

Vegetation Management Plan and Environmental Assessment

National Park Service
U.S. Department of the Interior
Bryce Canyon National Park



April 2010

Vegetation Management Plan

Environmental Assessment

Summary

The structure, function, and overall integrity of the plant communities at Bryce Canyon National Park are being altered partly due to the spread of invasive vegetation, changes in fire regime, and disturbance of native vegetation from park development projects and visitor use. Managing vegetation is a serious challenge facing the park. The Vegetation Management Plan and Environmental Assessment outlines alternative vegetation management strategies that would help preserve, protect, and restore the natural abundance, diversity, and distribution of native vegetation.

This environmental assessment evaluates three alternatives: a No Action Alternative, and two action alternatives. The No Action alternative describes an approach to vegetation management that does not include a comprehensive invasive plant treatment plan with limited monitoring and restoration efforts. Alternative II would use a full range of integrated pest management techniques and implement comprehensive sensitive plant management and native plant restoration programs. Alternative III is similar to Alternative II except it eliminates the potentially controversial use of chemical and biological methods for control of invasive vegetation.

This environmental assessment has been prepared in compliance with the National Environmental Policy Act to provide the decision-making framework that 1) analyzes a reasonable range of alternatives to meet objectives of the proposal, 2) evaluates potential issues and impacts to the resources and values of Bryce Canyon National Park, and 3) identifies mitigation measures to lessen the degree or extent of these impacts. Resource topics that are included in this document because the resultant impacts may be greater-than-minor include: Soils, Vegetation, Wetlands, Special Status Species, Wilderness Character, Park Operations, and Cultural Landscapes. All other resource topics have been dismissed because the project would result in negligible or minor effects to those resources. No major effects are anticipated as a result of this project. Public scoping was conducted to assist with the development of this document.

Public Comment

If you wish to comment on the environmental assessment, you may mail comments to the name and address below or post comments online at <http://parkplanning.nps.gov/>. This environmental assessment will be on public review for 30 days. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so. We will make all submissions from organizations, businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses available for public inspection in their entirety.

Jacque Lavelle, Acting Superintendent
Bryce Canyon National Park
P.O. Box 640201

TABLE OF CONTENTS

PURPOSE AND NEED	1
Introduction	1
Background	1
Purpose and Need	4
Relationship to Other Plans and Policies	4
Appropriate Use	4
Public Scoping	5
Impact Topics Retained for Further Analysis	5
Impact Topics Dismissed From Further Analysis	7
Alternatives Considered	11
Alternative Summaries	14
Mitigation Measures Specific to Alternative II	15
Mitigation Measures Common to Alternatives II & III	16
Environmentally Preferred Alternative	18
ENVIRONMENTAL CONSEQUENCES	20
Soils	21
Vegetation	24
Wetlands	28
Special-Status Species	31
Wilderness Character	39
Park Operations	44
Cultural Landscapes	46
Unacceptable Impacts	48
Impairment	49
CONSULTATION AND COORDINATION	51
Public Involvement Summary	51
Agency Consultations	51
Environmental Assessment Review	51
List of Recipients	52
List of Preparers	54
REFERENCES	55
APPENDIX A: NON-NATIVE PLANT SPECIES OF BRYCE CANYON NATIONAL PARK	57
APPENDIX B: 10 STEPS FOR INVASIVE PLANT MANAGEMENT	59

APPENDIX C: PREVENTING THE INTRODUCTION AND SPREAD OF INVASIVE PLANTS	64
---	----

APPENDIX D: MINIMUM REQUIREMENTS DECISION GUIDE.....	75
--	----

TABLES

Table 1: Alternative Summary and Plan Objectives	15
Table 2: Environmental Impact Summary by Alternative	19
Table 3: Federally Listed Plant Species*	31
Table 4: Sensitive Plant Species of Bryce Canyon National Park ¹	32
Table 5: Federally Listed and Candidate Animal Species	35

LIST OF MAPS

Map A: Location map of Bryce Canyon National Park, UT.....	2
Map B: Vegetation of Bryce Canyon.....	25
Map C: Recommended Wilderness.....	41

PURPOSE AND NEED

Introduction

The area known as Bryce Canyon National Park (BRCA) was set aside as a national monument in 1923. In 1924, Bryce Canyon National Monument was declared Utah National Park. An act of congress in 1928 increased the amount of protected land to double what was already protected by the national park (now 35,835 acres). This addition of land was accompanied by another name change and Bryce Canyon National Park was officially designated on February 25, 1928. The national monument, and later park, was established to protect the spectacular geologic structures known as hoodoos and other natural and cultural resources.

Bryce Canyon National Park is located on the western edge of the Colorado Plateau (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. The climate is characterized by cold snowy winters and cool summers with consistent monsoonal moisture in July and August.

Most of the land surrounding BRCA 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.

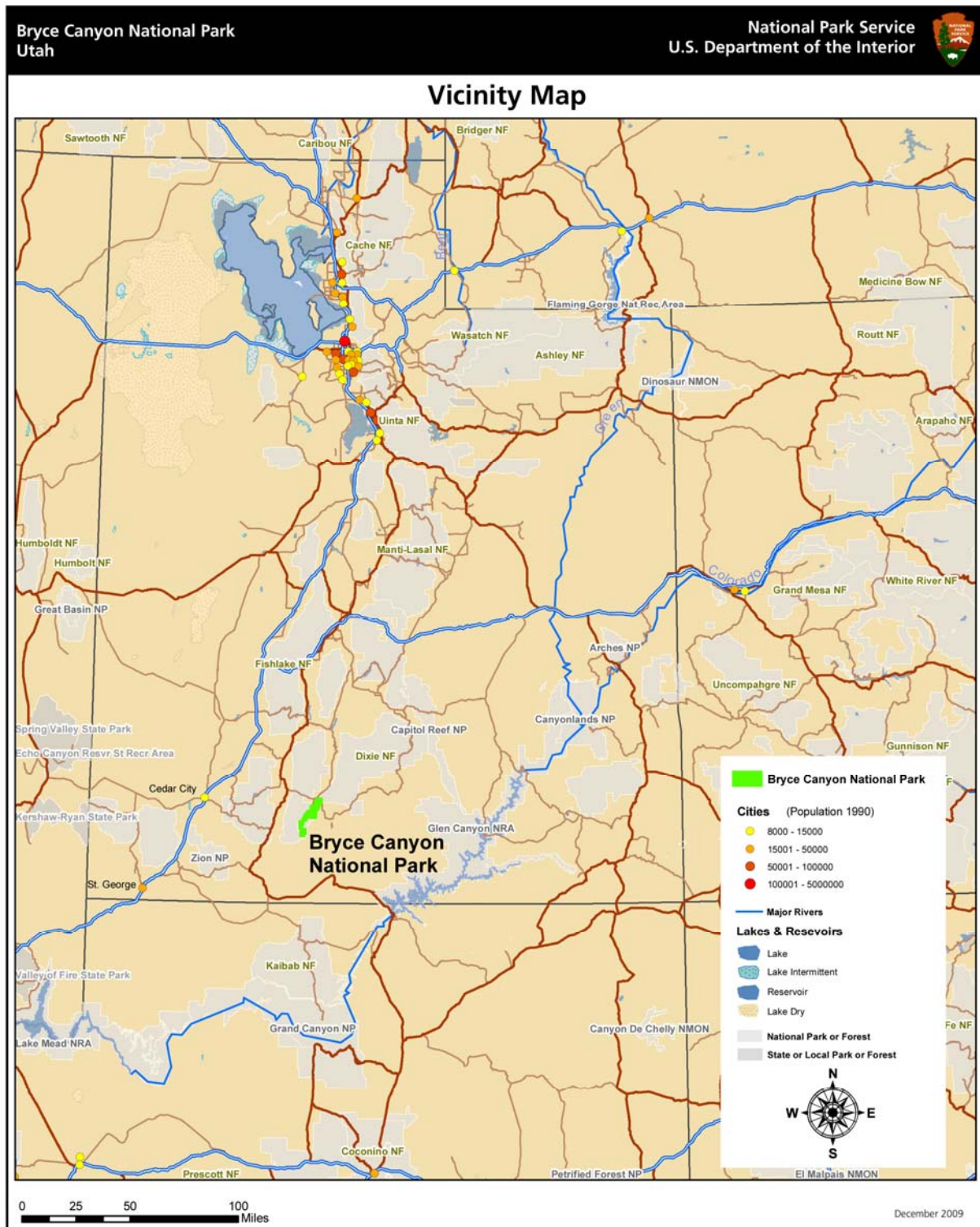
The purpose of this environmental assessment is to examine the environmental impacts associated with the proposal to implement a vegetation management plan to protect and restore native vegetative communities. This environmental assessment has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, regulations of the Council on Environmental Quality (CEQ) (40 CFR 1508.9), and the National Park Service (NPS) Director's Order (DO)-12 (*Conservation Planning, Environmental Impact Analysis, and Decision-making*).

