative period. The advent of pottery use around A.D. 500 provides a basis for the distinction of Formative period groups, such as the Parowan Fremont and Ancestral Puebloan (Virgin Anasazi). The Virgin Anasazi and Parowan Fremont practiced agriculture, produced ceramics, traded widely, and began to use the bow and arrow.

No Fremont sites are presently identified within Bryce Canyon, but are known from the surrounding areas. Puebloan use of the area was probably restricted to upland resource procurement rather than long-term occupation. Both groups disappeared from the archaeological record of southwestern Utah by about A.D. 1300. Extended droughts in the 11th and 12th centuries, interspersed with catastrophic flooding, may have made agriculture impossible, or it may be that these sedentary agricultural groups could not successfully compete for wild resources with the more mobile Numic language speakers (such as the Southern Paiute and Ute), who were in the region by about A.D. 1000. Numic speaking groups, the sole occupants of the Bryce landscape between A.D. 1300 and the late 1700s, depended on a wide range of seasonally gathered wild plants and animals.

Euro-Americans first made contact with Southern Paiute bands in the area in the late 1700s, as early explorers, like Fathers Dominguez and Escalante in 1776 who camped about 50 miles southwest of Bryce Canyon, and fur trappers passed through the region while it was Mexican territory. Within a few decades, traders had established well-defined routes between Santa Fe and Los Angeles through Utah to the northwest and west of the park. Information about the region reached the eastern United States in the 1840s encouraging pioneers, including members of the Church of Jesus Christ of Latter Day Saints (Mormons), to settle Utah Territory. In 1847, Brigham Young led Mormon pioneers to Utah Territory, and within a decade many pioneers had settled near the park. Mormon settlement in southern Utah began in the mid-1870s, with Clifton being the first of several communities established along the headwaters of the Paria River in 1874. Ebenezer Bryce, the namesake of the canyon that later became the park, was among the early settlers in this area. Settlers diverted river water through extensive irrigation ditches to crops in the floodplains and attempted dry land farming on the plateaus. One example of this is the Tropic Ditch, which is still in operation and crosses through the northern portion of the park. This ditch carries water from the Sevier River across the Paunsaugunt Plateau to Water Canyon. This natural drainage then carries the water to a diversion ditch that serves the Tropic townsite. Settlers grazed cattle, horses, sheep, and goats both in the lowlands and on the plateaus. By 1873, the Kanara Cattle Company was grazing cattle throughout the area and introduced sheep to the Paunsaugunt Plateau in 1877.

In the late 1800s and early 1900s timber stands were heavily logged and sawmills established in the Bryce Canyon area. In the early 20th century southern Utah, Bryce Canyon in particular, was recognized as a potential destination for tourism. At this time, public lands atop of the Paunsaugunt Plateau were placed under control of the Sevier National Forest (today Dixie National Forest). Roads were constructed across the Forest Service land to provide access to the canyon rim, trails were built below the rim, and the Forest Service conducted tours to raise interest in the area. Rudy and Clara Syrett purchased land near the rim, promoted tourism, and established a tent camp near the rim in 1919 and a permanent lodge called "Tourist Rest" in 1920. The Union Pacific Railroad recognized Bryce Canyon as one of several scenic

destinations on the Colorado Plateau, and established food and hotel services there along a multi-day scenic loop.

In 1891, a bill was introduced in the Congress to recognize Bryce Canyon as “Utah State National Park.” This bill did not pass, but interest in the area continued and on June 8, 1923, President Warren G. Harding established Bryce Canyon National Monument by proclamation. In that same year, the Union Pacific Railroad, through its subsidiary the Utah Parks Company, leased state-owned land along the rim that was the same property used by the Syretts and immediately began construction of the Bryce Canyon Lodge, which was completed in 1925. Over the next two years, five deluxe cabins, 67 tourist cabins, and several service structures were built, water and sewer systems were upgraded, and telephone lines installed. In 1928, the monument was elevated to National Park status and administration transferred from the Forest Service to the National Park Service, with administrative functions located at Zion National Park. Over time the boundaries were enlarged and the park reached its current size in 1931 and the Utah Park Company continued to operate and improve the facilities.

With the establishment of the monument, all commercial logging was halted, but grazing continued and was gradually phased out, until finally eliminated in 1964. The Rim Road was completed in the 1930s. In 1934, Civilian Conservation Corps (CCC) Company 962, which was based in Zion National Park, established a seasonal camp at Bryce, which operated until 1941. Numerous buildings, including residences, administrative buildings, and visitor facilities were constructed in this period. Many miles of fence lines, roads, and trails were built and thousands of erosion check dams were installed. The Park Service’s Mission 66 program led to the separation of administrative function of Bryce from Zion National Park in 1956. Staffing was increased and programs were improved, which laid the foundation for the park’s movement into the modern era.

Cultural Resource Documentation

Past cultural resource investigations at Bryce have mainly included small, brief reconnaissance and development-related surveys and test excavations. Prior to the 2000-2002 Bryce Canyon Archeological Inventory Survey (AIS), the available archeological information was patchy, outdated, and recent work had been focused on test excavations at plateau-top sites along the park’s roadways. The Bryce Canyon AIS was the first large-scale, intensive archeological survey conducted in the park. This resulted in a comprehensive and detailed view of the archeological resources on nearly 11,000 acres on the Paunsaugunt Plateau.

In all, archaeologists have conducted cultural resource inventory of approximately 35 percent of the park and documented 223 sites, including both prehistoric and historic resources. Many of these sites are artifact scatters, containing prehistoric flaked stone tools and ceramics or historic period tin cans and bottles. Other site types include culturally modified ponderosa pine trees, Civilian Conservation Corps (CCC) erosion control features, historic roads and trails, aspen dendroglyphs, campsites, and refuse scatters. These sites reflect a continuum of human use of Bryce’s biological and geologic resources to satisfy basic needs for food, shelter, and raw materials.

The Native American archeological sites in Bryce represent a wide range of temporal and cultural affiliations extending from the late Paleoindian/early Archaic period transition (ca. 9500 B.P.) to the protohistoric or historic period (late 1800s). The archeological cultures represented in the park include possible late Paleoindian; Great Basin early, middle and late Archaic; Virgin Anasazi; generalized late Prehistoric; and Numic/Southern Paiute. No aboveground architectural features have been identified at any Native American sites in the park. The most common sites found in the park are artifact scatters, and most of these consist entirely of flaked stone tools and manufacturing debris. Functionally, Archaic period sites overwhelmingly represent hunting locales. A single late Archaic period site contains a

grinding stone. Late Prehistoric or Formative period sites represent a variety of functions, but no clear pattern is evident. The few sites that contain Virgin Anasazi ceramics are of equivocal function, but at least one is a processing camp. Numic or Southern Paiute sites are relatively common on the plateau and generally represent processing camps.

Most of the Euro-American archeological sites consist of groves of aspen dendroglyphs, which are historic inscriptions carved into tree trunks. These sites appear to be primarily related to the use of the plateau's high meadows for sheep and cattle grazing from the 1920s through the 1930s. Small historic refuse scatters or dumps are also abundantly scattered throughout the park and generally date from the 1920s to the 1940s. Other important Euro-American sites in the park are temporary or seasonal campsite locations. The best known of these is the abandoned CCC camp. Another historic campsite west of Bryce Canyon Lodge appears to have been a camp where early visitors were entertained and housed. Other historic campsites in the park are less substantial and appear to represent work camps. The most common historic archeological features in the park are the nearly 4,000 log-and-rock checkdams. Historic records indicate that the CCC started building these in the late 1930s, with the park continuing this effort after the CCC was disbanded until the 1970s. Other Euro-American archeological resources include gravel pits (probably related to Rim Road construction) and rock quarries (probably related to the construction of park buildings). Several improved springs have been recorded, some of which include axe-hewn logs used for watering troughs. A historic telephone line crosses the park, as do several historic water pipelines. Many trail segments, blazed trees, rock piles, rock cairns, and stone alignments are also known, as are a variety of fence lines, park boundary markers, inscriptions on rock outcrops and pines trees, wood piles, depressions, and miscellaneous small concrete features.

Cultural Resource Categories

For this planning effort cultural resources have been grouped into four site or cultural resource categories. While these categories grossly simplify the variability, integrity, and scientific significance of these cultural resources, they remain basic and meaningful interpretive units for which appropriate treatment objectives, conservation, and protection measures may be addressed. Each category is discussed below.

Open Sites. This category includes both historic and prehistoric resources. These sites generally consist of surface artifacts, such as ceramics, flaked and ground stone, dendroglyphs, tin cans, glass or miscellaneous historic debris. This category represents most sites within the park. Open sites are found throughout the park in all vegetation zones.

Structural Sites. This category includes only historic resources that are constructed works architecturally designed or engineered for human activity. Resources in this category include buildings (habitation and non-habitation structures), roads, trails, bridges, irrigation ditches, wood telephone poles and fences, rock fence lines, water/soil erosion control features, and more. Historic structures are presented in more detail below.

Cultural Landscapes. This category refers to a geographic area that has been manipulated by humans, usually associated with a significant historic event, activity, or person. Two cultural landscapes have been identified within the park. One is associated with the buildings constructed by the Union Pacific Railroad, which is recognized as a National Historic Landmark. The second cultural landscape is related to the trails system and is listed in the National Register of Historic Places (NRHP). Four cultural landscapes have been defined and listed for future work: Bryce Canyon Lodge and Deluxe Cabins, Bryce Canyon Scenic Trails Historic District, Bryce Inn, and the NPS Historic Housing Area (Anne Trinkle Jones, NPS Cultural Resources Coordinator 2004).

Ethnographic Resources. These resources have importance to American Indians and descendants of early pioneers, and may include archaeological sites, geographic areas, or natural resources such as springs/seeps, vegetation, wildlife, or mineral deposits.

Human related studies are poorly represented at Bryce. Although Native Americans (primarily Paiute) acknowledge their former usage of the Bryce area for hunting and gathering activities, there is very little ethnographic information documenting the extent of this usage. During the late Prehistoric period, Numic-speaking peoples like the Southern Paiute occupied Bryce and the surrounding area. Ethnohistorical accounts and the oral history of contemporary Southern Paiute include the Bryce area. Contemporary descendants of the Southern Paiutes and the Kaibab Tribe are considered Native American tribes who have traditional affiliation with Bryce. No specific ethnographic resources have been identified by the park or were raised as issues during public scoping.

Historic Structures

Structures are constructed works that are architecturally designed or engineered to serve a human activity. These may include buildings, roads, trails, bridges, irrigation ditches, or earthen berms, to name a few. In 1994, an inventory and evaluation of the historic resources in the park was completed. This inventory resulted in the listing of 42 buildings, 10 trails, and the Tropic Ditch in the NRHP. Most of the buildings were listed under Criterion A (associated with broad patterns of American history) and/or Criterion C (architectural significance). Twenty-eight of the buildings are associated with the Union Pacific Railroad development of the park, while the remainder was built by the NPS. The park road system has been determined eligible, but is not formally listed in the NRHP. The listed buildings include:

- Bryce Canyon Lodge District (listed as a National Historic Landmark)
 - Lodge, Deluxe Cabins, Standard Cabins, Linen House, Recreation Hall, Boy's Dormitory, Pump House*
- Bryce Inn (General Store)
- Original NPS Administration Building (HS-31)
- Horse Barn
- Loop C and D Comfort Stations (North Campground)
- Rainbow Point Comfort Station and Overlook Shelter
- NPS Housing Area (HS-2 through HS-10)
- Utah Parks Service Station

Trails listed in the NRHP include:

- Navajo Loop
- Queens Garden
- Peekaboo
- Fairyland
- Rim Trail
- Riggs Spring Fire trail
- Under-the-Rim Trail

Impact Threshold Definitions

Negligible	The impact is at the lowest levels of detection – barely perceptible and not measurable.
Minor	For archaeological resources, the impact affects an archaeological 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 NRHP eligible or listed structure, district, or cultural landscape.
Moderate	For archaeological resources, the impact affects an archaeological site(s) with high data potential and no significant ties to a living community’s cultural identity. For a NRHP 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 NRHP eligibility is jeopardized.
Major	For archaeological resources, the impact affects an archaeological site(s) with exceptional data potential or that has significant ties to a living community’s cultural identity. For a NRHP 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 NRHP.
Duration	Short-term - treatment 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.). Any effect from treatments to archaeological, historic, or ethnographic resources would be considered long-term (see below).
	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.
Area of Analysis	Within park boundary

Effects of Alternative A – No Action Alternative

Under Alternative A, there would be limited fuels reduction activities and no use of wildland fire, with a resultant increase in fuel loading over time, making uncontrolled wildland fire more likely. Archeological and historic sites and features, both buried and on the surface, may be at risk from unwanted wildland fires and the associated suppression activities. Sites with flammable wooden elements would be especially vulnerable. Heating associated with fire can cause smudging, cracking, or other damage to artifacts and ruins. Adverse impacts may also result from human activities, such as fire line and helispot construction, thinning, and artifact collecting by visitors. While some of the disturbances caused by suppression could be avoided by careful planning of hand lines, the ability to consider and protect all cultural resources during a wildland fire is difficult.

Historic structures located within or adjacent to park boundaries also may be at risk from uncontrolled wildland fires. Fortunately, most of the park’s archeological and historic sites are in areas protected from wildland fires due to natural or man-made barriers. In addition, routine maintenance activities would help to maintain structural clearance from surrounding vegetation, and mechanical clearing would be conducted around structures. These activities would ensure that no major impacts would occur to these structures.

Any or all of the mitigation measures described in Chapter 2, *Mitigation Measures for Alternative A*, would be executed under the supervision of a qualified cultural resources specialist. However, because unidentified resources could not be protected in case of unplanned fire, and because professional expertise and many of the proposed mitigation measures may be unavailable for some areas during uncontrolled wildland fire, cultural resources could suffer minor to moderate, long-term adverse impacts, both direct and indirect.

There is the possibility that fire or use of equipment could expose previously unknown sites or artifacts that had been obscured by vegetation or forest litter, which could be viewed as a benefit. Post-fire cultural resource surveys would be conducted to identify and evaluate newly discovered sites and/or document damage to known sites. A plan would be developed to ensure site stabilization or information retrieval, and during rehabilitation of fire control lines, care would be taken to avoid damage to cultural resources.

Fires or damage from suppression activities could result in unacceptable changes to character-defining elements of historic districts or structures. That is, fire and suppression activities could remove important landscape elements, structures or historic sites, and unsightly burned and scorched vegetation, stumps, and unvegetated fire lines would diminish the visual integrity of the landscape.

Since the park's cultural resources are nonrenewable, most adverse effects on cultural resources would be considered direct and long-term. The intensity of impacts would depend on the intensity, duration, and location of the fire, and the mitigation efforts that could be implemented. Given the higher potential for more intense wildland fire as time goes on, Alternative A would result in minor to moderate, short- and long-term, direct and indirect adverse impacts to cultural resources.

Cumulative Impacts

Visitors, local residents, government agencies, and the general public affect fire management decisions on a regional basis. Some agencies and residents may take measures to reduce fire hazards, while in other areas fuels may continue to accumulate. Uneven fuel reduction efforts inside and outside the park boundaries could contribute to cumulative losses of cultural resources by creating fire-prone "pockets" of fuel. Uncontrolled wildland fires could move into adjacent public and private lands, damaging important cultural resources.