Background

Bryce Canyon has an elevation range of 6,850 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 change in elevation and topography, as well as the geology, soils, and water availability within the park. Pinyon Pine and Juniper woodlands are predominate at lower elevations. Ponderosa Pine forest is found on the plateau, with Fir-Spruce-Aspen stands thriving at the higher elevations. Meadow habitat occurs amongst the Ponderosa Pine forest along drainages, primarily in the northern end of the park.

The diverse communities of plants present in BRCA are being altered from a variety of sources. Five repeat surveys of vegetation transects conducted over a 50 year period at BRCA show changes in density, dominance, and abundance of plant species (Ironsides et al. 2008). Alternations in vegetation may be due in part to changes in fire regimes, introduction and spread of invasive species, human disturbance of native and sensitive plant species, and other possible factors such as climate change and pollution. The National Park Service is directed to maintain and restore, to the extent possible, the natural conditions and processes in the park, including natural abundance, diversity, and genetic and ecological integrity of native vegetation. This directive is reflected in Bryce Canyon's Government Performance Reporting Act

Map A: Location map of Bryce Canyon National Park, UT



(GPRA) that includes Park goals pertaining to disturbed land restoration, invasive plant control, and desired condition of natural landscapes.

Fire

Fire has a significant impact on vegetation by influencing nutrient cycling, water availability, plant composition and diversity, and fuel accumulation. Historically, fire has played an important role in the ecological development of the landscape in and around Bryce Canyon. Naturally occurring fire on this landscape periodically and, in some vegetation types, frequently thinned vegetation. Over time, continued suppression of natural fire has altered the landscape, threatening the natural functions of healthy ecosystems.

The BRCA Fire Management Plan was approved in 2005. The Fire Management Plan allows for the implementation of the full range of fire management activities and has been approved for BRCA through a separate environmental assessment (FONSI signed 3/14/05). Fire is currently used to manage hazardous fuels, stimulate fire dependent plant communities, restore natural ecosystems that have been modified by prolonged fire exclusion, reduce non-native plants, and restore vegetative composition. To determine if fire and resource management objectives are being met, a Wildland and Prescribed Fire Monitoring Plan has been implemented for the park (NPS 2004).

Invasive Vegetation

Of the 587 vascular plant taxa confirmed or reliably reported as occurring within BRCA, 60 species (10.2%) are introduced (Fertig and Topp 2009) and are listed in Appendix A. Invasive plants compete with native vegetation for space, light, water, and nutrients. They alter the structure and function of many plant communities, often in a negative way that reduces habitat quality.

Increasing efforts have been made to reduce/eradicate invasive vegetation within the park. Over the past four years approximately 10 acres or more have been treated for invasive vegetation annually. Treatments have included mechanical control and chemical herbicide application. However, compliance was not completed for these activities.

Restoration and Disturbance Management

Vegetation and soil disturbances have occurred in many areas of BRCA resulting from development and maintenance of park facilities, visitor use, and invasive plant management. High visitation at BRCA (approximately 1.5 million visitors per year) inevitably leads to high concentrations of people at overlooks, along trails, and at campgrounds. This traffic can lead to the trampling and destruction of native vegetation and the compaction or erosion of the soil around these recreational sites.

In the past steps have been taken to restore some social trails and sites disturbed as a result of construction projects. Restoration techniques include loosening of the soil, seeding, planting, and restricting access. Restoring native vegetation on disturbed sites is also a method of managing invasive vegetation, as it reduces the opportunity for non-native plants to become established.

Sensitive Plants

Although the park does not have any plant species that are federally listed, BRCA does provide unique habitat for many narrowly restricted endemic plants. The Annotated Checklist of the Vascular Flora of Bryce Canyon National Park (Fertig and Topp 2009) identifies 51 plant taxa of conservation concern, of which 21 are listed as sensitive (*Environmental Consequences: Special Status Species* Table 4). The distribution of many of these rare plants is within the main amphitheater or in the “breaks” environment of the park.

Bryce Canyon currently does not have a plan in place to assess impacts to sensitive plant species within the park. Implementation of a conservation strategy to protect the park’s endemic plant populations is necessary to direct planning and development efforts to avoid impacts to these sensitive species.

Purpose and Need

The purpose of this planning effort is to develop a park-wide vegetation management plan to direct efforts to protect and restore native plant communities while controlling the spread of invasive vegetation within the park.

The proposed plan is needed to achieve the following:

- Preserve, protect, and restore the natural abundance, diversity, and distribution of native plant populations, including sensitive plant species.
- Minimize/mitigate the effects of human activities on native plant populations and the communities and ecosystems in which they occur.
- Eradicate, reduce, or contain infestations of known invasive plants.
- Prevent further introductions of invasive species already present in the park, as well as new species introductions.
- Establish decision-making tools and protocols that would guide treatment plan development for vegetation management activities.

Relationship to Other Plans and Policies

A Vegetation Management Plan is consistent with previous planning efforts. The General Management Plan for BRCA, completed in 1987, identifies the need to protect native vegetation from competition and possible displacement by exotic plant species. Proposed management actions include:

- “Develop and implement an exotic plant management program and begin monitoring exotic plant encroachment.”
- “Locate, map, and identify exotic plants in park and address their impact on native plant communities.”

Bryce Canyon Fire Management Plan (2005) recognizes the roll of fire in maintaining and restoring vegetation, including the use of prescribed fire treatments “to achieve vegetation management objectives that support land and resource management plans.” Controlling the spread of invasive vegetation and revegetation of disturbed soil have been mitigation measures included in many of the environmental assessments for Bryce Canyon National Park including Road System Evaluation (1990), Mossy Cave Trail Rehabilitation and Resource Protection (2006), Tropic Canyon Highway Stabilization (2006), Tropic Ditch Replacement (2006), and Paria View Rehabilitation (2007). The proposal is consistent with the objectives of NPS *Management Policies* (NPS 2006) §4.4 Biological Resource Management and §4.5 Fire Management.

Appropriate Use

Section 1.5 of *Management Policies* (NPS 2006) directs that the National Park Service must ensure that park uses that are allowed would not cause impairment of, or unacceptable impacts on, park resources and values. A new form of park use may be allowed within a park only after a determination has been made in the professional judgment of the park manager that it would not result in unacceptable impacts.

Section 8.1.2 of *Management Policies* (2006), *Process for Determining Appropriate Uses*, provides evaluation factors for determining appropriate uses. All proposals for park uses are evaluated for:

- consistency with applicable laws, executive orders, regulations, and policies;
- consistency with existing plans for public use and resource management;
- actual and potential effects on park resources and values;
- total costs to the service; and
- whether the public interest will be served.

Park managers must continually monitor all park uses to prevent unanticipated and unacceptable impacts.

If unanticipated and unacceptable impacts emerge, the park manager must engage in a thoughtful, deliberate process to further manage or constrain the use, or discontinue it. More information on the definition of unacceptable impacts as cited in §1.4.7.1 of *Management Policies* (NPS 2006) can be found in the *Environmental Consequences* chapter.

Appropriate management of vegetation resources is a vital component of promoting ecosystem health and diversity of BRCA. Development of appropriately timed and executed vegetation management techniques would ensure that unacceptable impacts to park resources and values would not occur. The proposed vegetation management plan is consistent with the park's general management plan and other related park plans. With this in mind, the NPS finds that development and implementation of a vegetation management plan is an acceptable use at Bryce Canyon National Park.

Public Scoping

Scoping is an early and open process to determine the breadth of environmental issues and alternatives to be addressed in an environmental assessment. Bryce Canyon National Park conducted both internal scoping with appropriate NPS staff and external scoping with the public and interested and affected groups and agencies.

Internal scoping was conducted by the Compliance Interdisciplinary Team and Resource Management staff at Bryce Canyon. This interdisciplinary process defined the purpose and need, identified potential actions to address the need, determined what the likely issues and impact topics would be, and identified the relationship, if any, of the proposed action to other planning efforts within the park. During the initial planning phase of this project, we reviewed the various approaches that Bryce Canyon has taken toward managing vegetation and the National Environmental Policy Act (NEPA) compliance for those activities.

A scoping letter describing the proposed action was prepared and mailed to the various public groups, federal and state agencies, and other potentially interested parties on January 7, 2009. American Indian tribes traditionally associated with the lands of Bryce Canyon National Park were also apprised of the proposed action on January 7, 2009. Scoping information was also posted on the National Park Service Planning, Environment, and Public Comment website (<http://parkplanning.nps.gov/>).

Comments were solicited during external scoping until February 15, 2009. One comment was received from the public expressing interest in being informed about the project. No concerns or issues were raised, and no other alternatives were proposed.