The lands surrounding Bryce Canyon may also be expected to contain unknown cultural sites, and Alternative A would add to the cumulative losses of cultural resources from wildland fires over a broader area. Cultural resources are also lost through natural erosion and natural degradation, unauthorized collection, and damage from vegetation growth. Smaller, planned maintenance or road projects for the park would not contribute substantially to cumulative impacts, since they can be planned in advance, incorporating site surveys and use of various mitigation measures. Historically, a structural fire in the historic housing area adds to the cumulative adverse effect.

Overall, impacts of actions under Alternative A, combined with impacts from other actions that could affect cultural resources, would result in minor to moderate, adverse cumulative impacts to cultural resources due to the risk of uncontrolled wildland fire, past fires, collecting, erosion, and soil or ground disturbance.

Conclusion

Alternative A would result in minor to moderate, adverse impacts on cultural resources in the park. Short-term impacts may occur, but most impacts would be considered long-term due to the non-renewable nature of these resources. Cumulative impacts would be minor to moderate, long-term and adverse from fire, collecting, erosion, and soil/ground disturbance.

Because there would be no major, adverse impacts to cultural resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Bryce Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the

park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's cultural resources or values.

Effects of Alternative B – Proposed Action/Preferred Alternative

Under Alternative B, fire would still occur within the park, but the increased use of wildland fire and prescribed fire, plus the proposed fuels reduction activities, would help prevent extreme wildland fires in the future. Prescribed fire would be conducted so that burns could be controlled and kept at low intensity. Also, all prescribed fire plans would adhere to requirements of NHPA, and pre-burn surveys and the implementation of cultural resource protection measures (such as fire shelters) would keep impacts to minor levels.

During thinning, some unknown sites could be damaged by vehicular traffic and work crews trampling sites and dragging slash over the ground surface. Damage could be managed by cutting limbs and brush into sizes that can be transported without dragging or heavy vehicular use. All slash burning areas would be located away from known resources, or located in previously disturbed areas that have already been surveyed. Direct adverse impacts from thinning would be minor. Use of light-on-the-land equipment would be specified to reduce impacts to soils and sites from vehicular traffic.

Prescribed fires and wildland fire use could result in exposure of surface soils and previously unknown sites, with possible subsequent erosion and loss of site integrity. Impacts from planned prescribed fires would be reduced by careful pre-planning and archaeological monitoring of all burns. If unanticipated sites were discovered, the archaeologist would halt work and protect the area until further investigations could be completed in consultation with the Utah SHPO. Special project funds would be sought to complete an archaeology inventory survey in the remainder of the park in order to help facilitate fire management activities.

Implementation of the new Fire Management Plan would result in benefits, such as increased defensible boundaries, lower fire intensities, and lower heating residence times over the long-term. Overall, Alternative B would have long-term, minor, adverse impacts to cultural resources, with long-term, moderate beneficial effects.

Cumulative Effects

Visitor use, local residents, and the general public may add cumulatively to fire management effects, including firefighter presence around these values as prescribed fire operations increase. With the increased interagency coordination and provision for fuel reduction and wildland fire use across the park boundary, long-term cumulative adverse impacts to cultural resources would be reduced. Overall, impacts of actions under Alternative B, combined with impacts of other actions that could affect cultural resources, would result in minor, adverse, cumulative impacts to cultural resources, with long-term, moderate beneficial impacts due to the decreased potential for more intense and widespread wildland fires.

Conclusion

Alternative B would result in long-term, minor, adverse impacts to cultural resources, with some moderate, long-term beneficial impacts from eliminating the threat of extensive, high-intensity fires and reducing damaging fuels. Cumulative impacts would be short-term, minor, and adverse, with long-term, moderate beneficial effects.

Because there would be no major, adverse impacts to cultural resources whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Bryce Canyon

National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's cultural resources or values.

Section 106 Summary: After applying the Advisory Council on Historic Preservation's criteria of adverse effects (36 CFR Part 800.5, *Assessment of Adverse Effects*), the National Park Service concludes that implementation of the preferred alternative would have *no adverse effect* on cultural resources of Bryce Canyon National Park.

Economic Considerations

Affected Environment

Bryce Canyon National Park is located in the State of Utah in portions of southern Garfield County and northern Kane County. Garfield County is most closely linked economically (via tourism) to Bryce Canyon National Park, because the only access point to the park is located in Garfield County from State Highways 62 and 12. State Highway 12 bisects the northern portion of the park. The closest towns are Tropic, located 6 miles east of the park entrance, and Panguitch, located approximately 24 miles northwest of the park entrance.

Population

Between 1990 and 2000 the United States' population grew by approximately 13.2 percent. During the same time, the population of Utah grew at 29.6 percent, more than double the rate of the U.S. Since 1990, Kane County has experienced 15 percent growth, and Garfield County has experienced 19 percent growth (USDC U.S. Census Bureau 2004). The town of Tropic had a population of 508 in 2000 (City-data.com 2004). The town of Panguitch has a population of 1,444 (Utah Travel Center 2004).

The mild climate, community facilities and services, and proximity to several national parks and other public lands which offer a wide variety of outdoor recreational opportunities, have all contributed to the area's growth.

Economy

The primary economic sectors in terms of earnings are identified in Table 13. Leisure and hospitality (which includes tourism), government, and manufacturing are the largest industries adjacent to the park. The jobs provided by the leisure and hospitality sector typically are not high paying. This sector also tends to be seasonal in nature.

Total industry earnings (\$46,510,553) for persons employed in Utah increased by 2.1 percent between 2001 and 2002 (Bureau of Economic Analysis 2004). During the same period of time, Kane County increased 2.4 percent (for a total of \$77,845), and Garfield County decreased by 1.2 percent (for a total of \$60,185) (Utah Governor's Office of Planning and Budget, 2004). All income estimates are in thousands of dollars.

Table 13: Top Three Industries in Terms of Earnings in 2002			
	Industry and Percent of Total Earnings	Industry and Percent of Total Earnings	Industry and Percent of Total Earnings
State of Utah	Leisure and Hospitality (3.8%)	Government (18.1%)	Manufacturing (13.8%)

Garfield County	Leisure and Hospitality (24.6%)	Government (39.2%)	Manufacturing (5.4%)
Kane County	Leisure and Hospitality (22.4%)	Government (31.9%)	Manufacturing (18.5%)
Source: Bureau of Economic Analysis, Regional Economic Information System, 2004 data; and State of Utah Governor's Office of Planning and Budget, Demographic and Economic Analysis.			

Transportation /Access

Bryce Canyon National Park is one of the many destination parks located in southern Utah and northern Arizona far from the major population centers of the country. Domestic and foreign visitors are undaunted by these distances and arrive by various types of motor vehicles every year. Interstate 15, running north and south, is the major highway connecting the southwestern corner of Utah with the rest of the nation. Bryce can be accessed through this route from several state highways, including State Highways 14, 143, 20, and 12. Bryce is located 150 miles northeast of St. George, the closest substantial city, which is along Interstate 15. From Interstate 15, St. George is connected with Salt Lake City to the north and Las Vegas, Nevada and southern California to the south. Interstate 15 also intersects Interstate 70 about 125 miles north of St. George, which in turn connects with Denver, Colorado, to the east. Access to the park entrance is from State Highway 12, which bisects the northern portion of the park.

Visitor Services

Communities in southwest Utah have a variety of restaurants, motels, souvenir shops, and other retail establishments offering goods and services to the traveling public. Communities that provide these services near Bryce include Panguitch, Tropic, Cannonville, and Bryce Junction. The abundance of lodging facilities, including campgrounds, as well as eating establishments in this area attest to the importance of tourism in the region. Automotive services, medical services, and other visitor services are available in some communities.

The closest lodging to the park includes Bryce Canyon Lodge and Ruby's Inn. Bryce Canyon Lodge, located within the park boundaries, is open from April 15 to October 31. The lodge has 114 rooms, including lodge suites, motel rooms, and cabins. Ruby's Inn is located several miles from the park entrance along State Highway 62. Ruby's Inn provides 368 rooms, cabins and teepees, 200 campsites, and numerous RV parking spots. Other businesses that support visitors to Bryce Canyon include The Pines, Fosters, and Bryce Canyon Resorts.

The town of Tropic, with approximately 500 permanent residents, is the closest town to the park entrance. Six motels, lodges, inns and bed and breakfast establishments are located within Tropic. The lodging facilities range from small bed and breakfasts with five units, to an inn that offers 65 units. Nearly 175 lodging units are available to the public. At least five restaurants are open in Tropic as of 2004 (Utah Travel Center 2004).

Panguitch is the largest town in Garfield County and is the County seat. It is located about 24 miles northwest of the park entrance. Visitor services that are available in Panguitch include 19 lodging establishments, 9 campgrounds, and close to 15 restaurants. Panguitch also has medical services and auto services. Nearby access to Panguitch Lake, Bryce Canyon National Park, and Dixie National Forest provide a few of the many area recreational opportunities (Utah Travel Center 2004).

Regional Land Ownership and Use

Bryce Canyon National Park is surrounded by a mix of federal, state, and privately owned lands. Dixie National Forest, managed by the U.S. Forest Service, is the largest contiguous landholder, and is located east and west of the park. The Grand Staircase-Escalante National Monument, managed by the BLM, is

located along portions of the eastern boundary. The BLM also manages land along the northern and northeastern park boundaries. Other surrounding landowners include approximately a dozen private holdings and the State of Utah school trust lands. The lands bordering the park are used for a variety of purposes, including ranching, cattle grazing, recreation, private residences, and commercial uses.

Table 14 and Map B display the general land ownership patterns of the surrounding area. A large area of each of these two counties is publicly owned, with the federal government managing the largest portions of each county. The BLM, USFS, and NPS all manage federal lands within the two-county area. The State of Utah owns and manages numerous school trust parcels throughout these counties. In addition, six state parks are located in the area. The amount of area in private ownership is extremely low — four percent in Garfield County and five percent in Kane County (Garfield County 2004; Kane County 2004).

The lands in this part of Utah are used for a variety of purposes, including, but not limited to, agriculture (e.g., farming, ranching), mineral exploration and production (including coal, oil, and natural gas production), outdoor recreation of all types, timber production, watershed protection, wilderness, transportation (including roads, powerlines, and pipelines), wildlife and fish habitat, and urban and commercial uses. While traditional uses (such as grazing, mining, and forest products) are still important to the area's economy, other uses that are tied to the land — especially outdoor recreation and tourism — are growing in importance. The relatively mild climate and varied and abundant recreational opportunities have encouraged the development of the region for commercial, residential, tourism and vacation, and retirement purposes.

Table 14: Landownership in Southwest Utah				
Land Status	Garfield County		Kane County	
	Square Miles	Percentage of Total Area	Square Miles	Percentage of Total Area
Private	209	4%	218	5%
State	202	8%	437	10%
Federal	4639	88%	3,718	85%
Total	5268	100%	4,373	100%
Source: Garfield and Kane County Governments				

Impact Threshold Definitions

Negligible	No effects would occur, or the effects to socioeconomic conditions would be below or at the level of detection.
Minor	The effects to socioeconomic conditions would be detectable. Any effects would be small and, if mitigation was needed to offset potential adverse effects, would be simple and successful.
Moderate	The effects to socioeconomic conditions would be readily apparent. Any effects would result in changes to socioeconomic conditions on a local scale. If mitigation is needed to offset potential adverse effects, it could be extensive, but would likely be successful.
Major	The effects to socioeconomic conditions would be readily apparent and would cause substantial changes to socioeconomic conditions in the region. Mitigation measures to offset potential adverse effects would be extensive and their success could not be guaranteed.
Duration	Short-term - occurs only during the treatment effect/project period.
	Long-term - occurs after the treatment effect/beyond project period.
Area of Analysis	Garfield and Kane counties

Effects of Alternative A – No Action Alternative

Under Alternative A, fuels would continue to accumulate, resulting in short-term, indirect, adverse and beneficial impacts to the local economy in the event of a wildfire. The influx of firefighters needed for suppressing wildland fires would result in the need for temporary local housing and the additional purchases of food and other supplies from local merchants — a minor beneficial impact. However, the park and surrounding areas could close, or access may be very limited during these incidents, which would result in fewer tourists and recreationists visiting the local communities and purchasing food, supplies, and lodging. This loss of tourism and recreation revenue would result in a minor, indirect, short-term adverse impact on local socioeconomics. However, the chance of a more extensive wildland fire grows with each year of limited fuels management. A large wildland fire would create some short-term benefits to the local economy due to the needs of the temporary crews. However, such a fire would result in more consequential, long-term, minor to moderate adverse impacts, because visitation would decrease not just during the fire event, but after the event as well, until the park and surroundings reopened and visitors returned to the area. The length and severity of this impact would depend on the length and severity of the fire, whether or not the fire damaged some of the more widely used areas (such as near the Bryce Amphitheater), and when the fire occurred. It is more likely that an extensive wildland fire would occur during the dry summer months, when visitation would normally be highest and the impacts of the lack of income from decreased visitation would be most severe.

In addition to the impacts mentioned above, the actual cost of fighting any fire, especially extensive wildland fires, can be great and result in decreased public resources and support being available for other purposes in and around the park. This could have a minor, indirect, adverse, long-term impact to the local economy and other regional economies if projects that would have enhanced area tourism are cancelled due to lack of funds because of firefighting related expenditures.

The impacts of prescribed fires would be short-term, negligible to minor, and adverse. Few cancellations of existing hotel reservations would be expected. Approximately 30 to 60 firefighters and support staff would be brought in from out of town for each prescribed fire, and would require lodging and meals. In addition, the park would attempt to schedule prescribed fires at slower times of the year in order to minimize interference with local economies. Prescribed fires are generally less than one week in duration.

Cumulative Effects

Cumulative impacts to the local economy include those that could result from the park's actions plus those resulting from the fire policies of the surrounding landowners, visitor use, increased recreational development in and near the park, and fuel reduction treatments carried out on public or private lands near the park, which can influence the spread of fire into the park and create cumulative impacts relating to smoke, access, and other effects on recreational use in the area. For example, the Sanford Prescribed Fire in the Dixie National Forest's Powell Ranger District escaped, joined with the Adams Head Prescribed Fire, and became a wildland fire. This fire contributed to adverse impacts on the regional economy, including mortality to a Bonneville cutthroat trout fishery, adverse impacts to a highly valued recreation fishery in the East Fork Sevier River, and undesirable smoke impacts (USDA, USFS 2003).

Firefighting activities that would be expected in the park and surrounding lands would create similar demands on the local economy for lodging, food, and support supplies as described above, resulting in minor to moderate, short- and long-term cumulative adverse impacts to the local economy. Those who would receive revenue from the firefighter presence would experience some short-term beneficial impacts. Again, the intensity of these impacts would depend on the length and severity of the fire, whether or not the fire damaged some of the more widely used areas, and when the fire occurred. It is more likely that an extensive wildland fire would occur during the dry summer months when visitation

would normally be highest and the impacts of the lack of income from decreased visitation would be most severe. The effects from the smaller maintenance projects in the park would be very short-term, and access would not be denied to most areas of the park. Overall, impacts of actions under Alternative A, combined with impacts of other actions that could affect local socioeconomics, would result in short- to long-term, minor to moderate, adverse cumulative impacts, with short-term benefits to the local economy.

Conclusion

Alternative A would result in short- and long-term, indirect adverse impacts to local socioeconomic conditions, with some beneficial short-term impacts resulting from the revenue generated by the presence of fire crews. Adverse impacts would include loss of revenue and the cost of suppression, as well as costs associated with fighting a possibly extreme wildland fire. These impacts would be minor to moderate, depending on the length and severity of the fire, the location of the fire, and when it occurred. Cumulative effects from Alternative A would be short- to long-term, minor to moderate, and adverse.

Effects of Alternative B – Proposed Action/Preferred Alternative

Under Alternative B, there would be less chance of extreme wildland fires over time due to the reduction of fuels in the park and wildland fire use within the park and across boundaries. This would result in a long-term, indirect, minor beneficial impact to the local economy, since the possibility of loss of revenues, especially long-term loss of revenue due to wildland fire would be substantially reduced. Avoiding wildland fire damage and the resultant costs of firefighting would also add to the beneficial impacts of this alternative, including lodging and food for the temporary work crews and supplying the fuel needed to fight the fire. The actions prescribed for use of wildland fire and prescribed fire, and manual fuel reduction, would involve short periods when parts of the park would be closed to visitor use. However, this would cause a minor drop in visitation during those periods, especially since the prescribed fires and fuel reduction activities could be planned for seasons of low visitor use, or would occur in a manner that would not greatly limit tourism whenever possible. Some prescribed fires could last for up to 7 days, and wildland fires could last from 1 to 6 weeks depending on the location and create a need for up to 60 additional staff members. This could cause more severe impacts to visitors in certain areas of the park and to surrounding communities over an extended period of time. Overall, activities planned under Alternative B would have minor to moderate, short-term, adverse impacts on the local economy, with the intensity dependant on the length of time fire use continued in the park.

Cumulative Effects

Cumulative impacts to the local economy would be similar to those described under Alternative A. Because of the fuels reduction program and the use of wildland fire defined under this alternative, fewer extensive wildland fires would occur. Adverse impacts to the local economy from such instances would be minor and short-term, with long-term beneficial impacts to the local and regional economies as a result of the protection of local economic resources from the adverse effects and costs of wildland fire suppression. Also, fuel reduction activities would provide short-term increases in wages and work activities associated with fuel reduction projects. The effects from the smaller maintenance projects would be very short-term, and access would not be denied to most areas of the park. Overall, impacts of actions under Alternative B, combined with impacts of other actions that could affect local socioeconomics, would result in short-term, minor, adverse cumulative impacts, with short-term benefits to the local economy. Increased coordination with adjacent landowners would create long-term, minor beneficial impacts.

Conclusion

Alternative B would result in short-term, minor to potentially moderate, adverse impacts to the local economy during the periods of some fuels reduction activities or wildland fire use, which would require restrictions on park use. However, long-term, beneficial impacts would result from the increased protection from costly wildland fires, including both the direct firefighting costs and the indirect costs to the local economy from the reduction in tourism and recreation revenues. Short-term, beneficial impacts would result from the increases in wages and work activities associated with fuel reduction projects or wildland fire use. Cumulative effects to the local economy would range from short-term, minor, adverse to long-term, beneficial impacts from the reduced potential of a large-scale wildland fire.

Public Health and Safety

Affected Environment

The health and safety of visitors, fire personnel, park staff, and adjacent landowners are of the utmost importance to Bryce Canyon and the NPS. Wildland fires, wildland fire use, and other fire management activities can present risks to the public, firefighters, and park staff.

The park has identified two primary concerns related to health and safety from planned fire management activities and unplanned fires. The first concerns hazards directly related to fire that could affect both the public and firefighters, including being burned, trapped by the fire, or inhaling smoke. Smoke effects can reach to neighboring communities. The second concerns hazards from working in a firefighting/fuels reduction environment, which mainly affects firefighters, but could affect visitors, such as being hit by falling rocks or trees, suffering accidents with firefighting tools or equipment, tripping or falling, or suffering vehicular accidents.

Areas of concern include the Bryce Amphitheater, which is where the majority of the visitors congregate (majority of overlooks, parking areas, campgrounds, picnic areas, visitor center, roads and trails) and backcountry areas and the southern end of the park along the main road, since it is more difficult to inform visitors of impending danger. A wildland fire could potentially block the main road trapping visitors at the south end of the park.

The current fire management program in Bryce works to mitigate long-term threats to public safety by reducing hazardous fuels with the use of prescribed fire and mechanical fuel reduction treatments adjacent to developed areas and along roadways. Fires and canyon winds can cause smoke to accumulate in the canyons, other lower portions of the park, and adjacent communities. Because of this, prescribed fires are currently conducted when winds are unlikely to blow smoke into heavily used visitor areas. Hiking trails and roads are closed when fire poses a threat to visitors.

Resources in proximity to Bryce Canyon include one Type 6 wildland engine at the park and in Panguitch. Bryce Canyon currently has a Incident Commander Type 3 on staff. We rely on out Interagency partners to provide assistance when needed. Our fire dispatching goes through Color Country Interagency Fire Center in Cedar City and we routinely utilize a Type 3 helicopter with crew to initial attack our fires. Flight time from Cedar City is approximately 20 minutes.

Impact Threshold Definitions

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 likely 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.
Duration	Short-term - effects lasting for the duration of the treatment action
	Long-term - effects lasting longer than the duration of the treatment action
Area of Analysis	Park and surrounding communities

Effects of Alternative A – No Action Alternative

Under Alternative A, fuel loads would continue to accumulate and the risk of exposure to wildland fire would increase. The potential risks to public health and safety from wildland fire would include loss of life and property, injury, and health effects caused by exposure to smoke emissions. These effects represent minor to moderate, short- and long-term adverse impacts. Impacts would be directly related to the severity of the fire, its location, and weather/wind conditions at the time of the fire. During fire suppression, firefighters would be engaged in such activities as evacuations, fire line construction, and aerial fire suppression. These activities inherently involve some risk to public health and safety, but if fire suppression was commenced rapidly and the fire was not widespread or intense, impacts to health and safety would be minor and short-term. However, with the buildup of fuel that would occur over time under Alternative A, more potential for severe fire behavior would exist, as well as more adverse impacts on the health and safety of the firefighters and park personnel. Health of nearby residents would also be of greater concern due to indirect impact of exposure to smoke. Direct impacts, including injuries and possible loss of life and property, could also occur. Current management practices would generally result in minor to moderate, short- and long-term adverse impacts to public health and safety.

Cumulative Effects

Cumulative impacts to public health and safety under Alternative A include those that could result from the park's actions, plus any resulting from the continued fire policies within the surrounding area and other activities within the park that involve health and safety issues, including other regional fires; increased visitor use and exposure of these visitors to hazards within the park; increased traffic; and maintenance operations around the park. Adverse health and safety impacts from smaller maintenance projects or visitor use of the park would be very short-term and negligible to minor, based on the types of projects normally undertaken, the health and safety planning that would precede park projects, and prior good safety records. Regional planned fires would be coordinated to limit cumulative effects of fire and smoke that could occur at one time. Overall, impacts of actions under Alternative A, combined with impacts of other actions that could affect health and safety, would result in minor to moderate, short-term and long-term adverse cumulative impacts to public health and safety.

Conclusion

Alternative A would result in short- to long-term, minor to moderate, adverse impacts that have more potential to be more severe if fuels buildup reaches levels that could support an extreme wildland fire.

Cumulative effects of this alternative would be short-term, minor to moderate, and adverse primarily because of the risk of a large wildland fire.

Effects of Alternative B – Proposed Action/Preferred Alternative

Under Alternative B, there would be less chance of extreme or widespread wildland fires in the area due to the reduction of fuels in the park and wildland fire use within the park and across the park boundaries. This would result in long-term, indirect, beneficial impacts to local and regional health and safety by reducing the chances of large scale wildland fires. The possibility of more severe health and safety impacts due to unplanned fire and associated firefighting activities would be substantially reduced. The actions involved with the use of wildland fire and prescribed fire, and manual fuel reduction, would involve more controlled conditions and pre-planning for the protection of health and safety, as well as appropriate notification and permitting prior to taking action. Also, prescribed fires and fuel reduction activities would attempt to be planned for seasons of low visitor use whenever possible. Any herbicide used for vegetation control would be EPA approved and applied by certified applicators in accordance with label directions, and visitors would not be permitted in areas to be treated. Therefore, the potential for severe adverse impacts from fuel treatment or reduction activities would be minimal, resulting in negligible or minor, adverse, short-term impacts that are usually very localized, with few off-site adverse health and safety concerns to nearby residents.

Cumulative Effects

Under Alternative B, cumulative impacts to public health and safety would be less than under Alternative A, since the long-term reduction of additional fuels, use of wildland fire, and coordination with surrounding land owners would reduce the potential for widespread or extreme wildland fires, resulting in a cumulative beneficial impact. Overall, impacts of actions under Alternative B, combined with impacts of other actions that could affect health and safety, would result in minor, short-term, adverse cumulative effects on public health and safety.

Conclusion

Alternative B would result in more localized, short-term, negligible to minor, adverse impacts from the fire and fuels reduction activities expected, but would also provide long-term, beneficial impacts resulting from the increased protection from extreme wildland fires, which can create situations with higher health and safety risks. Cumulative effects of this alternative would be short-term, minor, and adverse.

Visitor Use and Experience

Affected Environment

In 2003, approximately 900,000 people visited Bryce Canyon National Park. Visitors participate in a wide range of activities, including lodging and camping (both within the park and in the gateway towns), hiking, attending ranger guided programs, scenic driving, photography, picnicking, horseback riding, cross-country skiing and snowshoeing, and nature observation. Trails range from short, easy walks along sections of the rim trail to long, strenuous hikes such as Riggs Spring Loop and Fairyland Loop. Hoodoos, the intricately carved rock spires for which Bryce is known, are best experienced on day-hiking trails. The Under the Rim Trail is a 23-mile long trail that extends from Bryce Point to Rainbow Point and has eight backcountry campsites. The number of backcountry permits have ranged from 1,928 to 2,557 since 1998. Overall, backcountry visitors seek varying degrees of solitude, and visitors enjoy natural sounds during most of their experiences. Once a visitor ventures from traveled roadways, unnatural sound diminishes markedly.

The park has shuttle buses that operate on the main roads in the park from mid-May through mid to late-September 30. The Red Line shuttle operates in the northern part of the park and provides access to the Bryce Amphitheater.

Visitor satisfaction has been very high in recent years at Bryce Canyon National Park. Since 1999, 94-99 percent of the park visitors rated the overall quality of facilities, services, and recreational opportunities either good or very good. The average evaluation score ranged from 4.5 to 4.7 out of 5. The most complaints concerned the restrooms and the commercial services in the park (NPS 2004b).

Bryce Canyon's dark night sky results in an excellent place for stargazing. The high desert location makes the thin air very easy to see through. Bryce's sky is almost as dark as world-class astronomical research locations, and 7,500 individual stars are visible to the unaided eye. On a clear dark night, it is possible to see 2.2 million light years to the Andromeda Galaxy. Night sky events at Bryce include astronomy programs scheduled around the new moon and ranger-led full moon hikes. Maintaining dark skies is a result of several factors, including regulation of fossil fuel emission, promotion of mass transit, and reduced light pollution from sources such as commercial advertising and security/safety lights (NPS summer 2004).

Bryce Canyon's natural quiet is also an important park element, especially for those visitors seeking opportunities for solitude. As described in the Natural Soundscapes section, the majority of the park is in recommended wilderness, which identifies noise levels as being "very low" (NPS 2003). Ambient noise levels at the park range from an average of 23.7 dBA in the winter months to an average of 28.0 dBA in the spring, summer, and fall months (Ambrose, 2004). Threats to natural quiet come from overhead aircraft, vehicle traffic, road construction, and the potential for external development.

Regarding fire management, every effort is made to allow maximum appreciation, enjoyment, and use of Bryce by park visitors. Notices about planned and current fire closures are posted at visitor facilities and trailheads. Prescribed fires are planned for days when winds are unlikely to blow smoke into high visitor use areas. Park publications and park staff inform visitors of fire's ecological and aesthetic values to Bryce. Unnatural noise is curtailed whenever possible by using non-motorized tools and equipment and by minimizing the use of aircraft or by routing aircraft around high-use or noise-sensitive areas.

Table 15: Visitor Use		
Month	Number of Park Visitors¹	Permitted Backcountry Visitors²
January	34,603	22
February	29,732	10
March	77,286	111
April	109,033	158
May	168,389	495
June	215,165	362
July	248,688	290
August	261,628	272
September	240,417	211
October	144,777	132
November	63,172	36
December	41,605	14
Total	1,634,495	2,112
¹ Based on five-year average (1997-2001)		
² Permits are required for all overnight backcountry stays in Bryce. Based on five-year average (1999-2003).		

Impact Threshold Definitions

Negligible	Visitors would not be affected, or changes in visitor use and/or experience would be below or at the level of detection. The visitor would not likely be aware of the effects associated with the alternative.
Minor	Changes in visitor use and/or experience would be detectable, although the changes would be slight. The visitor would be aware of the effects associated with the alternative, but the effects would be slight.
Moderate	Changes in visitor use and/or experience would be readily apparent. The visitor would be aware of the effects associated with the alternative and would likely be able to express an opinion about the changes.
Major	Changes in visitor use and/or experience would be readily apparent and would have important consequences. The visitor would be aware of the effects associated with the alternative and would likely express a strong opinion about the changes.
Duration	Short-term - occurs only during the treatment effect
	Long-term - occurs after the treatment effect
Area of Analysis	Within park boundary

Effects of Alternative A – No Action Alternative

Under Alternative A, fuel loads would continue to accumulate and the risk of exposure to wildland fire would increase over time. If a wildland fire started due to the increased fuel loads, suppression activities and the fire itself would disrupt public enjoyment and use of the park for the duration of the fire, and possibly for some time after widespread or extreme wildland fires. These impacts would result from reduced access, smoke, odors, noise, and changes in natural settings and visibility.

Visual impacts would be short-term, minor to moderate in intensity, and adverse. Visual values could be affected by recent wildland fires, limited prescribed fires, and/or manual fuel reduction operations near any recreational site or developed area, and by haze impacts over larger areas. However, adverse effects from viewing a burned landscape would diminish over time, as understory vegetation recovers naturally. A wildland fire that impacts a significant portion of the park could lead to long-term, minor to moderate, adverse impacts to the visual character of the park and therefore the public's perception of the park.

Impacts to recreational use would be short term, minor to moderate in intensity, and adverse where closures or entry restrictions would apply. Fire activity may result in temporary closure of roads, trails, and campgrounds. Smoke also may temporarily adversely affect the recreational experience and night sky visibility due to effects on visibility and odors, but these effects would be short-term and mitigated in part through a smoke management program, as well as from an effective public information and interpretation program that would direct visitors to areas of the park not affected by smoke and help educate visitors about long-term benefits of prescribed fire and wildland fire use. Other impacts to recreational use would result from the use of aircraft during suppression activities. The use of aircraft to carry water or slurry would depend on the size of the fire. Both helicopter and fixed wing aircraft could be employed. To reduce the impact on visitor use and experience, burning activities would take place when visitor use is low and weather conditions would limit the amount of smoke and facilitate its dispersal.