Impact Topics Retained for Further Analysis

Impact topics for this project have been identified on the basis of federal laws, regulations, and orders as well as NPS *Management Policies* (NPS 2006) and NPS staff knowledge of resources at BRCA. Impact topics that are carried forward for further analysis in this environmental assessment are those where the proposal is expected to have a measurable effect. For each of these topics, the following text describes the existing setting or baseline conditions (i.e. affected environment) within the project area. Additional information on the affected environment is located under each topic discussed in the *Environmental Consequences* chapter of this document. Some impact topics were dismissed from further consideration when the environmental effects were determined to be minor or negligible.

Soils

According to NPS *Management Policies* (NPS 2006), the NPS will preserve and protect geologic resources and features from adverse effects of human activity, while allowing natural processes to continue. These policies also state that the NPS will strive to understand and preserve the soil resources of the park and to prevent, to the extent possible, the unnatural erosion, physical removal, or contamination of the soil, or its contamination of other resources. Vegetation management practices such

as fire, native plant restoration, and control of invasive vegetation have the potential to measurably impact soil resources and will be analyzed further.

Vegetation

According to NPS *Management Policies* (NPS 2006), the NPS strives to maintain all components and processes of naturally evolving park ecosystems, including the natural abundance, diversity, and genetic and ecological integrity of the plants. Proposed vegetation management treatments could impact the productivity, composition, and density of plant communities of the park; therefore this topic will be analyzed further.

Wetlands

For regulatory purposes under the Clean Water Act, the term wetlands means "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas." Executive Order 11990 *Protection of Wetlands* requires federal agencies to avoid, where possible, adversely impacting wetlands. Further, Section 404 of the Clean Water Act authorizes the U.S. Army Corps of Engineers to prohibit or regulate, through a permitting process, discharge of dredged or fill material or excavation within waters of the United States. NPS policies for wetlands as stated in NPS *Management Policies* (NPS 2006) and DO 77-1 (*Wetlands Protection*), strive to prevent the loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. In accordance with DO 77-1, proposed actions that have the potential to adversely impact wetlands must be addressed in a Statement of Findings for wetlands. Wetlands characteristics such as plant composition may be affected; therefore this topic was retained for further analysis.

Special Status Species

The Endangered Species Act of 1973 requires examination of impacts on all federally-listed threatened, endangered, and candidate species. Section 7 of the Endangered Species Act requires all federal agencies to consult with the U.S. Fish and Wildlife Service (or designated representative) to ensure that any action authorized, funded, or carried out by the agency does not jeopardize the continued existence of listed species or critical habitats. In addition, NPS *Management Policies* (NPS 2006) and DO 77 (*Natural Resources Management Guidelines*) require the NPS to examine the impacts on federal candidate species, as well as state-listed threatened, endangered, candidate, rare, declining, and sensitive species. For the purposes of this analysis, the USFWS and the Utah Division of Natural Resources were consulted with regards to federally- and state-listed species to determine those species that could potentially occur within the park. A number of special status species (listed as Tier I, II or III under Utah's Wildlife Action Plan, UDWR 2005), including the Utah prairie dog (*Cynomys parvidens*), were determined to potentially occur in Bryce Canyon National Park. Formal consultation with the USFWS resulted in a *may affect, not likely to adversely affect* the threatened Utah prairie dog. Because of the presence of special status species within the project area, this topic was analyzed in detail.

Wilderness Character

The 1964 Wilderness Act defined wilderness as "an area where the earth and its community of life are untrammeled by man." A total of 22,325 acres (62%) of the park has been recommended as wilderness. While not yet legislatively designated, this recommended wilderness (which was proposed in 1974) is managed as wilderness in accordance with NPS *Management Policies* (NPS 2006). Vegetation management activities may impact the character of recommended wilderness, specifically untrammeled, natural, and solitude or a primitive and unconfined type of recreation; therefore this topic will be retained.

Park Operations

The proposed action would change overall park operations by directing the management of plant communities. The proposed action would affect the number of staff members at Bryce Canyon and could measurable change overall park operations including an influx in seasonal personnel, a need for dedicated

staff to supervise vegetation crews, increased coordination between park divisions, and increased contact with park visitors and field crews. Because the proposed action would involve the implementation of a new management plan at Bryce Canyon, park operations is anticipated to change in some capacity; therefore this topic will be analyzed in detail.

Cultural Landscapes

The 1966 National Historic Preservation Act as amended (NHPA, 16 USC 470 et seq.), the 1916 NPS Organic Act, and NPS planning and cultural resource guidelines call for the consideration and protection of cultural landscapes. According to DO 28 (*Cultural Resource Management Guideline*) a cultural landscape is a reflection of human adaptation and use of natural resources, and is often expressed in the way land is organized and divided, patterns of settlement, land use, system of circulation, and types of structures that are built. The character of a cultural landscape is defined by both physical materials, such as roads, buildings, walls, and vegetation, and by use reflecting cultural values and traditions. Five cultural landscapes have been identified at Bryce Canyon of which vegetation patterns are contributing. As the proposed action would alter the vegetation composition in cultural landscapes, this topic will be analyzed in further detail.

Impact Topics Dismissed From Further Analysis

Some impact topics have been dismissed from further consideration, as listed below. The rationale for dismissing these specific topics is stated for each resource.

Air Quality

The Clean Air Act of 1963 (42 USC 7401 et seq.) was established to promote public health and welfare by protecting and enhancing the nation's air quality. The act establishes specific programs that provide special protection for air resources and air quality related values associated with NPS units. Section 118 of the Clean Air Act requires a park unit to meet all federal, state, and local air pollution standards. Bryce Canyon National Park is designated a Class 1 area under the Clean Air Act. The park's air quality is among the best in the nation with occasional periods of regional haze, forest fire smoke, or widely dispersed industrial pollution.

There is the potential to cause negligible, short-term impacts to air quality from invasive plant treatments and restoration techniques, due to dust from tillage, exhaust from vegetation crew vehicles and chainsaw operation, or volatilization of herbicide. Overall, these activities could result in a negligible degradation of local air quality, but such effects would be temporary and localized and would likely dissipate rapidly. The Class I air quality designation for Bryce Canyon National Park would not be affected by any of the alternatives proposed. The use of fire would reduce air quality, potentially below federal, state, or local air quality standards. The environmental assessment on the use of fire for vegetation management has already been conducted (NPS 2005). Therefore, air quality has been dismissed as an impact topic.

Soundscape Management

In accordance with NPS *Management Policies* (NPS 2006) and DO 47 (*Sound Preservation and Noise Management*), an important component of the NPS's mission is the preservation of natural soundscapes associated with national park units. Natural soundscapes exist in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all the natural sounds that occur in the park, together with the physical capacity for transmitting natural sounds. Natural sounds occur within and beyond the range of sounds that humans can perceive and can be transmitted through air, water, or solid materials. The frequencies, magnitudes, and durations of human-caused sound considered acceptable varies among NPS units as well as potentially throughout each park unit, being generally greater in developed areas and less in undeveloped areas.

Impacts to the soundscape would occur from vegetation management activities. Human-caused sounds would likely increase due to vegetation crews and the operation of chainsaws or other mechanized equipment. Any sounds generated from vegetation management activities would be temporary, limited to the time of treatment, and would have a minor effect on visitors and employees. Because these effects are minor or less in degree and would not result in any unacceptable impacts, the topic of soundscape management is dismissed from further assessment.

Lightscape Management

In accordance with NPS *Management Policies* (NPS 2006), the NPS strives to preserve natural ambient lightscares, which are natural resources and values that exist in the absence of human caused light. The NPS recognizes that a clear view of the night sky is an important value to park visitors. Artificial light pollution can affect opportunities for night sky viewing and enjoyment. Bryce Canyon strives to limit the use of artificial outdoor lighting to that which is necessary for basic safety requirements. None of the alternatives proposed would adversely affect night sky viewing since all activities would occur during daytime hours. This topic has been dismissed from further analysis since there would be no impacts to lightscape management.

Water Quality and Quantity

NPS policies require protection of water quality consistent with the Clean Water Act. The purpose of the Clean Water Act is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." To enact this goal, the U.S. Army Corps of Engineers has been charged with evaluating federal actions that result in potential degradation of waters of the United States and issuing permits for actions consistent with the Clean Water Act. The U.S. Environmental Protection Agency also has responsibility for oversight and review of permits and actions, which affect waters of the United States. The soil disturbance from mechanical removal of invasive plants could reduce soil stability, which could result in sedimentation and reduced water quality. Such impact would be localized and could be reduced by tamping soil back into place after removal of invasive plants. Herbicides pose the risk of causing water contamination, but have the benefit of not causing soil disturbance and subsequent sedimentation of aquatic habitats. Mitigation measures would be employed to reduce or eliminate these risks including only using herbicides approved for use near water and not applying herbicides when rain is threatening. Restoration treatments would improve water quality by reducing erosion and sedimentation. Vegetation could be used to help stabilize stream banks or disturbed ground that may be subject to erosion. Because these impacts would be minor or less, this topic has not been analyzed in further detail.