Long-term effects from current management on visitor use and experience would range from negligible adverse to beneficial and minor in intensity where areas have been treated and recovered. However, as treated areas are limited in size under the current fire management plan, there remains the potential for continued adverse, short-term effects on appearance from high-severity fires where fuels have not been treated and the continued presence of overgrown climax woodlands. This represents a minor, adverse

long-term effect on recreationist attitudes toward a system shaped by periodic, low-intensity fire, mitigated in part through a timely information and education program.

Cumulative Effects

Visitor use and experience in the park would be affected by the actions described under Alternative A, as well as by other actions inside and outside the park. There is increased potential for wildland fires to cross the park boundary from surrounding properties. Existing high fuel levels within the park would magnify the impact of fire coming into the park from outside, potentially closing portions of the park to visitor use. Other maintenance and construction actions in the park, including road and facility improvements, would cause short-term, adverse impacts to visitor use and experience. In addition, air tours benefit from visitors seeking that type of experience, while causing adverse impacts to those seeking solitude. Overall, impacts of actions under Alternative A, combined with impacts of other actions that could affect visitor use or experience at Bryce, would result in short-term, minor to moderate, adverse, cumulative effects on visitor experience.

Conclusion

Alternative A would result in short-term, minor to moderate, adverse impacts to visitor use and experience, with long-term, minor to moderate, beneficial impacts where the effects of prescribed fires and limited clearing have created a more diverse, natural landscape in the long-term. Cumulative effects on visitor use and experience would be short-term, minor to moderate, and adverse.

Effects of Alternative B – Proposed Action/Preferred Alternative

Under Alternative B, fuel reduction activities, wildland fire use, prescribed fire, mechanical thinning, or use of herbicides would cause short-term public use restrictions, resulting in minor to moderate effects on visitor use and experience in and around the affected areas. Noise associated with the use of power tools, such as chainsaws, could disrupt the visitor experience. To reduce the impact on visitor use and experience, burning activities would take place when visitor use is low and weather conditions would limit the amount of smoke and facilitate its dispersal. Smoke may also temporarily adversely affect visitors' recreational experience and night sky visibility, but these effects would be mitigated in part from a smoke management program and an effective public information and interpretation program. Under Alternative B, wildland fire use could last for several weeks, causing longer-lasting disruption of visitor use. However, the park would increase public outreach and education on the benefits of restoring the natural fire regime to the park and try to mitigate these adverse effects by providing information and directing the public to areas that could be safely used.

There would be short-term, minor, adverse visual impacts within the vicinity of affected areas due to the change in appearance following treatment or wildland fire use. The sight of blackened trees, slash piles, and recently thinned areas could be perceived as a visual impact to visitor experience, although many visitors would view this as an educational opportunity if provided with appropriate interpretation. In addition, closures or entry restrictions would apply. Fire activity may result in temporary closure of roads, trails, and campgrounds. Smoke also may temporarily adversely affect the recreational experience and night sky visibility due to effects on visibility and odors, but these effects would be short-term and mitigated in part through a smoke management program, as well as from an effective public information and interpretation program that would direct visitors to areas of the park not affected by smoke and help educate visitors about long-term benefits of prescribed fire and wildland fire use. Other impacts to recreational use would result from the use of aircraft during suppression activities. The use of aircraft to carry water or slurry would depend on the size of the fire. Both helicopter and fixed wing aircraft could be employed.

Long-term effects on visual resources would be beneficial and of minor to moderate intensity where areas have been treated. Mixed-severity and larger scale prescribed fire treatments, combined with naturally ignited wildland fires managed for resource benefit, would result in moderately more desirable scenery in the long-term, including habitat diversity that would optimize wildlife viewing, provide enjoyment of healthy understory plant life, and present a visually desirable mosaic of age-classed overstory trees.

Cumulative Effects

Cumulative impacts under Alternative B would be similar to those expected under Alternative A, with more long-term, minor to moderate, beneficial effects on visitor use and experience from reducing the risk of catastrophic wildland fire within the park. The addition of interpretive programs and exhibits would also have beneficial impacts on the visitor experience. Overall, impacts of actions described under Alternative B, combined with impacts of other actions that could affect visitor use or experience at Bryce, would result in short-term, minor, adverse, cumulative impacts to visitor experience, with beneficial impacts due to the reduced risk of catastrophic wildland fire.

Conclusion

Alternative B would result in short-term, minor to moderate, adverse to visitor use and experience, as well as moderate, beneficial impacts. Cumulative effects would include short-term, minor adverse impacts, as well as long-term, minor to moderate and beneficial impacts.

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CONSULTATION AND COORDINATION

Public Involvement Summary

Public participation is an important component of any planning process. For the proposed Fire Management Plan and Environmental Assessment process, Bryce Canyon used several strategies to involve the public. External scoping was initiated in January 2004 and continued throughout the planning process. Scoping strategies included:

- Distributed over 200 scoping newsletters to individuals, organizations, and government agencies. The newsletter outlined the proposal and described the process for public involvement.
- Posted the newsletter and workshop notices on the Bryce Canyon internet homepage.
- Hosted two public information workshops in surrounding communities (Tropic, UT, January 22, 2004 - Panguitch, UT, January 27, 2004); 18 interested individuals attended the workshops.
- Published notices of the planning/environmental assessment process and workshops information in local newspapers.

The park received 6 scoping comment letters. The general concerns identified in the letters and where those concerns are addressed in this document are summarized below.

Vegetation

- Keeping historic meadows from being invaded by trees.
- Clearing of underbrush and dead trees all infested trees with beetles more of a fire hazard.
- How future fire suppression practices will be changed to restore natural fire regimes and patterns, and to avoid excessive fuel accumulations. How NPS interpretative programs and products will be changed to foster greater public understanding of the ecological importance of fire and the stupidity of past suppression programs.

Visitor Use and Experience and Economic Considerations

- Timing of Burns. Not during holiday and tourist season. Loss of tourism money, poor information, media attention. End of fall burn (October).
- How to prevent large-scale fire problems and to appease all parties.
- Continued close communication on when burns may occur. Clear information for tourists helping them to understand fire source and reasons.

Alternatives Considered but Dismissed

- Sell trees for firewood or lumber.
- Use of domestic livestock to reduce fuels.

Alternatives

- Development of criteria for "let fire proceed unabated"
- Spend some of the money to hire more people to do the job.
- An alternative to maximize the use of prescribed fire and minimizes mechanical treatments, especially in remote or backcountry areas. An alternative to seasonally limit treatments to avoid disturbance to tourists, nesting birds, migrating deer, etc.

General Comments

- The Federal Government would have the equipment to protect at least the parks.

- I strongly support and applaud progressive fuels and fire management practices that respect the ecological necessity of restoring natural fire regimes and patterns. Despite decades of “Smokey Bear” anti-fire propaganda, fire is necessary and beneficial, management must change to reflect this reality.
- While fire can be very useful in reducing fuel loads in certain situations, I am opposed to burning where each individual tree is tried to be ignited. A good example of this is along the Tom Best Spring Road there was not enough fuel to carry a fire so the result is a half dead tree that looks awful.

National Historic Preservation Act. In accordance with the Act, letters requesting tribal consultation were mailed to the following tribes: Ute Mountain Ute, White Mesa Ute, Navajo Tribe, Skull Valley Goshute, Goshute Indian Tribe, and San Juan Southern Paiute.

State Historic Preservation Office. A letter requesting scoping comments was sent to the State Historic Preservation Office in January 2004. No comments were received. A copy of this document will be sent to the SHPO for review and comment as part of the Section 106 process.

U.S. Fish and Wildlife Service. Park staff contacted the U.S. Fish and Wildlife Service by letter on January 5, 2004. A reply identifying endangered and threatened species in and around the park was received on January 22, 2004. This correspondence can be found in Appendix E. The NPS will send a copy of the EA to the USFWS for review under Section 7 of the Endangered Species Act.

List of Preparers

Name	Project Role	Title
National Park Participants		
Craig Axtell	Review	Superintendent (Bryce)
Bruce Fields	Preparer	Assistant Fire Management Officer/Fuels Specialist (Bryce)
Jan Passek	Preparer	Fire Management Officer (Zion)
Henry Bastian	Preparer	Fire Ecologist (Bryce)
Kristin Legg	Preparer	Chief Resource Management & Research (Bryce)
David Eaker	Information/Education	Fire Information/Education Specialist (Bryce)
Sarah Horton	Cultural Resources	Archaeologist (Zion)
Kristen Meyer	Data Compilation, Maps	Forestry Tech (Zion)
Royce Pollock	Review	Maintenance Division (Bryce)
Kevin Poe	Review	Park Ranger, Interpretation (Bryce)
Brent McGinn	Review	Chief Ranger (Bryce)
Bruce Silliaman	Review	Purchasing Agent
Eva Long	NEPA Review	Environmental Protection Specialist (Intermountain Regional Office)
Consultant Participants		
Nancy VanDyke	Author – Affected Environment and Impacts Wildlife, TES Animals, TES Plants, Vegetation and Wetlands, technical review	Consultant Project Manager
Lisa Pine	Author – Affected Environment and Impacts – Air Quality, Soils, Water Quality & Hydrology, Consultation and Coordination Chapter	Environmental Planner
Bob Mutaw	Author – Affected Environment and Impacts – Cultural Resources	Cultural Resources Manager

Name	Project Role	Title
National Park Participants		
Pam Roszell	Author - Affected Environment and Impacts – Natural Soundscapes, Wilderness, Economic Considerations, Public Health & Safety, Visitor Use & Experience	Environmental Planner
Patricia Steinholtz	Document Editing	Editor

List of Environmental Assessment Recipients

Federal Agencies

Advisory Council on Historic Preservation

Bureau of Land Management

Cedar City Field Office

Grand Canyon-Parashant National Monument

Grand Staircase-Escalante National Monument

Kanab Field Office

Utah State Office

Vermilion Cliffs National Monument

National Forest Service

Dixie National Forest

Kaibab National Forest

North Kaibab Ranger District

National Park Service

Arches National Park

Canyonlands National Park

Capitol Reef National Monument

Cedar Breaks National Monument

Glen Canyon National Recreation Area

Grand Canyon National Park

Pipe Spring National Monument

Utah State Coordinator

Zion National Park

U.S. Corps of Engineers

U.S. Environmental Protection Agency Region VIII

U.S. Fish and Wildlife Service

U.S. Geological Survey

State and Local Agencies and Governments

Anasazi Indian Village State Park

Five County Association of Governments

Garfield County Commissioners

Iron County Commissioners

Kane County Commissioners

Kane County Water Conservancy District

Mayor of Cedar City, UT

Mayor of Canyonville, UT

Mayor of Hatch, UT

Mayor of Kanab, UT
Mayor of Panguitch, UT
Mayor of Tropic, UT
Utah Department of Environmental Quality
Utah Department of Natural Resources
Utah Division of Air Quality
Utah Division of Drinking Water
Utah Division of Water Resources
Utah Division of Wildlife Resources
Utah Office of the Governor
Utah School and Institutional Trust Lands Administration
Utah State Clearinghouse
Utah State Historic Preservation Officer

Indian Tribes

Goshute Indian Tribe
Navajo Tribe
Northern Band of the Shoshoni Tribe
San Juan Southern Paiute
Shivwits Paiute Band
Skull Valley Goshute
Ute Mountain Ute
White Mesa Ute

Organizations

Back Country Horsemen of Utah
Bryce Canyon Natural History Association
Canyon Trail Riders
Daily Spectrum
Defenders of Wildlife
Desert News
Garfield County News
Grand Canyon Trust
Grand Canyon Wildlands Council
National Audubon Society
National Parks and Conservation Association
National Trust for Historic Preservation
National Wildlife Federation
Partners in Parks
Salt Lake Tribune
Sierra Club
Southern Utah Wilderness Alliance
Southwest Forest Alliance
The Access Fund
The Nature Conservancy
The Wilderness Society
Wilderness Watch

Local Businesses

Backcountry Horsemen of Utah
Best Western Resort
Bryce Canyon Airport
Bryce Canyon Livery
Bryce Canyon Lodge
Bryce Canyon Pines
Bryce Country Cabins
Bryce Junction Inn
Bryce Pioneer Village
Bryce Point B&B
Bryce Resorts
Bryce Trail B&B
Bryce Valley Business Association
Bryce Valley KOA
Bybee's Stepping Stone
Canyon Trail Rides
Cedar Breaks Lodge
Color Country Travel Council
Doug's Place and Country Inn
Fox's Bryce Trails B&B
Francisco's Farm B&B
Garfield County Travel Council
Golden Hills Motel
Grand Staircase Inn
Horizon Motel
Iron County Travel Council
Kane County Travel Council
Lewis Brothers Stages
M&S Aero
Ruby's Inn
Scenic Flights
Utah State Chambers of Commerce Association
Western Town Resorts

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GLOSSARY

Annual Plant – A plant growing from seed, producing flowers and seeds, and dying the same year.

Appropriate Management Response – Specific actions taken in response to a wildland fire to implement protection and/or fire use objectives. This term is a new term that does not replace any previously used term.

Appropriative Water Rights – Water Rights administered by the state for the use of water by diverting it from the natural channel and applying it to state recognized beneficial uses (e.g. irrigation, domestic or municipal water supply). Among their attributes are date of appropriation, point of diversion, place of use, amount and type of use.

Backcountry – Backcountry constitutes most of the undeveloped area of the park, where no roads or substantial human-made structures exist.

Base Flow – River or spring flow that is low and steady, typically from the discharge of groundwater and not as a result of recent precipitation.

Biological Soil Crusts – Where the soil surface is bound together by a community of organisms that can include cyanobacteria, algae, fungi, mosses and lichens. These create a soft crust at the soil surface that is resistant to raindrop impact, erosion from wind and water, and its roughness greatly increase the soil's ability to capture and hold water.

Breaks – The area where the Paunsaugant Plateau “breaks off” and the topography changes to steeply descending badlands that lead to lower elevations; the cliffs.

Class I Area – Lands designated through the Clean Air Act, including National Parks and Wilderness, that are given the highest protection of existing air quality (prevention of significant deterioration), and where visibility and other air quality related values are protected.

Cumulative Impacts – The impacts of cumulative actions - includes impacts of actions in the past, the present, and the reasonable foreseeable future.

Defensible Space – An area either natural or manmade where material capable of causing a fire to spread has been treated, cleared, reduced, or changed to act as a barrier between an advancing wildland fire and the loss to life, property, or resources. In practice, "defensible space" is defined as an area a minimum of 30 feet around a structure that is cleared of flammable brush or vegetation.

Dendroglyphs – Historic carvings found on the bark of Aspen trees (circa 1900).

Desired Future Conditions – The goals or end results park managers are striving to achieve. Desired conditions can be set for park resources, visitor experiences, management activities, and facilities. Desired conditions reflect the park's purpose and mission goals, and ensure that Bryce Canyon's resources are conserved and quality experiences are provided.

Direct Effect – An impact that occurs as a result of the proposed action or alternative in the same place and at the same time as the action.

Ecosystem Sustainability – Perpetuation of the biological, cultural, and physical processes such that dependent resources are maintained in high condition within a natural range of variability.

Environmental Assessment – Environmental assessments were authorized by the National Environmental Policy Act (NEPA) of 1969. They are concise, analytical documents prepared with public participation that determine if an Environmental Impact Statement is needed for a particular project or action. If an environmental assessment determines an environmental impact statement is not needed, the environmental impact statement becomes the document allowing agency compliance with NEPA requirements.

Environmental Impact Statement – Environmental impact statements were authorized by the National Environmental Policy Act (NEPA) of 1969. Prepared with public participation, they assist decision makers by providing information, analysis and an array of action alternatives, allowing managers to see the probable effects of decisions on the environment. Generally, environmental impact statements are written for large-scale actions or geographical areas.

Ethnographic Resources – These resources have importance to American Indians and descendants of early pioneers and may include archaeological sites, geographic areas, or natural resources such as springs/seeps, vegetation, wildlife, or mineral deposits.

Fecal Bacteria – A group of bacteria growing in abundance in the gut of warm-blooded animals, including humans, that are used as an indicator of fecal contamination of water.

Fire Break – A natural or constructed barrier used to stop or check fires that may occur, or to provide a control line from which to work.

Fire Regime – Refer to Historical Natural Fire Regime.

Fire Regime Current Condition Class - A qualitative measure describing the degree of departure from historical fire regimes, possibly resulting in alterations of key ecosystem components such as species composition, structural stage, stand age, canopy closure, and fuel loadings. Data typically shows the degree of departure from historical fire regimes. The classification system includes three current condition classes. 1 – Fire regimes are within an historical range, and the risk of losing key ecosystem components is low. 2 – Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components is moderate. 3 – Fire regimes have been significantly altered from their historical range. The risk of losing key ecosystem components is high. (See also historical natural fire regime)

Federal Reserved Water Rights – Water Rights associated with lands by virtue of their withdrawal by the Congress of the United States for Specific Purposes. The use and amount of water is that necessary to meet the purposes of the reservation, which may differ from state appropriative uses, and the date of appropriation is the date of withdrawal.

Fire Management Areas (FMA) – A sub-geographic area within an FMU that represents a pre-defined ultimate acceptable management area for a fire managed for resource benefits. This predefined area can constitute a Maximum Manageable Area (MMA) and is useful for those units having light fuel types conducive to very rapid fire spread rates. Pre-definition of these areas removes the time-lag in defining an MMA after ignition and permits pre-planning of the fire area, identification of threats to life, property, resources, and boundaries, and identification of initial actions.

Fire Management Plan (FMP) – A strategic plan that defines a program to manage wildland and prescribed fires and documents the Fire Management Program in the approved land use plan. The plan is supplemented by operational plans such as preparedness plans, preplanned dispatch plans, prescribed fire plans and prevention plans.

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 (FMP). These units may have dominant management objectives and pre-selected strategies assigned to accomplish these objectives.

Flash Flood – A flood that arrives with such rapidity that escape is difficult or impossible.

Floodplain – Part of a river channel that is inundated only during time of high flow. A 100-year floodplain is the area inundated by a flood that has a 1% chance of occurring in any given year, or occurs on average once every 100 years. Floods of this magnitude occur frequently enough to pose a serious threat to facilities and people. Fuel Reduction: Manipulation, including combustion, or removal of fuels to reduce the likelihood of ignition and/or to lessen potential damage and resistance to control.

Fuel – Combustible material. Includes, vegetation, such as grass, leaves, ground litter, plants, shrubs, and trees that feed a fire.

Fuel Type – An identifiable association of fuel elements of a distinctive plant species, form, size, arrangement, or other characteristics that will cause a predictable rate of fire spread or difficulty of control under specified weather conditions.

Fuel Reduction – manipulation, including combustion of fuels to reduce the likelihood of ignition and/or to lessen potential damage and resistance to control.

Hazard Reduction – Any treatment of a hazard that reduces the threat of ignition and fire intensity or rate of spread.

Herbicide – Any chemical substance used to control plant growth.

Historical Natural Fire Regime - Present definition being defined nationally as conditions existing before extensive pre-Euro-American settlement (pre-1900); conditions reflect the typical fire frequencies and effects that evolved in the absence of fire suppression. Fire frequency and severity measures were used to determine the departure from historical conditions. These data are not exact reconstructions of historical conditions. The classification system includes five historical fire regimes. Fire Regime I (0- to 35-year frequency, low severity) is found primarily in forests that experience frequent, low-severity, non-lethal surface fires. Fire Regime II (0- to 35-year frequency, stand-replacement severity) is found primarily in grass and shrub lands. Fire Regimes III (35- to 100+ year frequency, mixed-severity), IV (35- to 100+ year frequency, stand replacement severity), and V (200+ year frequency, stand-replacement severity) can occur in any vegetation type.

Impact Topics – Specific natural, cultural, or socioeconomic resources that would be affected by the proposed action or alternatives (including no action). The magnitude, duration, and timing of the effect to each of these resources are evaluated in the impact section of the environmental assessment.

Indirect Impact – Reasonably foreseeable impacts that occur removed in time or space from the proposed action. These “downstream” impacts, future impacts, or the impacts of reasonably expected connected actions (e.g., growth in an area after a highway is completed).

Issue(s) – In NEPA, issues are environmental, social, and economic problems or effects that may occur of the proposed action or alternatives (including no action) are implemented or continue to be implemented.

Light-on-the-Land Equipment- Tracked vehicles designed to exert minimal pounds per square inch on the land surface and therefore do not cause extreme rutting or compaction.

Litter – Top layer of the forest, scrubland, or grassland floor, directly above the fermentation layer composed of loose debris of dead sticks, branches, twigs, and recently fallen leaves or needles, little altered in structure by decomposition.

National Environmental Policy Act (NEPA) – NEPA is the basic national law for protection of the environment, passed by Congress in 1969. It sets policy and procedures for environmental protection, and authorizes Environmental Impact Statements and Environmental Assessments to be used as analytical tools to help federal managers make decisions.

Natural Sound and Soundscape – Any sounds produced by nature, such as the wind in the trees, songs of birds, flow of water in rivers and streams, etc. Unnatural sound would include any sounds produced by people or their devices, such as human voices, vehicles, and motorized tools.

Non-native Plant – A plant that is not native to the area, exotic.

Perennial Plant – Plants living more than two years.

Plateau – An elevated, relatively flat region commonly limited on at least one side by an abrupt descent to lower land.

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. This term replaces management ignited prescribed fire.

Prescribed Fire Plan – A plan required for each fire application ignited by managers. It must be prepared by qualified personnel and approved by the appropriate Agency Administrator prior to implementation. Each plan will follow specific agency direction and must include critical elements described in agency manuals. Formats for plan development vary among agencies, although the plans cover the same topics.

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. Prescription criteria may include safety, economic, public health, environmental, geographic, administrative, social or legal considerations.

Prior Appropriation – The concept that is the basis of water rights in most western states whereby the first water user to apply the water to a state-defined beneficial use has the most powerful right. Water is then distributed based on the “appropriation date” of each water right, with the earliest date receiving all of its entitlement before more junior users receive any.

Regional Haze – A reduction in visual range caused by long-range transport of particulate matter. An increase in haze reduces the ability to see distant features, and causes a loss of detail and color saturation in close features.
Rehabilitation: The activities necessary to repair damage or disturbance caused by wildland fires or the fire suppression activity.

Retardant – A substance or chemical agent that reduces the flammability of combustibles.

Riparian – Adjacent to, or living on, the bank of a river, or sometimes a lake or pond.

Scoping – Internal NPS decision-making on issues, alternatives, mitigation measures, the analysis boundary, appropriate level of documentation, lead and cooperating agency roles, available references and guidance, defining purpose and need, and so forth. External scoping is the early involvement of the interested and affected public.

Second Entry Burn – A prescribed fire that is treating the unit for a second time.

Seral – One of a series of plant communities that follows another in time on a specific site – early, mid, late.

Soil Horizon – A layer within a soil profile that is distinct due to differences in texture, color, structure or the amount of organic matter. These develop due to the weathering of minerals in the soil, or the removal and deposition of fine particles or water-soluble minerals in the soil column.

Suppression – All the work of extinguishing or containing a fire, beginning with its discovery.

Type – The capability of a firefighting resource in comparison to another type. Type 1 usually means a greater capability due to power, size, or capacity required for a larger fire. Type 5 usually relies on local resources.

Unplanned Ignition – A fire start that is the result of natural causes or accidental ignitions.

Watershed – The area drained by a river or river system.

Wildland – Any natural landscape not maintained for buildings, road, fence or other human development.

Wildland Fire – Any non-structural fire, other than a prescribed fire, that occurs in wildland. This term encompasses fire previously called both wildfire and prescribed natural fire.

Wildland Fire Implementation Plan (WFIP) – A progressively developed assessment and operational management plan that documents the analysis and selection of strategies and describes the appropriate management response for a wildland fire. A full WFIP consists of three stages. Different levels of completion may occur for differing management strategies (i.e., fires managed for resource benefits will have two - three stages of the WFIP completed while some fires that receive a suppression response may only have a portion of Stage I completed).

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.

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. Operational management is described in the Wildland Fire Implementation Plan (WFIP). Wildland fire use is not to be confused with “fire use,” which is a broader term encompassing more than just wildland fires

Wildland Urban Interface – The line, area or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

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ACRONYMS

BAER	Burn Area Emergency Rehabilitation
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BRCA	Bryce Canyon National Park
CC	Condition Class
CCC	Civilian Conservation Corps
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	Carbon Monoxide
dBA	A-Weighted Decibels
DFC	Desired Future Condition
DO	Director's Order
EA	Environmental Assessment
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact
FMP	Fire Management Plan
FMU	Fire Management Unit
FR	Fire Regime
GIS	Geographic Information System
GMP	General Management Plan
GPS	Global Positioning System
LCS	List of Classified Structures
MIST	Minimum Impact Suppression Techniques
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO _x	Oxides of Nitrogen
NPS	National Park Service
NRHP	National Register of Historic Places
NVCS	U.S. National Vegetation Classification System
RNA	Research Natural Area
SHPO	State Historic Preservation Officer
SO _x	Oxides of Sulfur
UDWR	Utah Division of Wildlife Resources
USBOR	U.S. Bureau of Reclamation
USC	United States Code
USDA	U.S. Department of Agriculture
USDC	U. S. Department of Commerce
USDI	U.S. Department of the Interior
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
WFIP	Wildland Fire Implementation Plan
WFSA	Wildland Fire Situation Analysis
WUI	Wildland Urban Interface

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Appendix A
Summary of Fires in Bryce Canyon National Park 1940 – 2003

Year	Cause		Acres	Prescribed Fires	
	Lightning	Human		Number	Acres
1940	1	4	9.3	0	0
1941	0	1	0.10	0	0
1942	2	0	0.20	0	0
1943	1	1	0.20	0	0
1944	1	4	2.40	0	0
1945	2	0	0.20	0	0
1946	0	3	0.30	0	0
1947	1	2	1.20	0	0
1948	3	0	0.30	0	0
1949	0	2	0.20	0	0
1950	1	0	1.00	0	0
1951	2	1	0.30	0	0
1952	2	0	0.20	0	0
1953	5	2	5.50	0	0
1954	1	0	0.10	0	0
1955	2	0	0.20	0	0
1956	3	3	1.50	0	0
1957	0	0	0	0	0
1958	0	0	0	0	0
1959	0	0	0	0	0
1960	0	0	0	0	0
1961	0	0	0	0	0
1962	1	0	0.10	0	0
1963	0	0	0	0	0
1964	0	0	0	0	0
1965	0	0	0	0	0
1966	0	0	0	0	0
1967	0	0	0	0	0
1968	0	0	0	0	0
1969	0	0	0.0	0	0
1970	0	0	0	0	0
1971	4	4	0.80	0	0
1972	0	2	0.20	0	0
1973	0	0	0	0	0
1974	4	0	3.10	0	0
1975	0	0	0	0	0
1976	0	3	2.10	0	0
1977	2	4	4.20	0	0
1978	8	2	3.00	0	0
1979	2	0	0.20	0	0
1980	0	0	0	0	0
1981	5	1	2.50	0	0
1982	3	0	0.30	1	0.20
1983	1	1	0.20	5	13.80
1984	2	0	0.20	1	25.00
1985	5	1	6.50	0	0
1986	0	0	0	0	0
1987	4	2	2.40	0	0
1988	2	1	2.20	0	0
1989	7	2	2.20	0	0
1990	1	1	0.90	0	0

Appendix A
Summary of Fires in Bryce Canyon National Park 1940 – 2003

Year	Cause		Acres	Prescribed Fires	
	Lightning	Human		Number	Acres
1991	4	0	2.40	1	260
1992	5	0	0.50	2	490.0
1993	3	1	0.50	5	814.0
1994	4	1	0.50	1	945.0
1995	3	0	0.30	3	647.0
1996	0	1	0.20	0	0
1997	0	0	0	1	0.10
1998	1	1	0.20	1	313.0
1999	5	1	14.5	3	116.0
2000	4	0	0.40	2	500.0
2001	2	0	0.20	4	1386.0
2002	6	0	0.60	6	674.0
2003	6	0	8.90		
Total	120	54	81	36	6184.10

Source: SACS internet site of 1202 Fire Reports on file.

Appendix B

Bryce Canyon Enabling Legislation

BRYCE CANYON NATIONAL MONUMENT—UTAH¹ BY THE PRESIDENT OF THE UNITED STATES OF AMERICA

A PROCLAMATION

[No. 1664—June 8, 1923—43 Stat. 1914]

WHEREAS, certain lands within the Powell National Forest, in the State of Utah, known as Bryce Canyon, are of unusual scenic beauty, scientific interest and importance, and it appears that the public interests will be promoted by reserving these areas with as much land as may be necessary for the proper protection thereof as a national monument;

NOW, THEREFORE, I, Warren G. Harding, President of the United States of America, by virtue of the power in me vested by section two of the Act of Congress approved June eight, nineteen hundred and six, entitled "An Act for the preservation of American antiquities", do proclaim that there are hereby reserved from all forms of appropriation under the public land laws, subject to all prior valid adverse claims, and set apart as a National Monument to be known as Bryce Canyon National Monument, all of the tracts of land in the State of Utah which are shown on the diagram forming a part hereof.

The reservation made by this proclamation is not intended to prevent the use of the lands for National Forest purposes under the proclamation establishing the Powell National Forest, and the two reservations shall both be effective on the land withdrawn, but the National Monument hereby established shall be the dominant reservation and any use of the land which interferes with its preservation or protection as a National Monument is hereby forbidden.

Warning is hereby given to all unauthorized persons not to appropriate, injure, deface, remove or destroy any feature of this National Monument or to locate or settle on any of the lands reserved by this proclamation.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the United States to be affixed.

DONE at the City of Washington this eighth day of June, in the year of our Lord one thousand nine hundred and twenty-three, and of [SEAL] the Independence of the United States of America the one hundred and forty-seventh.

WARREN G. HARDING.

By the President:

CHARLES E. HUGHES,
Secretary of State.