Floodplains

Executive Order 11988 *Floodplain Management* requires all federal agencies to avoid construction within the 100-year floodplain unless no other practicable alternative exists. Under NPS *Management Policies* (NPS 2006) and DO 77-2 (*Floodplain Management*) the Service will strive to preserve floodplain values and minimize hazardous floodplain conditions. According to DO 77-2, certain construction within a 100-year floodplain requires preparation of a Statement of Findings for floodplains. There would be no net loss of floodplains and no construction in these areas. Therefore a Statement of Findings for floodplains will not be prepared. Because there would be no unacceptable impacts to floodplains, this topic has been dismissed from further analysis.

Wildlife

According to NPS *Management Policies* (NPS 2006), the Service shall strive to maintain all the components and processes of naturally evolving park ecosystems, including the natural abundance, diversity, and genetic and ecological integrity of the plant and animal species. Wildlife commonly found in the park includes mule deer, pronghorn, black bear, mountain lions, ringtail cats, chipmunks, ground squirrels, bats, mice, and over 150 species of birds. There are also 11 species of reptiles and 4 species of amphibians, and an estimate of over 1,000 insect species within the park. The proposed vegetation management practices have the potential to have negligible to minor, adverse impacts of some wildlife or their habitat. Treatments would not result in direct mortality to any wildlife species. Wildlife may be

disturbed during treatments that would result in minor, short-term, adverse impacts to some wildlife species. Removal of invasive vegetation and restoration of native species would have minor beneficial long-term impacts from the improvement of wildlife habitat and forage. Because impacts to wildlife would be minor, this topic has not been analyzed in detail.

Visitor Use and Experience

According to NPS *Management Policies* (NPS 2006), the enjoyment of park resources and values by people is part of the fundamental purpose of all park units. The NPS is committed to providing appropriate, high quality opportunities for visitors to enjoy the park and will maintain within the park an atmosphere that is open, inviting, and accessible to every segment of society. Further, the NPS will provide opportunities for forms of enjoyment that are uniquely suited and appropriate to the superlative natural and cultural resources found in the parks. The NPS *Management Policies* (2006) also states that scenic views and visual resources are considered highly valued associated characteristics that the NPS should strive to protect. Alternatives considered in this environmental assessment could result in impacts to visitor use and experience due to the presence of vegetation crews and the exclusion of visitors from areas during treatments. This impact would be localized, short-term, and negligible in intensity. In the long-term, there would be a progression towards a minor, beneficial improvement of the visitor experience from the protection and restoration of native plant communities. Since impacts to visitor use and experience would be negligible, this topic has not been analyzed in detail.

Paleontological Resources

According to NPS *Management Policies* (NPS 2006), paleontological resources, including both organic and mineralized remains in body or trace form, will be protected, preserved, and managed for public education, interpretation, and scientific research. The uplifting of the Colorado Plateau and the erosional down-cutting along with the Colorado River and its associated tributaries exposed geological outcrops that can be seen in Bryce Canyon and the surrounding area. The rocks exposed in Bryce Canyon are from the cretaceous period and contain localities rich in fossils. Paleontological localities are found primarily along the cliffs and badlands of the park where the vegetation is sparse. Vegetation management activities would be limited in these areas (generally only occurring along already established trail corridors) as they are not favorable to the establishment of invasive vegetation and the need for restoration is limited as the desired condition is often bare ground. Plant monitoring for species of concern would result in negligible disturbance of paleontological resources. Because impacts would be localized and negligible and would not result in any unacceptable impacts, this topic was dismissed from further assessment.

Historic Structures

The term historic structure refers to structures that are constructed works architecturally designed or engineered for human habitation or activity. Resources in this category include, roads, trails, bridges, irrigation ditches, wood telephone poles and fences, rock fence lines, and water/soil erosion control features. 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 National Register of Historic Places (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. Localized soil disturbance associated with mechanical treatments and plant restoration activities would potentially occur around historic structures. Herbicide application would occur in the vicinity of historic structures but through careful, controlled application would have negligible impact. Because these impacts would be minor or less, this topic was dismissed from further assessment.

Archeological Resources

The 1966 National Historic Preservation Act as amended (NHPA, 16 USC 470 et seq), the NPS's DO 28 (*Cultural Resource Management*), and NPS *Management Policies* (NPS 2006) require the consideration

of impacts on historic properties, including archeological sites, that are listed, or eligible to be listed in the National Register of Historic Places. Archeological resources include both historic and prehistoric sites. At Bryce Canyon these sites generally consist of surface artifacts, such as ceramics, flaked and ground stone, dendroglyphs, tin cans, glass, or miscellaneous historic debris. Archeological sites are found throughout the park in all vegetation zones. Invasive plant treatments and restoration activities would have negligible to minor, adverse impact on archeological resources. Mechanical removal of invasive plants and restoration activities could potentially disturb artifacts. Herbicides are not known to have any impacts on historic or prehistoric material so with careful, controlled application the use of herbicides to control invasive plants would have negligible impact on archeological resources. For this reason the preferred control method for invasive vegetation within archeological sites may be chemical control to avoid soil disturbance. Consultation with the park's Cultural Resource Specialist would take place before any treatments occur near any known archeological sites to determine the most suitable course of treatment. Should any treatment be determined to have more than minor impact, compliance for the specific site would be initiated. Because impacts to archeological resources would be minor or less and this determination would be re-evaluated on a site-by-site basis by the Cultural Resource Specialist, this topic has not been analyzed in detail

Museum Collections

According to DO 24 (*Museum Collections*), the NPS requires the consideration of impacts on museum collections (historic artifacts, natural specimens, and archival and manuscript material) and provides further policy guidance, standards, and requirements for preserving, protecting, documenting, and providing access to, and use of, NPS museum collections. The flora of Bryce Canyon is well documented in NPS museum collections (1,245 plant vouchers). The discovery of a new plant species would necessitate an additional herbarium specimen. As the discovery of new plant species is rare, the impact to museum collections would be negligible; therefore, this topic has been dismissed from further consideration.

Ethnographic Resources

Per DO 28 (*Cultural Resource Management*), ethnographic resources are defined as any site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it. According to DO 28 and Executive Order 13007 on sacred sites, the NPS should try to preserve and protect ethnographic resources.

No ethnographic research has been conducted to determine ethnographic resources; however, culturally affiliated groups received scoping letters and notification of this environmental assessment. The park did not receive any information from tribes indicating that there are any ethnographic resources in the project area. There is the potential for ethnographic resources to be identified in the future and project alternatives analyzed in this document would not adversely impact any designation of these resources. The proposed treatments would be designed to minimize resource impacts and to restore native plant communities that could be identified as ethnographic resources. Any of the proposed alternatives analyzed in this document would cause no greater than a negligible to minor impact on ethnographic resources, if they exist within the park; therefore, this topic has been dismissed from further consideration.

Socioeconomics

The proposed action would neither change local and regional land use nor appreciably impact local businesses or other agencies. Implementation of the proposed action could result in a minimal increase in employment opportunities, primarily in the form of seasonal positions, providing a negligible impact to the economy of the local area. Because the impacts to the socioeconomic environment would be negligible, this topic has not been analyzed in detail.

Prime and Unique Farmlands

The Farmland Protection Policy Act of 1981, as amended, requires federal agencies to consider adverse effects to prime and unique farmlands that would result in the conversion of these lands to non-agricultural uses. Prime or unique farmland is classified by the U.S. Department of Agriculture's Natural Resources Conservation Service, and is defined as soil that particularly produces general crops such as common foods, forage, fiber, and oil seed; unique farmland produces specialty crops such as fruits, vegetables, and nuts. There are no prime and unique farmlands designated in the park and this topic has been dismissed.

Indian Trust Resources

Secretarial Order 3175 requires that any anticipated impacts to Indian trust resources from a proposed project or action by the Department of Interior agencies be explicitly addressed in environmental documents. The federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes. There are no Indian trust resources at BRCA. The lands comprising the park are not held in trust by the Secretary of the Interior for the benefit of Indians due to their status as Indians. Therefore, the project would have no effect on Indian trust resources, and this topic has been dismissed from further analysis.

Environmental Justice

Executive Order 12898 *General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. The proposed action would not have disproportionate health or environmental effects on minorities or low-income populations or communities as defined in the Environmental Protection Agency's Environmental Justice Guidance (1998), and seasonal employees recruited to work on vegetation management for the park would not be hired based on their race or income. Therefore, environmental justice has been dismissed as an impact topic in this document.