Appendix B
Bryce Canyon Enabling Legislation

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Appendix C

10-year Fuels Treatment Plan

Dec 2004

The 10-year plan outlines fuel treatment target areas based on current fuel conditions and national emphasis as of Dec 2004. Considering the uncertainty of land development, weather (i.e. drought), insect and disease infestations, non-native plant encroachment, and political concerns or new policy directives, this plan is open to modifications and adjustments in the future. Projects not identified on this 10 year plan may need to become a higher priority to address these uncertainties. Therefore the following examples are included as general criteria for selecting future treatment areas that are not currently addressed in the 10-year plan.

- Areas could be selected for treatments that are in condition class 2 and 3 and are within fire regimes I, II and III. An emphasis would be placed on areas along the park boundary that are within these historical fire regimes and condition classes.
- Areas could be selected where ecological restoration projects would be accomplished to meet cultural or natural resource goals and objectives. Restoration areas may include: prairie dog habitat, drought and insect related disturbances, and vegetation type conversions.
- Treatments may be selected, following guidance from the national fire plan, along boundaries with neighboring state and federal agencies that have completed NEPA requirements. This collaborative and cooperative approach may allow treatments to cross boundaries utilizing natural fuel breaks or roads to more efficiently implement fuels projects.
- Treatments may be implemented in areas that are adjacent to recent wildland fire, next to previous project areas where a fuels treatment project would enhance public safety, boundary protection, or cultural and natural resource values.

-2005-

Project Treatment Unit(s) <i>Fire Management Unit(s)</i>	Acres	Objectives	Comments	Treatment Schedule
Fairyland 2 <i>Dave's Hollow</i>	160	Hazard fuels reduction: reduce fuel loading. Ecological benefits: reintroduce fire to ponderosa pine ecosystem	Wildland Urban Interface along North Boundary protecting Ruby's Developed Area	Spring/Fall
Dave's Hollow <i>Dave's Hollow</i>	180	Hazard fuels reduction: reduce fuel loading. Ecological benefits: reintroduce fire to ponderosa pine ecosystem	Wildland Urban Interface along North Boundary protecting Ruby's Developed Area. Joint project with Dixie NF(DNF)	Spring/Fall

Appendix C
10-year Fuels Treatment Plan
Dec 2004

-2006-

Project Treatment Unit(s) <i>Fire Management Unit(s)</i>	Acres	Objectives	Comments	Treatment Schedule
East Creek Meadow <i>Dave's Hollow & East Fork</i>	400	Ecological benefits: improve prairie dog habitat, reintroduce fire to the ecosystem	Second entry burn	Spring/Fall
Residence <i>Dave's Hollow</i>	280	Hazard fuels reduction: reduce fuel loading. Ecological benefits: reintroduce fire to ponderosa pine ecosystem	Wildland Urban Interface Possible Joint project with DNF. Third entry burn	Spring/Fall

-2007-

Project Treatment Unit(s) <i>Fire Management Unit(s)</i>	Acres	Objectives	Comments	Treatment Schedule
Puma <i>East Fork</i>	2,500	Hazard fuels reduction: reduce fuel loading. Ecological benefits: reintroduce fire to ecosystem	Joint project with DNF. Multiple year project	Late Summer/Fall
East Creek Ridge <i>East Fork</i>	1460	Ecological benefits: reintroduce fire to the ecosystem	Third entry burn	Spring/Fall

-2008-

Project Treatment Unit(s) <i>Fire Management Unit(s)</i>	Acres	Objectives	Comments	Treatment Schedule
Puma <i>East Fork</i>	2,500	Hazard fuels reduction: reduce fuel loading. Ecological benefits: reintroduce fire to ecosystem	Joint project with DNF. Multiple year project	Late Summer/Fall
Sunset CG <i>Dave's Hollow</i>	530	Hazard fuels reduction: reduce fuel loading. Ecological benefits: reintroduce fire to ecosystem	Conduct during reconstruction of campground, date may change. Possible joint project with DNF	Spring through fall as construction warrants.
Whiteman <i>East Fork</i>	2060	Hazard fuels reduction: reduce fuel loading. Ecological benefits: reintroduce fire to ecosystem	Possible joint project with DNF	Late Summer/Fall
Riggs Springs <i>Fish Hook</i>	350	Hazard fuels reduction: reduce fuel loading. Ecological benefits: reintroduce fire to ponderosa pine ecosystem	Possible joint project with DNF	Early spring/Late Summer/Fall

Appendix C
10-year Fuels Treatment Plan
Dec 2004

-2009-

Project Treatment Unit(s) <i>Fire Management Unit(s)</i>	Acres	Objectives	Comments	Treatment Schedule
Loop <i>Dave's Hollow</i>	300	Hazard fuels reduction: reduce fuel loading. Ecological benefits: reintroduce fire to ponderosa pine ecosystem	Wildland Urban Interface Protect park infrastructure. Thinned areas will be treated with fire.	Spring/Fall
Paria <i>Dave's Hollow</i>	1000	Hazard fuels reduction: reduce fuel loading. Ecological benefits: reintroduce fire to ponderosa pine ecosystem	Third entry burn	Spring/Fall

-2010-

Project Treatment Unit(s) <i>Fire Management Unit(s)</i>	Acres	Objectives	Comments	Treatment Schedule
Fairyland <i>Dave's Hollow</i>	855	Hazard fuels reduction: reduce fuel loading. Ecological benefits: reintroduce fire to ponderosa pine ecosystem	Wildland Urban Interface along North Boundary protecting Ruby's Developed Area. Third entry burn.	Spring/Fall
Dave's Hollow <i>Dave's Hollow</i>	180	Hazard fuels reduction: reduce fuel loading. Ecological benefits: reintroduce fire to ponderosa pine ecosystem	Wildland Urban Interface along North Boundary protecting Ruby's Developed Area. Joint project with Dixie NF. Third entry.	Spring/Fall
Bridge Hollow <i>East Fork</i>	900	Hazard fuels reduction: reduce fuel loading. Ecological benefits: reintroduce fire to ponderosa pine ecosystem	Possible joint project with DNF	Late Summer/Fall

-2011-

Project Treatment Unit(s) <i>Fire Management Unit(s)</i>	Acres	Objectives	Comments	Treatment Schedule
Residence <i>Dave's Hollow</i>	280	Hazard fuels reduction: reduce fuel loading. Ecological benefits: reintroduce fire to ponderosa pine ecosystem	Wildland Urban Interface Possible Joint project with DNF. Fourth entry burn	Spring/Fall
East Creek Meadow <i>Dave's Hollow & East Fork</i>	400	Ecological benefits: improve prairie dog habitat, reintroduce fire to the ecosystem	Third entry burn	Spring/Fall

Appendix C
10-year Fuels Treatment Plan
Dec 2004

-2012-

Project Treatment Unit(s) <i>Fire Management Unit(s)</i>	Acres	Objectives	Comments	Treatment Schedule
Under the Rim <i>Fish Hook</i>	400	Ecological benefits: reintroduce fire to the ponderosa pine ecosystem	Possible joint project with DNF	Early spring/Late Summer/Fall

-2013-

Project Treatment Unit(s) <i>Fire Management Unit(s)</i>	Acres	Objectives	Comments	Treatment Schedule
Puma <i>East Fork</i>	2,500	Hazard fuels reduction: reduce fuel loading. Ecological benefits: reintroduce fire to ecosystem	Joint project with DNF. Second entry burn	Late Summer/Fall

-2014-

Project Treatment Unit(s) <i>Fire Management Unit(s)</i>	Acres	Objectives	Comments	Treatment Schedule
Under the Rim <i>Fish Hook</i>	300	Ecological benefits: reintroduce fire to the ponderosa pine ecosystem	Possible joint project with DNF	Early spring/Late Summer/Fall

-2015-

Project Treatment Unit(s) <i>Fire Management Unit(s)</i>	Acres	Objectives	Comments	Treatment Schedule
Whiteman <i>East Fork</i>	2060	Hazard fuels reduction: reduce fuel loading. Ecological benefits: reintroduce fire to ecosystem	Possible joint project with DNF. Second entry burn.	Late Summer/Fall

Appendix D

Minimum Impact Suppression Techniques

Minimum impact management is an increased emphasis to do the job of suppressing a wildland fire while maintaining a high standard of caring for the land. Actual fire conditions and good judgment will dictate the actions taken. Firefighter and public safety considerations will be overriding factors for any of the following:

- Fire management activities in the backcountry will minimize degradation in an effort to keep ecosystems unaffected by human influences while protecting and conserving wilderness attributes.
- Careful consideration must be given before using motorized or mechanized equipment. Long-term effects of suppression tactics must be given considerable attention when developing strategies.
- Refer to the most current *Interagency Standards for Fire and Aviation Operations*, Chapter 10, Minimum Impact Suppressions Techniques (MIST).
- All fire management activities will conform to *leave no trace (LNT)* principles and MIST.

The following guidelines would be used when implementing fire management actions in Zion National Park. The Superintendent approves the use of motorized equipment or mechanized transport for:

Emergencies where the situation involves an inescapable urgency and temporary need for speed beyond that available by primitive means. Categories include fire suppression, health and safety, law enforcement involving serious crime and fugitive pursuit, removal of deceased persons, and aircraft accident investigations.

The recommended and proposed wilderness within Zion National Park will be maintained within the standards of the 1964 Wilderness Act. It is critical that fire suppression actions are undertaken within the spirit of the Wilderness Act, and the need to protect wilderness values relative to suppression actions. This will include use of MIST and may include walking in crews, packing supplies in and out, etc. Within this context, the following fire operations are authorized, as stated, through the Agency Representative in cooperation with the Incident Commander.

Spike Camps within recommended and proposed wilderness – actions that require pre-approval by the Superintendent or concurrence by Resource Chief, Ranger Chief, and Fire Management Officer:

- Location of camp, including maximum number of occupants and estimated duration.
- Location and type of toilet and sanitary facilities.

Aviation Operations within proposed wilderness – actions that require pre-approval by the Superintendent:

- Temporary flight restriction location and extent.

Aviation Operations that do not require pre-approval:

- Long line operations.
- Helicopter water bucket operations.
- Low level reconnaissance flights.
- Use of existing helispots or existing natural openings.

Motorized and mechanical equipment within proposed wilderness – actions that require approval by the Superintendent:

- Heavy equipment, including dozers of any size.
- Any mechanical equipment.

Additional Stipulations:

- The use of retardant and foam around streams and wetlands will use standard protocols of remaining at least 300 feet away.
- Any items not covered above would follow Wilderness ethics guidelines and be approved by the Agency Representative or Superintendent based on delegated authorities.

Appendix D
Minimum Impact Suppression Techniques

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Appendix E USFWS Coordination



United States Department of the Interior
NATIONAL PARK SERVICE
BRYCE CANYON NATIONAL PARK
Highway 63 Bryce #1
PO Box 170001
Bryce Canyon, UT 84717



Y1421 (1335)

January 5, 2004

Henry Maddux
Field Supervisor
U.S. Fish and Wildlife Service
Utah Field Office
2369 West Orton Circle
West Valley City, UT 84119

Dear Mr. Maddux,

We request informal consultation with the U.S. Fish and Wildlife Service to comply with section 7 of the Endangered Species Act of 1973, as amended.

The National Park Service has initiated an environmental assessment to guide the preparation of a fire management plan for Bryce Canyon National Park in Garfield and Kane Counties, Utah. The fire management plan will guide the National Park Service in how prescribed and wildland fires will be managed on Bryce Canyon National Monument over the next five to ten years. This plan will replace the existing plan from 1994 and will cover the entire park. We anticipate that the environmental assessment and fire management plan will be completed by December of 2004.

As part of the fire management plan process and environmental assessment we request a complete list of federally listed, proposed, candidate, and former category 2 species that could potentially occur in this area. We will be evaluating these species in the environmental assessment prepared in association with the Fire Management Plan.

Enclosed is the general scoping letter outlining the objectives and timeline for the environmental assessment and Fire Management Plan.

If you need additional information please contact the park's Chief of Resources, Kristin Legg at (435) 834-4900 or by email at kristin_legg@nps.gov.

Sincerely,

Craig C. Axtell
Superintendent

Enclosure

cc: Cay Ogden, Threatened and Endangered Species Coordinator, IMSO
Bryan Swift, Fire Management Officer, IMSO

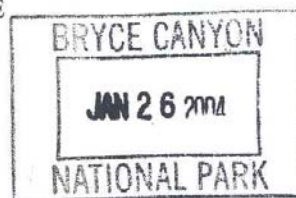


Appendix E USFWS Coordination



United States Department of the Interior FISH AND WILDLIFE SERVICE

UTAH FIELD OFFICE
2369 WEST ORTON CIRCLE, SUITE 50
WEST VALLEY CITY, UTAH 84119



In Reply Refer To
FWS/R6
ES/UT
04-0416

January 22, 2004

To: Craig C. Axtell, Superintendent, Bryce Canyon National Park, National Park Service

From: Utah Field Supervisor, Ecological Services, U.S. Fish and Wildlife Service, Salt Lake City, Utah

Subject: Fire Management Plan EA Bryce Canyon National Park

The U.S. Fish and Wildlife Service (FWS) has reviewed your letter of January 5, 2004, announcing your intent to prepare an Environmental Assessment (EA) in support of a Fire Management Plan (FMP). The purpose of the project is to provide a comprehensive plan covering all vegetation communities found in Bryce Canyon National Park. The EA will evaluate the potential impacts to the natural and cultural environments from proposed fire management activities.

Consistent with NEPA regulation 40 CFR § 1503.1(a)(1) that the action agency shall obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved, we are responding to your request for concerns and comments on this project. In Section 1 of this letter we convey our concerns that should be addressed in the EA for the FMP. Section 2 of this letter addresses your Endangered Species Act (ESA) Section 7 responsibilities and provides a species list.

Section 1.

Based on a telephone conversation between Bruce Fields (NPS) and Bekee Megown (FWS) on January 20, 2004, it is our understanding that invasive species issues will be addressed in the EA. Detailed inventory and mapping of invasive species in and near project areas could identify potential problems. Fire Management tools should be evaluated to assess potential for increased spread of invasive species and develop measures to avoid and/or control invasive plant species.

Impacts on wildlife and their habitats from project activities would vary depending on disturbance size, patterns, seasonality, and frequency. We recommend that the EA discuss the range of impacts this project would cause to plants, pollinators, terrestrial and aquatic wildlife, and sensitive areas. The EA should discuss the expected future vegetation communities and

Appendix E

USFWS Coordination

effects to wildlife resulting from changes in the extent, distribution, and composition of vegetative communities. To minimize impacts to endangered, threatened, and sensitive species, suitable acres and juxtaposition of habitat for the species should be maintained through time.

Activities should avoid, to the extent possible, sensitive wildlife periods and areas (breeding season, calving season, migration corridors). Impacts to migratory bird habitat should be evaluated and minimized, focusing on species on the Service's 2002 List of Birds of Conservation Concern and the Partners in Flight Priority Bird Species. To help meet responsibilities under Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds), we recommend you conduct activities outside critical breeding seasons for migratory birds, minimize temporary and long-term habitat losses, and mitigate unavoidable habitat losses. If your activities occur in the spring or summer, we recommend you conduct surveys for migratory birds to assist you in your efforts to comply with the Migratory Bird Treaty Act (16 U.S.C. 703-712) and E.O. 13186.