Alternatives Considered

The alternatives considered in this environmental assessment cover the range of what is physically possible, acceptable by policy, and feasible for local managers (i.e. all reasonable alternatives). Criteria used in the selection of reasonable alternatives include:

- Potential for protecting the park's natural and cultural resources.
- Effectiveness, efficiency, and economy in protecting native plant communities and controlling invasive plant infestations.
- Ability to ensure human health and safety.

The use of prescribed fire to meet vegetation management objectives has been approved in the Bryce Canyon National Park Fire Management Plan and Environmental Assessment (NPS 2005) and therefore is a component in all alternatives and is not analyzed in detail.

Alternative I: No Action

Under the No Action Alternative there would be no pulling or spraying of invasive vegetation. Reseeding and planting to encourage the re-establishment of native plants and prevent the establishment of invasive vegetation would not occur. The exception would be those treatment options that either qualifies as a Categorical Exclusion (CE) or whose impacts have been previously addressed in other NEPA documents. Under DO-12 (*Conservation Planning, Environmental Impact Analysis, and Decision-making*), the only exotic plant management activities that are covered under a CE involve "removal of individual members of a non-threatened/endangered species or populations of pests and exotic plants that pose an imminent

danger to park visitors or an immediate threat to park resources.” Revegetation activities that are covered under a CE involve “restoration of noncontroversial (based on internal scoping requirements) native species in suitable habitats within their historic range.” In addition to meeting this criterion, the proposed treatment must also have no measurable impacts to qualify as a CE. Measurable impacts are those that the interdisciplinary team determines to be greater than minor by the analysis process described in DO-12. For effects to be minor, a relatively small number of individuals/resources would be affected. Minor impacts typically require considerable scientific effort to measure, are limited to relatively few individuals of the populations, are much localized in area, and have barely perceptible consequences. Any proposed treatments that were not covered under a CE or under another existing NEPA document would require preparation of additional NEPA documents.

Bryce Canyon currently has a CE for exotic plant management in the backcountry. However, there is no CE in place for exotic plant treatments in the front-country or for native plant restoration. Because the scope of work allowed under the CE pertaining to backcountry areas where vegetation management needs are minimal, the impacts of these vegetation management activities will not be analyzed under this alternative. The no action alternative evaluated in this document is a true “do nothing” alternative in terms of invasive plant management and restoration.

Under this alternative current management of threatened, endangered, and sensitive plants would continue. Inventory and monitoring of sensitive plants would continue, but sporadically and based on the extent and level of resource damage, personnel availability, and area of impact. The last documented rare plant monitoring occurred in 2006. Location of sensitive plant populations would continue to be kept on file and made available.

Alternative II: Full use of Integrated Pest Management (IPM) techniques (fire, mechanical, chemical, and biological control) to manage invasive plants; implementation of a sensitive plant species monitoring/protection program; implementation of a restoration program.

Alternative II proposes the implementation of vegetation management strategies pertaining to fire, invasive plants, restoration, and sensitive plants. Under this alternative integrated pest management procedures would be employed to determine whether to use fire, mechanical, chemical, or biological methods to control invasive vegetation. A comprehensive program of restoration treatments of disturbed areas would be established and a mechanism set up by which conservation and restoration measures would be incorporated into future projects. A protocol for the inventory and monitoring of sensitive plants would be established and sensitive plant management would be incorporated into project planning and compliance. Vegetation Management Strategies employed under this alternative would include the following:

Fire

Fire would continue to be used to help meet vegetation management objectives in accordance with the Fire Management Plan (NPS 2005). Wildland and prescribed fire would continue to be used to restore natural ecosystems that have been modified by prolonged fire exclusion, remove/reduce non-native plant species, and improve vegetative compositions to natural levels.

Invasive Plant Management

This alternative proposes the implementation of the full range of appropriate IPM techniques available and fully implements the 10 Steps for Invasive Plant Management (Appendix B). This alternative would provide for proactive, responsible, and adaptive (defined below) integrated invasive species management. The integrated approach is defined as a system for the planning and implementation of a program, using an interdisciplinary approach, to select a method for containing or controlling an undesirable plant species or groups of species using all available methods including prevention, education, physical or mechanical methods, biological control agents, herbicide methods, prescribed fire, and general land management. It is a multidisciplinary, ecological approach to managing unwanted plant species. This integrated approach

incorporates mechanical treatments and herbicide applications, which been used at BRCA in the past, with the ability to use biological control agents and implementation of a comprehensive prevention program (Appendix C). Prevention is the most effective, economical, and ecologically sound approach to managing invasive species with zero risk to resources of value. Under this alternative, chemical herbicides could be used for the treatment of species that are not effectively treated with mechanical methods or for large dense populations of invasive plants. Following chemical treatments, these areas may be maintained using alternate methods such as reseeding or planting to enhance native vegetation biodiversity. Mechanical methods would be used for scattered individual plants.

This alternative also allows for the use of biological control which involves the release of host-specific predators or pathogens that suppress the invasive plant population. Bio-control agents are not capable of completely eradicating an invasive plant population, because as the number of host plants declines, so does the population of bio-control agents. However, bio-control can be a useful tool in reducing the initial size or density of an invasive plant infestation, making other treatments more efficacious. Biological control is not currently being considered at BRCA. However, under this alternative if an appropriate biological control agent becomes available or a new invasive species becomes established for which there is a biological control agent, bio-control could be used.

Restoration

Under this alternative the park would implement a program of comprehensive restoration treatments for disturbed areas, including meadow habitat occupied by Utah prairie dogs (UPD). This effort would involve a full inventory of disturbed sites within the park. As part of the inventory, these sites would be assessed for degree of disturbance and priority need. The restoration process would also involve evaluation of success and execution of any necessary follow-up treatments.

Re-vegetation would be a required component of all construction/maintenance projects that would cause measurable ground disturbance that warrants restorative actions. The restoration methods used would depend on the location, size, and type of disturbance. For projects that include excavation, topsoil would be conserved and placed near the surface when filling in any trenches or other human-made depressions to act as a seed source for bolstering the re-vegetation of a site.

There are various techniques that could be employed in restoring native vegetation. The techniques used depend in part on the desired condition, size of disturbance, and type of disturbance. No active restoration may be necessary if bare ground/rock is the desired condition or if the disturbed site is small enough that there is sufficient desired vegetation in close proximity to re-vegetate the site naturally. Disturbances that involve the loss of topsoil or major compaction of the soil may require soil amendments or loosening of the soil. Restoration techniques would include but are not limited to:

- loosening soil/tilling;
- soil amendments;
- seeding;
- shrub/sapling plantings;
- exclosures;
- restricting access to a site using down trees, signs, and fencing; and
- erosion-control: recontouring or waterbarring concentrations of runoff created by trails or roads to protect and ensure re-vegetation.

All seeding and planting would be done with species native to BRCA. As outlined in NPS *Management Policies* (NPS 2006), the restoration of native plants would be accomplished using organisms taken from populations as closely related genetically and ecologically as possible to park populations, preferably from similar habitats in adjacent or local areas. Deviations from this general policy may be made where the management goal is to increase the variability of the park gene pool to mitigate past, human-induced loss of genetic variability. Use of species genetically from the area can significantly improve restoration

success since duplication of the genetic structure of the local population provides the greatest survivorship (Millar and Libby 1989). Seed can be collected from within the park for use in restoration projects. The BRCA Seed Collection Reference Manual (NPS 2007) provides information on collection times, collection methods, and cleaning techniques for 29 native plant species commonly used in restoration projects at BRCA. Seed collected in BRCA can be grown in a nursery (on- or off-site) to be used as seedlings for planting or as a source of seed. Slender wheatgrass (*Elymus trachycaulus*) and nodding brome (*Bromus anomalus*) have been successfully grown at the NRCS Upper Colorado Environmental Plant Center from seed collected at BRCA. These grasses were grown for multiple years and provided hundreds of pounds of seed. Finally, seedlings and saplings would be salvaged from construction sites. Prior to the start of any projects involving ground disturbance, small shrubs and saplings would be transplanted.

Sensitive Plants

A more comprehensive sensitive plant management program would be implemented under this alternative. All data on sensitive plant localities would be compiled in GIS to produce maps to help identify important conservation areas within the park and direct mitigation measures related to development projects in the vicinity of sensitive plant locations. Projects located near known populations or projects that would be disturbing new ground in the breaks environment would require a sensitive plant survey. If sensitive plants are observed to be within a project area, the project may need to be re-evaluated to determine if there is an alternative that would have less of an impact on sensitive plants. If there is not another feasible alternative then steps would be taken to mitigate the impacts. Locations of sensitive plants would be flagged to prevent trampling by staff or vehicles. If necessary, sensitive plants would be inventoried and transplanted to a similar location. A map of sensitive plant localities would also facilitate selection of sites for monitoring. Those populations located in proximity to sites heavily used by visitors would be a priority for monitoring to determine if management intervention, such as fencing or signage, is necessary to help protect these populations. Permanent sensitive plant plots have been established and would continue to be monitored under this alternative.