We recommend use of the *Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances* (Romin and Muck, 2002) which were developed in part to provide consistent application of raptor protection measures statewide and provide full compliance with environmental laws regarding raptor protection. Raptor surveys and mitigation measures are provided in the Raptor Guidelines as recommendations to ensure that proposed projects will avoid adverse impacts to raptors. Locations of existing raptor nests should be identified prior to the initiation of the project activities. Direct loss of nesting sites or territories should be avoided. Appropriate spatial buffer zones of inactivity should be established during crucial breeding and nesting periods relative to raptor nest sites or territories. Arrival at nesting sites can occur as early as December for certain raptor species. Nesting and fledging continues through August. Generally we recommend spatial buffers of 1.0 mile for threatened or endangered raptors, 0.5 mile for other diurnal raptors, and 0.25 mile for nocturnal raptor nests.

For fire management projects near streams, we recommend that the NPS consider using the guidelines listed in the Inland Native Fish Strategy (INFISH) (USFS 1995). As per INFISH, no disturbance should occur within a buffer zone of 300' on each side of perennial fish bearing streams, 150' on each side of perennial non-fish bearing streams, and between 50' - 100' on each side of intermittent streams. Riparian areas are sensitive habitats which are relatively scarce and highly valuable to many species of insects, amphibians, reptiles, fishes, birds and mammals. Impacts to these areas should be avoided to the greatest extent possible.

The impacts to channel/riparian processes should be limited by reducing sedimentation into streams. If the fire management activities are likely to lead to some form of erosion, proposed erosion control measures should be discussed in the EA.

Section 2.

Federal agencies have specific additional responsibilities under Section 7 of the ESA. To help you fulfill these responsibilities, we are providing an updated list of threatened (T), endangered (E) and candidate (C) species that may occur within Kane County:

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Species	Scientific Name	Status ¹
Aquarius Paintbrush	<i>Castilleja aquariensis</i>	C
Autumn Buttercup	<i>Ranunculus aestivalis</i>	E
Jones Cycladenia	<i>Cycladenia humilis</i> var. <i>jonesii</i>	T
Kodachrome Bladderpod	<i>Lesquerella tumulosa</i>	E
Maguire Daisy	<i>Erigeron maguirei</i>	T
Navajo Sedge	<i>Carex specuicola</i>	T
Siler Pincushion Cactus	<i>Pediocactus sileri</i>	T
Ute Ladies'-tresses	<i>Spiranthes diluvialis</i>	T
Welsh's Milkweed ²	<i>Asclepias welshii</i>	T
Bald Eagle ³	<i>Haliaeetus leucocephalus</i>	T
California Condor ⁴	<i>Gymnogyps californianus</i>	E
Mexican Spotted Owl ^{2,5}	<i>Strix occidentalis lucida</i>	T
Southwestern Willow Flycatcher	<i>Empidonax traillii extimus</i>	E
Western Yellow-billed Cuckoo	<i>Coccyzus americanus occidentalis</i>	C
Utah Prairie Dog	<i>Cynomys parvidens</i>	T

¹ Candidate species have no legal protection under the Endangered Species Act. However, these species are under active consideration by the Service for addition to the Federal List of Endangered and Threatened Species and may be proposed or listed during the development of the proposed project.

² Critical habitat designated in this county.

³ Wintering populations (only four known nesting pairs in Utah).

⁴ Experimental nonessential population.

⁵ Nests in this county of Utah.

The proposed action should be reviewed and a determination made if the action will affect any listed species or their critical habitat. If it is determined by the Federal agency, with the written concurrence of the Service, that the action is not likely to adversely affect listed species or critical habitat, the consultation process is complete, and no further action is necessary.

Formal consultation (50 CFR 402.14) is required if the Federal agency determines that an action is "likely to adversely affect" a listed species or will result in jeopardy or adverse modification of critical habitat (50 CFR 402.02). Federal agencies should also confer with the Service on any action which is likely to jeopardize the continued existence of any proposed species or result in the destruction or adverse modification of proposed critical habitat (50 CFR 402.10). A written request for formal consultation or conference should be submitted to the Service with a completed biological assessment and any other relevant information (50 CFR 402.12).

Candidate species have no legal protection under the Endangered Species Act (ESA). Candidate species are those species for which we have on file sufficient information to support issuance of a proposed rule to list under the ESA. Identification of candidate species can assist environmental planning efforts by providing advance notice of potential listings, allowing resource managers to alleviate threats and, thereby, possibly remove the need to list species as endangered or threatened. Even if we subsequently list this candidate species, the early notice provided here could result in fewer restrictions on activities by prompting candidate conservation measures to alleviate threats to this species.

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Only a Federal agency can enter into formal Endangered Species Act (ESA) section 7 consultation with the Service. A Federal agency may designate a non-Federal representative to conduct informal consultation or prepare a biological assessment by giving written notice to the Service of such a designation. The ultimate responsibility for compliance with ESA section 7, however, remains with the Federal agency.

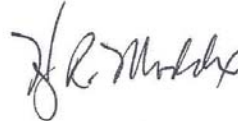
- Your attention is also directed to section 7(d) of the ESA, as amended, which underscores the requirement that the Federal agency or the applicant shall not make any irreversible or irretrievable commitment of resources during the consultation period which, in effect, would deny the formulation or implementation of reasonable and prudent alternatives regarding their actions on any endangered or threatened species.

Please note that the peregrine falcon which occurs in all counties of Utah was removed from the federal list of endangered and threatened species per Final Rule of August 25, 1999 (64 FR 46542). Protection is still provided for this species under authority of the Migratory Bird Treaty Act which makes it unlawful to pursue, hunt, take, capture, or kill migratory birds, their parts, nests, or eggs (16 U.S.C. 703-712). When taking of raptors or other migratory birds is determined by the applicant to be the only alternative, application for federal and state permits must be made through the appropriate authorities. For take of raptors; nests occupied by eggs or nestlings; nests still essential to the survival of the juvenile bird; nestlings; or eggs, Migratory Bird Permits pursuant to 50 CFR parts 13 and 21 must be obtained through the Service's Migratory Bird Permit Office in Denver at (303) 236-8171

The following is a list of species that occur within the counties that the project area lies within and are managed under Conservation Agreements/Strategies. Conservation Agreements are voluntary cooperative plans among resource agencies that identify threats to a species and implement conservation measures to proactively conserve and protect species in decline. Threats that warrant a species listing as a sensitive species by state and federal agencies and as threatened or endangered under the ESA should be significantly reduced or eliminated through implementation of the Conservation Agreement. Project plans should be designed to meet the goals and objectives of these Conservation Agreements.

Species	Scientific Name
Aquarius Paintbrush	<i>Castilleja aquariensis</i>
Arizona Willow	<i>Salix arizonica</i>
Colorado River Cutthroat Trout	<i>Oncorhynchus clarki pleuriticus</i>

We appreciate the opportunity to provide these comments. If you need further assistance, please contact Bekee Megown, Fish and Wildlife Biologist, at the letterhead address or (801) 975-3330 ext. 146.



Appendix E USFWS Coordination

FEDERALLY LISTED AND PROPOSED (P) ENDANGERED (E), THREATENED (T) AND CANDIDATE9 (C) SPECIES AND HABITAT IN UTAH BY COUNTY As of May 2004			
COUNTY	Species	Scientific Name	Status
GARFIELD			
PLANTS	Aquarius Paintbrush	Castilleja aquariensis	C
	Autumn Buttercup	Ranunculus aestivalis	E
	Jones Cycladenia	Cycladenia humilis var. jonesii	T
	Maguire Daisy	Erigeron maguirei	T
	Ute Ladies'-tresses	Spiranthes diluvialis	T
FISH	Bonytail4,10	Gila elegans	E
	Colorado Pikeminnow4,10	Ptychocheilus lucius	
	Humpback Chub4,10	Gila cypha	E
	Razorback Sucker4,10	Xyrauchen texanus	E
BIRDS	Bald Eagle3	Haliaeetus leucocephalus	T
	California Condor7	Gymnogyps californianus	E
	Mexican Spotted Owl1,4	Strix occidentalis lucida	T
	Southwestern Willow Flycatcher	Empidonax traillii extimus	E
	Western Yellow-billed Cuckoo	Coccyzus americanus occidentalis	C
Mammals	Utah Prairie Dog	Cynomys parvidens	T
KANE			
PLANTS	Jones Cycladenia	Cycladenia humilis var. jonesii	T
	Kodachrome Bladderpod	Lesquerella tumulosa	E
	Navajo Sedge	Carex specuicola	T
	Siler Pincushion Cactus	Pediocactus sileri	T
	Welsh's Milkweed4	Asclepias welshii	T
SNAIL	Kanab Ambersnail5	Oxyloma haydeni kanabensis	E
INSECT	Coral Pink Sand Dunes Tiger Beetle	Cincindela limbata albissima	C

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FISH	Colorado Pikeminnow ^{4,10}	<i>Ptychocheilus lucius</i>	E
	Razorback Sucker ^{4,10}	<i>Xyrauchen texanus</i>	E
BIRDS	Bald Eagle ³	<i>Haliaeetus leucocephalus</i>	T
	California Condor ⁷	<i>Gymnogyps californianus</i>	E
	Mexican Spotted Owl ^{1,4}	<i>Strix occidentalis lucida</i>	T
	Southwestern Willow Flycatcher	<i>Empidonax traillii extimus</i>	E
	Western Yellow-billed Cuckoo	<i>Coccyzus americanus occidentalis</i>	C
Mammals	Utah Prairie Dog	<i>Cynomys parvidens</i>	T

1 Nests in this county of Utah.

3 Wintering populations (only five known nesting pairs in Utah).

4 Critical habitat designated in this county.

7 Experimental nonessential population.

9 Candidate species have no legal protection under the Endangered Species Act. However, these species are under active consideration by the Service for addition to the Federal List of Endangered and Threatened Species and may be proposed or listed during the development of the proposed project.

10 Water depletions from any portion of the occupied drainage basin are considered to adversely affect or adversely modify the critical habitat of the endangered fish species, and must be evaluated with regard to the criteria described in the pertinent fish recovery programs.

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Appendix F

Bryce Canyon National Park Wildlife List (Amphibians, Reptiles, Mammals)

***Habitat**

J – Utah Juniper – Pinyon Pine Woodland; lower elevations below the rim.

P – Ponderosa Pine Forest – mainly between 7,500 and 8,500 feet.

S – Black Sagebrush Meadows – mainly between 7,500 and 8,500 feet.

F – White Fir Forest – southern end of the park above 8,500 feet.

C – Cliffs and breaks along the rim.

W – Water areas – primarily outside of the park.

V – Found in the vicinity of the park – not usually found within the park.

M – Multiple Habitats.

N/A – Accidentals (Only 1 or 2 sightings since 1920s)

Frequency

a – abundant: Very likely to be seen in its habitat in the proper season

c – common: Seen on a regular basis in its habitat in the proper season.

u – uncommon: Seen infrequently in its habitat in the proper season.

r – rare: A few are noted, but not every year.

Common Name	Scientific Name	Habitat/Area*	Frequency
Amphibians			
Great Basin Spadefoot Toad	<i>Spea intermontana</i>	Swamp Canyon and near springs	c
Northern Leopard Frog	<i>Rana pipiens</i>	Swamp Canyon	c
Tiger Salamander	<i>Ambystoma tigrinum</i>	Swamp Canyon and in springs	c
Woodhouse's Toad	<i>Bufo woodhousei</i>	Above and below the rim	c
Reptiles			
Great Basin Gopher Snake	<i>Pituophis melanoleucus deserticolor</i>	Above and below the rim	c
Great Basin Rattlesnake	<i>Crotalus viridis lutosus</i>	Above and below the rim	c
Great Basin Skink	<i>Eumeces skiltonianus utahensis</i>	Below the rim	r
Mountain Short-horned Lizard	<i>Phrynosoma douglassi</i>	Above and below the rim	a
Northern Plateau Lizard	<i>Sceloporus undulates elongatus</i>	Below the rim	u
Northern Sagebrush Lizard	<i>Sceloporus graciosus</i>	Below the rim	c
Side-blotched Lizard	<i>Uta stansburiana</i>	Below the rim and in Tropic area	c
Spotted Night Snake	<i>Hypsiglena torquata</i>	Below the rim and in canyon mouths	u
Striped Whipsnake	<i>Masticophis taeniatus</i>	Below the rim and in Tropic area	c
Tree Lizard	<i>Urosaurus ornatus</i>	Below the rim	c
Wandering Garter Snake	<i>Thamnophis elegans vagrans</i>	Below the rim	c
Mammals			
Badger	<i>Taxidea taxus</i>	M	u
Beaver	<i>Castor canadensis</i>	W	u
Big Brown Bat	<i>Eptesicus fuscus</i>	M	c
Black Bear	<i>Ursus americanus</i>	M	r
Black-tailed Jackrabbit	<i>Lepus californicus</i>	M	c
Bobcat	<i>Lynx rufus</i>	M	u
Brush Mouse	<i>Peromyscus boylii</i>	J	c
Bushy-tailed Woodrat	<i>Neotoma cinerea</i>	J/C	u

Appendix F
Bryce Canyon National Park Wildlife List
(Amphibians, Reptiles, Mammals)

Common Name	Scientific Name	Habitat/Area*	Frequency
California Myotis	<i>Myotis californicus</i>	M	u
Canyon Mouse	<i>Peromyscus crinitus</i>	J	u
Cliff Chipmunk	<i>Eutamias dorsalis</i>	J/C	u
Coyote	<i>Canis latrans</i>	M	c
Deer Mouse	<i>Peromyscus maniculatus</i>	M	a
Desert Cottontail	<i>Sylvilagus audubonii</i>	J/S	u
Desert Woodrat	<i>Neotoma lepida</i>	J	u
Dusky (Montane) Shrew	<i>Sorex monticolus</i>	S/W	c
Elk	<i>Cervus elaphus</i>	V	c
Ermine	<i>Mustela erminea</i>	N/A	r
Fringed Myotis	<i>Myotis thysanodes</i>	M	u
Gray Fox	<i>Urocyon cinereoargenteus</i>	M	u
Great Basin Pocket Mouse	<i>Perognathus parvus</i>	J	u
Golden-mantled Ground Squirrel	<i>Spermophilus lateralis</i>	M	a
Hoary Bat	<i>L. cinereus</i>	N/A	r
House Mouse	<i>Mus musculus</i>	V	u
Least Chipmunk	<i>Eutamias minimus</i>	M	c
Little Brown Myotis	<i>Myotis lucifugus</i>	M	u
Long-eared Myotis	<i>Myotis evotis</i>	M	c
Long-legged Myotis	<i>Myotis volans</i>	M	c
Long-tailed Vole	<i>Microtus longicaudus</i>	M	c
Long-tailed Weasel	<i>Mustela frenata</i>	M	u
Mountain Cottontail	<i>Sylvilagus nuttallii</i>	P/F	u
Mountain Lion	<i>Felis concolor</i>	M	u
Mountain Vole	<i>Microtus montanus</i>	S	c
Mule Deer	<i>Odocoileus hemionus</i>	M	a
Muskrat	<i>Ondatra zibethicus</i>	V	u
Northern Flying Squirrel	<i>Glaucomys sabrinus</i>	F	u
Northern Grasshopper Mouse	<i>Onychomys leucogaster</i>	N/A	r
Northern Pocket Gopher	<i>Thomomys talpoides</i>	P/S	c
Ord's Kangaroo Rat	<i>Dipodomys ordii cupidinus</i>	V	r
Pallid Bat	<i>Antroxous pallidus</i>	M	u
Pinyon Mouse	<i>Peromyscus truei</i>	J	c
Porcupine	<i>Erethizon dorsatum</i>	M	u
Pronghorn	<i>Antilocapra americana</i>	V	c
Red Fox	<i>Vulpes vulpes</i>	M	u
Red Squirrel	<i>Tamiasciurus hidsonicus</i>	F	c
Ringtail	<i>Bassariscus astutus</i>	C	u
Rock Squirrel	<i>Spermophilus variegatus</i>	M	c
Sagebrush Vole	<i>Lagurus curtatus</i>	V	u
Silver-haired Bat	<i>Lasionycteris noctivagans</i>	M	c
Small-footed Myotis	<i>Myotis subulatus</i>	M	u
Spotted Bat	<i>Euderma maculate</i>	M	r
Spotted Skunk	<i>Spilogale putorius</i>	M	r
Striped Skunk	<i>Mephitis mephitis</i>	M	c
Uinta Chipmunk	<i>Eutamias umbrinus</i>	M	a
Utah Prairie Dog	<i>Cynomys parvidens</i>	S	c
Western Harvest Mouse	<i>Reithrodontomys megalotis</i>	M	u
White-tailed Antelope Squirrel	<i>Ammospermophilus leucurus</i>	N/A	r

Appendix F
Bryce Canyon National Park Wildlife List
(Amphibians, Reptiles, Mammals)

Common Name	Scientific Name	Habitat/Area*	Frequency
White-tailed Jackrabbit	<i>Lepus townsendii</i>	P/S r	
Yellow-bellied Marmot	<i>Marmota flaviventris</i>	C	u

Source: NPS, Wildlife Checklist provided to park visitors

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Appendix G

Bryce Canyon National Park Bird List

The following bird list is arranged alphabetically by family and scientific name.