Alternative III: Limited use of Integrated Pest Management (IPM) techniques (fire and mechanical) to manage invasive plants; implementation of a sensitive plant species monitoring/protection program; implementation of a restoration program.

This alternative is similar to Alternative II except potentially controversial treatment techniques have been eliminated. Under this alternative chemical herbicides and biological control would not be employed. Invasive vegetation would only be treated using fire and mechanical methods. Implementation of the 10 Steps for Invasive Plant Management (Appendix B) would be limited under this alternative. Limitations on the ability to integrate a full range of treatment methods would restrict the implementation of Step 8 – Identify most appropriate control technique.

Alternative Summaries

Table 1 summarizes the major components of each alternative and compares the ability of these alternatives to meet the project objectives (the objectives for this project are identified in the *Purpose and Need* chapter). As shown in the following table, Alternative II meets each of the objectives identified for this project, while Alternatives I and III do not address all of the project objectives.

Table 1: Alternative Summary and Plan Objectives

<p>Alternative I: No Action</p> <p>Under this alternative vegetation management activities would be limited. No invasive plant treatments or restoration activities would occur except those treatments that have been address in other NEPA documents. No comprehensive sensitive plant management program would be implemented.</p> <p>Meets Project Objectives: No. Invasive plant infestation would be expected to expand under this alternative. The no action alternative does not provide the tools necessary for preservation, protection, and restoration of native plant communities. No formal procedures are in place to direct restoration activities, monitor sensitive plant species, or prevent further introduction of invasive plants. Alternative I would not meet plan objectives.</p>
<p>Alternative II: Full use of IPM techniques</p> <p>Under this alternative the full range of integrated pest management techniques (fire, mechanical, chemical, and/or biological control) would be used to treat invasive vegetation in addition to the implementation of protocols to prevent the introduction and spread of invasive vegetation. Comprehensive sensitive plant management and native plant restoration programs would be implemented.</p> <p>Meets Project Objectives: Yes. The maximum amount and type of vegetation resources would be preserved, protected, and restored over the long-term through the implementation of a comprehensive vegetation management plan. Alternative II would fully meet plan objectives.</p>
<p>Alternative III: Limited use of IPM techniques</p> <p>Chemical herbicide and biological control would not be employed under this alternative; only fire and mechanical methods would be used to treat invasive vegetation. Comprehensive invasive plant prevention, sensitive plant management, and native plant restoration programs would be implemented.</p> <p>Meets Project Objectives: No. This alternative does not provide all tools necessary for preservation, protection, and restoration of native plant communities. Although this alternative eliminates potentially controversial treatment techniques, it does not provide the means to effectively control invasive vegetation. Alternative III would partly meet plan objectives.</p>

Mitigation Measures Specific to Alternative II

The park has adopted the policy of having a trained and certified applicator on site during projects involving herbicides. Utah State pesticide applicator certification, including herbicide training and safety, is renewed every three years. All project participants would receive herbicide training from the certified project leader. Project participants would understand and abide by the established personal protective equipment (PPE) requirements and rules outlined on the product label. Rubber gloves, long sleeve shirts, and eye protection may be required PPE for application of herbicides. Job hazard analyses for herbicide application would be reviewed frequently with all project participants.

All information and instructions on the herbicide label would be strictly followed. Herbicide containers would be properly labeled. Application equipment and chemicals would be stored in appropriate storage facilities separate from food and personal items. Material Safety Data Sheets (MSDS) would be maintained for all chemicals. The MSDS contains fire and explosive hazard data, environmental and disposal information, health hazard data, handling precautions, and first aid information. All participants would review the MSDS with the project leader and understand first aid instructions described on the MSDS.

If the label instructions for the herbicide and application method recommend limiting exposure to humans and pets, the area would be closed during treatment. Treatments would occur when the least number of visitors would be impacted by the closure. Treatments that pose no risk to humans may be done at any

time. All herbicide mixing and loading of sprayer tanks would occur in designated staging areas where there would be no impacts to native plant communities. To prevent drift, herbicide would not be applied during windy conditions or when rainfall is threatening.

Only Plateau, RoundUp, Milestone, Fusilade, and Habitat (or the generic equivalents) would be used between 50' and 500' of active UPD colonies. These herbicides are rated 'practically nontoxic' to terrestrial organisms according to EPA's toxicity scale. Outside of 500' from active UPD colonies, the park may use Garlon (or the generic equivalent) to treat invasive species. Only one application using Garlon/site would be conducted within the same year. If additional herbicides are developed or discovered to be more effective at treating exotic plants, the park would contact the USFWS for authorization of those products.

Mitigation Measures Common to Alternatives II & III

There is several mitigation measures common to both action alternatives and are related to a number of resource areas.

- **Historic Properties**

Mechanical treatments in close proximity to historic and prehistoric cultural resource sites would only be implemented under the supervision of a Cultural Resource Specialist to avoid the possibility of disturbing subsurface archeological material or undermining remaining standing architecture.

The park's Cultural Resource Specialist would work closely with the park biologist and invasive plant management crews in the location and identification of historic and prehistoric structures. Park staff conducting invasive plant management work would be trained yearly in cultural site awareness to learn how to identify and avoid archeological and historical resources on the ground. Should presently unidentified archeological resources be discovered during project implementation, work in that location would stop until the resources are properly recorded by an NPS archeologist and evaluated under National Register of Historic Places eligibility criteria in consultation with the Utah State Historic Preservation Officer and affiliated tribes as appropriate. If the resources are determined eligible, appropriate measures would be implemented either to avoid resource impacts or to mitigate disturbance. In compliance with the Native American Graves Protection and Repatriation Act of 1990, the NPS would also notify and consult affiliated tribal representatives for proper treatment of human remains, funerary, and sacred objects, should these be discovered. All workers would be informed of penalties for illegally collecting artifacts or intentionally damaging any archeological or historic property in the vicinity. Should any unusual treatment conditions or locations arise related to historic properties, park staff would contact the Cultural Resource Specialist to determine how to proceed.

- **Mapping of Invasive Plant Species**

Newly discovered invasive plant species and infestations would be mapped with a GPS unit and the park's resource staff would be notified. All workers' clothing and footwear and all tools and equipment would be cleaned at the sites to ensure that seeds or propagules from invasive plants are not transported to new locations.

- **Job and Tool Use Safety**

A job hazard analysis (JHA) that outlines job hazards and safety precautions would be developed for each activity and all participants would receive tool safety training and would be required to use the appropriate personal protective equipment (PPE) for each associated task. The use of tools would follow procedures outlined in the JHA.

- **Visitor Experience**

NPS staff would be available to provide educational and informational messages to any groups encountered during project implementation. Infestations located near heavily used areas would be mechanically controlled (if feasible) and the work would be completed when visitors would be least impacted.

- **Soil Compaction and Biotic Community Disturbance**

To minimize soil compaction, the following mitigation measures would be incorporated into all action alternatives:

- The project leader would determine the access route that would cause the least disturbance to sensitive soils and vegetation. Access to areas would use existing wildlife or hiking trails wherever possible. If no trails exist, the project leader would determine whether single or multiple paths would be used depending on which would cause the least impact.
- The minimum number of trips would be conducted into sensitive areas for treatments and/or monitoring.
- If equipment such as a utility vehicle (UV) or tractor is used for invasive plant treatments the lightest/smallest equipment would be used and would be consistent with the minimum tool requirement concept for work occurring in designated or proposed wilderness. No such equipment would be used on wet soils that would be subject to compaction. Equipment would be cleaned on-site to prevent the transport of invasive species to uninfested areas.

- **Special Status Species**

There are a number of special status species known or suspected to occur in the park. A complete list is found in the *Environmental Consequences* chapter, Special Status Species section. The following mitigation measures would be incorporated into all action alternatives:

- The proposed project would include provisions for the discovery of previously unknown or undiscovered threatened, endangered, or special status species. These provisions require the cessation of project activities until park staff evaluates the project impact on the discovered species and conducts additional Section 7 consultation with the USFWS if necessary.
- All project participants would be informed about special status species and what actions should occur if a special status species is encountered.
- In order to minimize negative impacts to migratory birds, any invasive tree species (e.g. tamarisk, Russian olive) greater than 2" diameter at breast height would be cut and stump treated (under Alternative II) after July 31st to avoid interference with the breeding/nesting season.
- Restoration efforts at Sheep/Swamp and Yellow Creeks (where sightings of southwestern willow flycatcher and yellow-billed cuckoo are documented) would occur after the breeding season.