Habitats

J – Utah Juniper – Pinyon Pine Woodland;
lower elevations below the rim.

P – Ponderosa Pine Forest – mainly between
7,500 and 8,500 feet.

S – Black Sagebrush Meadows – mainly
between 7,500 and 8,500 feet.

F – White Fir Forest – southern end of the park
above 8,500 feet.

C – Cliffs and breaks along the rim.

W – Water areas – primarily outside of the
park.

M – Multiple Habitats.

Frequency

a – abundant: Very likely to be seen in its
habitat in the proper season

c – common: Seen on a regular basis in its
habitat in the proper season.

u – uncommon: Seen infrequently in its habitat
in the proper season.

Status

PR – Permanent resident

SR – Summer resident

WR – Winter resident

M -Migrant

Family / Common Name	Scientific Name	Habitat	Frequency	Status
Family ACCIPITRIDAE – Hawks & Eagles				
Cooper's Hawk	<i>Accipiter cooperii</i>	M	c	PR
Northern Goshawk	<i>A. gentiles</i>	P/F	u	PR
Sharp-shinned Hawk	<i>A. striatus</i>	M	u	PR
Golden Eagle	<i>Aquila chrysaetos</i>	S/C	c	PR/M
Red-tailed Hawk	<i>Buteo jamaicensis</i>	M	c	PR
Rough-legged Hawk	<i>B. lagopus</i>	J/S	u	WR
Swainson's Hawk	<i>B. swainsoni</i>	J/W	u	SR
Northern Harrier	<i>Circus cyaneus</i>	S/W	u	PR
Bald Eagle	<i>Haliaeetus leucocephalus</i>	C/W	c	WR/M
Family AEGITHALIDAE – Bushtits				
Common Bushtit	<i>Psaltirparus minimus</i>	J	u	PR
Family ALAUDIDAE – Larks				
Horned Lark	<i>Eremophila alpestris</i>	S	c	PR
Family ALCEDINIDAE – Kingfishers				
Belted Kingfisher	<i>Ceryle alcyon</i>	W	c	SR
Family APODIDAE – Swifts				
White-throated Swift	<i>Aeronautes saxatalis</i>	C	a	SR
Family ANTATIDAE – Swans, Geese & Ducks				
Northern Pintail	<i>Anas acuta</i>	W	u	PR
American Widgeon	<i>A. Americana</i>	W	u	WR/M
Shoveler	<i>A. clypeata</i>	W	u	M
Green-winged Teal	<i>A. crecca</i>	W	u	PR
Cinnamon Teal	<i>A. cyanoptera</i>	W	u	SR/M
Blue-winged Teal	<i>A. discors</i>	W	u	SR/M
Mallard	<i>A. platyrhynchos</i>	W	c	PR
Canada Goose	<i>Branta Canadensis</i>	W	c	WR/M
Tundra Swan	<i>Cygnus columbianus</i>	W	u	WR/M
Ruddy Duck	<i>Oxyura jamaicensis</i>	W	u	SR/M
Family ARDEIDAE – Herons				
Great Blue Heron	<i>Ardea herodias</i>	W	u	PR/M
Family CAPRIMULGIDAE – Night Jars				
Common Nighthawk	<i>Chordeiles minor</i>	J/W	u	SR
Family CATHARTIDAE – American Vultures				
Turkey Vulture	<i>Cathartes aura</i>	M	u	SR

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Bryce Canyon National Park Bird List

Family / Common Name	Scientific Name	Habitat	Frequency	Status
Family CETHIIDAE – Creepers				
Brown Creeper	<i>Certhia americana</i>	P/F	c	PR
Family CHARADRIIDAE – Killdeer				
Killdeer	<i>Charadrius vociferous</i>	W	u	SR
Family COLUMBIDAE – Pigeons & Doves				
Mourning Dove	<i>Zenaida macroura</i>	S/W	c	PR
Family CORVIDAE – Jays, Magpies & Ravens				
Scrub Jay	<i>Aphelocoma coerulescens</i>	J	u	PR
Common Raven	<i>Corvus corax</i>	M	a	PR
Steller's Jay	<i>Cyanocitta stelleri</i>	P	a	PR
Pinyon Jay	<i>Gymnorhinus cyanocephalus</i>	J	u	PR
Clark's Nutcracker	<i>Nucifraga columbiana</i>	P/F	a	PR
Gray Jay	<i>Perisoreus canadensis</i>	P/F	u	WR
Black-billed Magpie	<i>Pica pica</i>	W	c	PR
Barn Swallow	<i>H. rustica</i>	W	u	SR
Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	W	u	SR
Tree Swallow	<i>Tachycineta bicolor</i>	W	u	SR
Violet-green Swallow	<i>T. thalassina</i>	P/C	a	SR
Family EMBERIZIDAE – Warblers, Blackbird & Orioles				
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	W	c	SR
Black-throat Sparrow	<i>Amphispiza bilineata</i>	J	u	SR
Lark Sparrow	<i>Chondestes grammacus</i>	J/W	u	SR
Yellow-rumped Warbler	<i>Dendroica coronata</i>	M	c	SR
Grace's Warbler	<i>D. graciae</i>	P	u	SR
Black-throated Gray Warbler	<i>D. nigrescens</i>	J	u	SR
Yellow Warbler	<i>D. petechia</i>	W	u	SR
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	M	c	SR
Yellow-breasted Chat	<i>Icteria virens</i>	W	u	SR
Northern (Bullock's) Oriole	<i>I. galbula</i>	W	u	SR
Dark-eyed Junco	<i>Junco hyemalis</i>	M	a	PR
Lincoln's Sparrow	<i>Melospiza lincolni</i>	S/W	u	SR
Song Sparrow	<i>M. melodia</i>	W	u	PR
Brown-headed Cowbird	<i>Molothrus ater</i>	M	u	SR
MacGillivray's Warbler	<i>Oporornis tolmiei</i>	W	u	SR
Lazuli Bunting	<i>Passerina amoena</i>	J/W	u	SR
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>	M	u	SR
Green-tailed Towhee	<i>Pipilo chlorurus</i>	J/P	u	SR
Rufous-sided Towhee	<i>P. erythrophthalmus</i>	J	u	SR
Western Tanager	<i>Piranga ludoviciana</i>	M	c	SR
Vesper Sparrow	<i>Pooecetes gramineus</i>	S	c	SR
Brewer's Sparrow	<i>Spizella breweri</i>	S	u	SR
Chipping Sparrow	<i>S. passerine</i>	M	a	SR
Western Meadowlark	<i>Sturnella neglecta</i>	S/W	u	SR
Virginia's Warbler	<i>Vermivora virginiae</i>	J	c	SR
Wilson's Warbler	<i>Wilsonia pusilla</i>	W	u	SR
Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>	W	u	SR
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	M	u	SR
Family FALCONIDAE – Falcons				
Prairie Falcon	<i>Falco mexicanus</i>	S/C	u	SR/M
Peregrine Falcon	<i>F. peregrinus</i>	C/W	c	SR/M
American Kestrel	<i>F. sparverius</i>	M	c	

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Bryce Canyon National Park Bird List

Family / Common Name	Scientific Name	Habitat	Frequency	Status
Family FRINGILLIDAE – Finches				
Pine Siskin	<i>Carduelis pinus</i>	M	c	PR
Lesser Goldfinch	<i>C. psaltria</i>	J	u	PR
American Goldfinch	<i>C. tristis</i>	J/W	u	WR
Cassin's Finch	<i>Carpodacus cassinii</i>	P	u	PR
House Finch	<i>C. mexicanus</i>	M	c	SR
Evening Grosbeak	<i>Coccothraustes vespertinus</i>	M	u	SR
Rosy Finch	<i>Leucosticte arctoa</i>	M	u	WR
Red Crossbill	<i>Loxia curvirostra</i>	P	c	PR
Family HIRUNDINIDAE – Swallows				
Cliff Swallow	<i>Hirundo pyrrhonota</i>	C/W	u	SR
Barn Swallow	<i>H. rustica</i>	W	u	SR
Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	W	u	SR
Tree Swallow	<i>Tachycineta bicolor</i>	W	u	SR
Violet-green Swallow	<i>T. thalassina</i>	P/C	a	SR
Family LANIIDAE – Shrikes				
Loggerhead Shrike	<i>Lanius ludovicianus</i>	M	u	PR
Family MIMIDAE – Thrashers				
Sage Thrasher	<i>Oreoscoptes montanus</i>	S	u	SR
Family MUSCICAPIDAE – Thrushes				
Hermit Thrush	<i>Catharus guttatus</i>	P/F	c	SR
Townsend's Solitaire	<i>Myadestes townsendi</i>	M	c	PR
Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>	J	u	SR
Ruby-crowned Kinglet	<i>Regulus calendula</i>	F	u	SR
Mountain Bluebird	<i>Sialia currucoides</i>	M	c	SR
Western Bluebird	<i>S. mexicana</i>	P	c	SR
Robin	<i>Turdus migratorius</i>	M	a	PR
Family PARIDAE – Chickadees & Titmice				
Black-capped Chickadee	<i>Parus atricapillus</i>	J/P	u	SR
Mountain Chickadee	<i>P. gambeli</i>	J/P	a	PR
Plain Titmouse	<i>P. inornatus</i>	J/P	u	PR
Family PASSERIDAE – Weavers				
House Sparrow	<i>Passer domesticus</i>	W	c	PR
Family PHASIANIDAE – Grouse & Pheasants				
Blue Grouse	<i>Dendragapus obscurus</i>	F	c	PR
Wild Turkey	<i>Meleagris gallopavo</i>	M	u	PR
Ring-necked Pheasant	<i>Phasianus colchicus</i>	W	u	PR
Family PICIDAE – Woodpeckers				
Northern (Red-shafted) Flicker	<i>Colaptes auratus</i>	J/P	a	PR
Hairy Woodpecker	<i>Picoides villosus</i>	M	c	PR
Red-naped Sapsucker	<i>Sphyrapicus nuchalis</i>	J/P	u	SR/M
Williamson's Sapsucker	<i>S. thyroideus</i>	P	u	SR
Family PODICIPEDIDAE - Grebes				
Eared Grebe	<i>Podiceps nigricollis</i>	W	u	SR/M
Family RALLIDAE – Coots				
American Coot	<i>Fulica Americana</i>	W	c	PR
Family RECURVIROSTRIDAE – Stilts & Avocets				
Black-necked Stilt	<i>Himantopus mexicanus</i>	W	u	SR
Family SCOLOPACIDAE – Sandpipers				
Spotted Sandpiper	<i>Actitis macularia</i>	W	u	SR
Common Snipe	<i>Gallinago gallinago</i>	W	u	PR
Wilson's Phalarope	<i>Phalaropus tricolor</i>	W	u	M

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Bryce Canyon National Park Bird List

Family / Common Name	Scientific Name	Habitat	Frequency	Status
Family SITTIDAE – Nuthatches				
Red-breasted Nuthatch	<i>Sitta canadensis</i>	F	c	PR
White-breasted Nuthatch	<i>S. carolinensis</i>	M	c	PR
Pygmy Nuthatch	<i>S. pygmaea</i>	P	c	PR
Family STRIGIDAE – Typical Owls				
Great horned Owl	<i>Bubo virginianus</i>	M	c	PR
Flammulated Owl	<i>Otus flammeolus</i>	P/F	u	PR
Family STURNIDAE – Starlings				
Starling	<i>Sturnus vulgaris</i>	M	u	PR
Family TROCHILIDAE – Hummingbirds				
Black-chinned Hummingbird	<i>Archilochus alexandri</i>	J	c	SR
Broad-tailed Hummingbird	<i>Selasphorus platycercus</i>	M	c	SR
Rufous Hummingbird	<i>Selasphorus rufus</i>	M	u	SR
Family TROGLODYTIDAE – Wrens				
Canyon Wren	<i>Cartherpes mexicanus</i>	C	u	SR
Rock Wren	<i>Salpinctes obsoletus</i>	C	u	SR
House Wren	<i>Troglodytes aedon</i>	P/W	u	SR
Family TYRANNIDAE – Flycatchers				
Olive-sided Flycatcher	<i>Contopus borealis</i>	P	u	SR
Western Wood Pewee	<i>C. sordidulus</i>	P	c	SR
Western Flycatcher	<i>Empidonax difficilis</i>	P	c	SR
Hammond's Flycatcher	<i>E. hammondii</i>	P/F	c	SR
Dusky Flycatcher	<i>E. oberholseri</i>	J/P	c	SR
Gray Flycatcher	<i>E. wrightii</i>	J	c	SR
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>	J	u	SR
Say's Phoebe	<i>Sayornis saya</i>	M	c	SR/M
Western Kingbird	<i>Tyrannus verticalis</i>	J/W	u	SR
Family VIREONIDAE – Vireos				
Warbling Vireo	<i>Vireo gilvus</i>	J/P	u	SR
Solitary Vireo	<i>V. solitarius</i>	J/P	c	SR
Grey Vireo	<i>V. vicinior</i>	J	u	SR

Source: NPS, Bird Checklist provided to park visitors