- **Utah Prairie Dog Habitat**

Control of exotic vegetation and revegetation efforts are proposed to occur within Utah prairie dog habitat under these alternatives and have the potential to affect that species. The following mitigation measures would be implemented to lessen any negative impacts to UPD colonies within the park.

- All project participants would be informed about the special status of the UPD and what actions are authorized within active UPD colonies, including distance restrictions and approved tool use.
- Vegetation treatment (mechanical/herbicide treatments) within 500' of active UPD colonies would not occur until pups have emerged from burrows (~June 15) and would be completed by August 31st to reduce interference with pre-hibernation foraging. This would reduce impacts to UPD during especially critical life history periods of the species.
- The use of motorized equipment within 500' of active UPD colonies for vegetation treatments (that do not involve ground disturbance) would be conducted during the dormant season when possible. If motorized equipment is necessary during the active season, treatments would occur after the pups emerge (June 15 – August 31) and would be limited to two hours per day during the less active period of the day (approximately 10 a.m. to 2 p.m.). Motorized equipment used for vegetation treatments includes such items as string trimmers and chainsaws.

- No motorized vehicles (including ATVs, cars/trucks, tractors, heavy equipment, etc.) would be used overland within .5 miles of occupied UPD habitat.
 - Only hand-pulling of weeds is authorized within 50' of an active UPD burrow.
 - No more than 20% of habitat within 500' of active UPD colonies would be treated within one season; follow-up treatments can occur for up to 2 years after the initial treatment in the same 20% area with reseeding efforts to occur following the last year of treatment. New treatment areas within the same colony would not be selected until rehabilitation is completed on previously treated sites (i.e. previously treated areas have been reseeded and no further vegetation removal is expected for at least a 5 year period). This method ensures that no greater than a 20% loss in vegetation would occur in the area surrounding active colonies. A maximum of 40% of habitat would be treated between 500' and ½ mile from an active UPD colony within one season. First year/initial treatments would not be performed on two colonies in the same season if those colonies have functional connectivity (e.g., the Mixing Circle Junction colony and the Mixing Circle colony).
 - Rehabilitation efforts of UPD habitat will strive to produce vegetation characteristics that optimize colony establishment and success (USFWS 2009) including the following parameters:
 - 1-20% ground cover of warm season grasses
 - 12-14% ground cover of cool season grasses
 - 1-10% ground cover of forbs
 - 0-8% ground cover of shrubs (<10% canopy cover)
 - Reseeding of treated areas within 500' of active UPD colonies would use a native seed mix (seed collected from plants from within BRCA or a local genetic strain).
- **Best Management Practices (BMPs)**
 The most current and scientifically-based Best Management Practices would be utilized in order to protect all natural and cultural resources within the park including soil erosion control, as outlined in DO 77 (*Natural Resource Protection*), and wetlands protection, as outlined in DO 77-1 (*Wetlands Protection*).

Environmentally Preferred Alternative

The environmentally preferred alternative is determined by applying the criteria suggested in the National Environmental Policy Act of 1969, which is guided by the Council on Environmental Quality. This includes alternatives that:

- fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
- assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings;
- attain the widest range of beneficial uses of the environment without degradations, risk to 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 which supports diversity and variety of individual choice;
- achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities; and
- enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Based on these national environmental policy goals Alternative II is the environmentally preferred alternative for this project.

Alternative II is the environmentally preferred alternative because it surpasses both Alternative I and Alternative III in realizing the full range of national environmental policy goals as stated in Section 101

of the NEPA. Although Alternative I does include sensitive plant management, it is not as comprehensive as the preferred Alternative. Alternatives I and III do not provide for comprehensive invasive plant management treatments on a large scale across the park. The control of invasive plant species populations are expected to be less successful under these two alternatives. While Alternative III does result in the least amount of public controversy over perceived potential impact to resources and humans, it does not result in decreased risk to long-term health of native plant communities and natural processes in comparison with Alternative II. Alternative II would provide the highest level of protection of the natural and cultural resources over the long-term.

Table 2: Environmental Impact Summary by Alternative

Impact Topic	<i>Alternative I: No Action</i>	<i>Alternative II: Preferred Alternative – Full use of IPM techniques to manage invasive plants; implementation of a sensitive plant species monitoring/protection program; implementation of a restoration program.</i>	<i>Alternative III: Limited use of IPM techniques to manage invasive plants; implementation of a sensitive plant species monitoring/protection program; implementation of a restoration program.</i>
Soils	Short and long-term impacts negligible.	Short-term impacts minor, adverse and long-term impacts minor, beneficial.	Short-term impacts minor, adverse and long-term impacts moderate, adverse.
Vegetation	Short-term impacts minor, adverse and long-term impacts moderate, adverse.	Short-term impacts minor, beneficial and long-term moderate, beneficial.	Short-term impacts minor, adverse and long-term impacts moderate, adverse.
Wetlands	Short-term impacts negligible and long-term impacts moderate, adverse.	Short-term impacts minor, adverse and long-term impacts moderate, beneficial.	Short and long-term impacts minor, adverse.
Special Status Species	Plants: Short and long-term impacts minor, beneficial. Animals: Short-term impacts negligible and long-term impacts moderate, adverse.	Plants: Short and long-term impacts moderate, beneficial. Animals: Short-term impacts minor, adverse and long-term impact moderate, beneficial.	Plants: Short and long-term impacts moderate, beneficial. Animals: Short term impacts minor, adverse and long-term impacts moderate, adverse.
Wilderness	Short-term impacts negligible and long-term impacts moderate, adverse.	Short-term impacts minor, adverse and long-term impacts minor, beneficial.	Short and long-term impacts minor, adverse.
Park Operations	Short-term impacts negligible and long-term impacts minor, adverse.	Short and long-term impacts minor, adverse.	Short and long-term impacts minor, adverse.
Cultural Landscapes	Short-term impacts negligible and long-term impacts moderate, adverse.	Short-term impacts minor, adverse and long-term impacts minor, beneficial.	Short-term impacts minor, adverse and long-term impacts minor, adverse.

ENVIRONMENTAL CONSEQUENCES

This section analyzes the potential environmental consequences, or impacts, that would occur as a result of implementing the vegetation management plans described under each alternative. Topics analyzed in this chapter include: Soils, Vegetation, Wetlands, Special Status Species, Wilderness Character, Park Operations, and Cultural Landscapes. A summary of the affected environment is presented at the beginning of each resource topic carried forward for analysis. Direct, indirect, and cumulative effects are analyzed for each resource topic; a discussion of unacceptable impacts and impairment related to each alternative occurs at the end of the chapter. Potential impacts are described in terms of type, context, duration, and intensity. Specific impact thresholds are given for each resource at the beginning of each resource section. General definitions are defined as follows:

- **Type** describes the classification of the impact as either beneficial or adverse, direct or indirect:
Beneficial: A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.
Adverse: A change that moves the resource away from a desired condition or detracts from its appearance or condition.
Direct: An effect that is caused by an action and occurs in the same time and place.
Indirect: An effect that is caused by an action but is later in time or farther removed in distance, but is still reasonably foreseeable.
- **Context** describes the area or location in which the impact will occur. Are the effects site-specific, local, regional, or even broader?
- **Duration** describes the length of time an effect will occur, either short-term or long-term:
Short-term impacts generally last only during treatment and the resources resume their pre-treatment conditions after completion of the project.
Long-term impacts last beyond the treatment period and the resources may not resume their pre-treatment conditions for a longer period of time following completion of the project. In the case of historic properties, while damage that results in the loss of, or damage to historic fabric can be physically repaired, that loss or damage constitutes a permanent impairment of the resource.
- **Intensity** describes the degree, level, or strength of an impact. For this analysis, intensity has been categorized into negligible, minor, moderate, and major. Because definitions of intensity vary by resource topic, intensity definitions are provided separately for each impact topic analyzed in this environmental assessment.

Cumulative Effects:

The CEQ regulations, which guide the implementation of the NEPA (42 USC 4321 et seq.), requires assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined 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" (40 CFR 1508.7).

Cumulative impacts were determined by combining the impacts of the Alternatives with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other ongoing or reasonably foreseeable future projects within the park and, if applicable, in the surrounding region. The geographic scope for this analysis includes elements within the park boundaries and areas adjacent to the park. The temporal scope includes projects within a range of approximately ten years. Given this, the following activities have been identified for the purpose of conducting this cumulative effects analysis:

Urbanization: The communities surrounding BRCA continue to grow. The park is near the town of Bryce Canyon City (to the north) and Tropic (to the east). Residential and commercial development near park boundaries would result in a loss of vegetation and increase the possibility for the introduction of invasive plant species. Ground disturbance associated with construction activities creates a suitable seedbed for invasive species.

Vehicles: Vehicles, including construction equipment, are a key source of weed seed and propagule introductions into parks. Plant parts are easily transported on undercarriages, grills, bumpers, and the inside of vehicles. Vehicle use within the park by staff, visitors, and for construction projects is expected to continue and provides a means for continual invasive plant introductions.

Agriculture and Livestock: There are a number of farming operations in the vicinity of the park. Livestock grazing occurs in areas adjacent to the park and trespass livestock in BRCA continues to be a problem. Livestock are known to transport and spread invasive species in addition to trampling of native vegetation.

Visitor Use: Visitor use activities provide a transport mechanism for invasive species. In 2008, over one million people visited Bryce Canyon. Visitor vehicles have the potential to introduce new invasive plants as plant parts and seeds are easily transported on undercarriages, grills, bumpers, and the inside of vehicles. There are a number of existing hiking trails in and adjacent to the park. Seeds often attach to and are transported by hiker's boots and can be a source of non-native vegetation entering the park. There are also trails in the park designated for horse and mule use. A park concessionaire operates horse and mule rides on these trails. Horse and mules are a potential source of weed seeds both directly from hay or feed products and indirectly after traveling through the animals gut. If hikers and riders stray from designated trails, they may trample native vegetation or sensitive plants.

Park Construction: Construction projects within the park may destroy native vegetation and without proper precautions, promote the spread of invasive species. Recent projects, such as the realignment of the main park road and modification of the Tropic Ditch, caused significant ground disturbance. Additional future construction projects within the park include replacement of sewer lines, viewpoint modifications, development of several miles of bike paths throughout the park, and construction of wildlife viewing pullouts along the main park road. Depending on the location and diligence employed in equipment use, construction projects also have the potential to impact sensitive plant populations.

Soils

Affected Environment

In general, the top of the Paunsaugunt Plateau is covered with gravelly loam-type soils derived from the weathering of limestone parent material. These shallow, well-drained soils are typically low in nutrients and moisture availability. A substantial portion of the park is classified as badlands, rock outcrops, or talus fields rather than as developed soils. Soils along drainages (both above and below the rim) which are formed in limestone alluvium can be deeper and well developed.

Impact Threshold Definitions

Impact Intensity	Intensity Definition
Negligible	Soils would not be affected or the effects to soils would be below or at the lower levels of detection. Any effects to soils would be slight and erosion would not be noticeable.
Minor	The effects to soils would be detectable. Effects to soil area, including soil disturbance and erosion, would be small and localized. Minimal soil loss would occur. Mitigation may be needed to offset adverse effects and would be relatively simple to implement and likely be successful.
Moderate	The effect on soils would be readily apparent and result in a change to the soil character over a relatively wide area, soil disturbance over a wide area, or erosion that extends beyond the project site and/or results in some soil loss. Mitigation measures would be necessary to offset adverse effects and likely be successful.
Major	The effect on soils would be readily apparent and substantially change the character of soils over a large area and substantial erosion would occur resulting in a large soil loss. Mitigation measures to offset adverse effects would be needed, would be extensive, and their success could not be guaranteed.

Soil impacts would be considered short-term if the soils recover in three years or less and long-term if the recovery takes longer than three years.

Alternative I: No Action

Impact Analysis: Under this alternative no invasive vegetation would be treated or native plant communities restored. Since no activity would occur there would be little to no impacts to the soil. Monitoring and inventorying of rare plants would cause little soil disturbance. Since these plants are present in small quantities, changes in abundance would not have a detectable affect on soil stability.

Cumulative Impacts: Development, agricultural operations, and recreational activities (hiking, ATVs, horseback riding) adjacent to the park are resulting in substantial soil disturbance. There has been and are expected to be localized areas of soil disturbance in the park from construction activities and visitor use. Thus, when combined with other past, present, and foreseeable future actions that would result in impacts to soils, this alternative would have negligible short and long-term cumulative impacts to the soil resources.

Conclusion: Impacts to the soil resource from the implementation of this alternative in the short and long-term are expected to be negligible as little activity would occur. Cumulative impacts would be negligible when considered in the context of ongoing disturbances in and around the park.

Alternative II: Preferred Alternative – Full use of IPM techniques (fire, mechanical, chemical, and biological control) to manage invasive plants; implementation of a sensitive plant species monitoring/protection program; implementation of a restoration program.

Impact Analysis: Using an integrated approach to manage invasive plant infestations would allow the park to minimize the amount of soil disturbance. The amount of soil disturbance would be less for the preferred alternative when compared to Alternative III because additional techniques are available under this alternative that are not as disruptive to the soil. The localized soil disturbance from mechanical removal of invasive plants could reduce soil stability until plants have reestablished on the disturbed sites. This would be minimized by tamping the soil back into place after removal of the invasive plants and seeding when appropriate. Herbicides used for chemical control can bind with soils or impact soil microorganisms and could have short-term, minor, localized, adverse impacts on soils. This would be mitigated by using application methods like backpack sprayers and cut-stump treatments to minimize the amount of chemicals contacting soil. Biological control is not currently being considered, but could include introducing predators or pathogens to reduce invasive plant infestations. Biological control would be expected to have no direct impact on soil resources. Long-term control of invasive vegetation would be beneficial to soil stability and chemistry as a result of the protection and restoration of native plant communities.

Restoration activities such as loosening of the soil in preparation for seeding would make the soil more susceptible to erosion. Planting of shrubs and saplings would cause localized soil disturbance. Once established, native vegetation would increase soil stability. Monitoring and inventorying of rare plants would cause little soil disturbance. Since these plants are present in small quantities, changes in abundance would not have a detectable effect on soil stability

Cumulative Impacts: Cumulative impacts are the same as Alternative I.

Conclusion: Short-term impacts to the soil resource from the implementation of the preferred alternative are expected to be direct, minor, and adverse primarily due to the localized impacts of mechanical treatments and restoration activities. Long-term soil impacts are expected to be minor and beneficial. The greatest amount of invasive plant populations are expected to be treated and native plant populations restored under this alternative, resulting in indirect benefits to the soil resource from increased soil productivity and stability. Cumulative impacts would be negligible when considered in the context of ongoing disturbances in and around the park.

Alternative III: Limited use of IPM techniques (fire and mechanical) to manage invasive plants; implementation of a sensitive plant species monitoring/protection program; implementation of a restoration program.

Impact Analysis: Invasive plant species would be controlled primarily by mechanical methods, with some use of prescribed burning. The localized soil disturbance from mechanical removal of invasive plants would reduce soil stability and increase potential for erosion until plants have reestablished on the disturbed sites. This would be minimized by tamping the soil back into place after removal of the invasive plants. Mechanical treatments are not very effective on a number of species (e.g., tamarisk, Russian knapweed, Russian olive, and several species of thistle) resulting in the need to retreat some populations several times in order to reduce (but probably never eliminate) these populations, which causes recurring disturbance to the soil resource. Larger infestations would not be effectively treated under this alternative because of the amount of labor it takes to mechanically remove populations.

Restoration activities such as loosening of the soil in preparation for seeding would make the soil more susceptible to erosion. Planting of shrubs and saplings would cause localized soil disturbance. Once established, native vegetation would increase soil stability. Monitoring and inventorying of rare plants would cause little soil disturbance. Since these plants are present in such small quantities, changes in abundance would not have a detectable effect on soil stability

Cumulative Impacts: Cumulative impacts are the same as Alternative I.

Conclusion: The impacts of implementing this alternative would have direct, minor, adverse impacts in the short-term on localized areas due to soil disturbance resulting from mechanical treatments and re-vegetation activities. Impacts in the long-term would be moderate and adverse as soils are repeatedly disturbed from re-treatments. Many invasive plant populations would not be treated and would continue to spread. Alterations in species composition could bring about changes in soil stability and chemistry. Cumulative impacts would be negligible when considered in the context of ongoing disturbances in and around the park.

Vegetation

Affected Environment

Bryce Canyon has an elevation range of 6,850 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 change in elevation and topography, as well as the geology, soils, and water availability within the park (see Map B). Five major vegetation communities occur at BRCA: Pinyon-Juniper Woodlands, Breaks Communities, Ponderosa Pine Forests, Mountain Grasslands, and Fir-Spruce-Aspen Forests.

The Pinyon-Juniper woodlands are open forests of Two-Needle Pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*). These species thrive under relatively dry, hot conditions that are common in lower elevations in the park. The trees are less dense than other forest habitats because of the competition for water, creating open woodland. Utah juniper generally dominates the low elevations of its range, Pinyon pine the upper. Greenleaf manzanita (*Arctostaphylos patula*), serviceberry (*Amelanchier utahensis*), and cliffrose (*Purshia mexicana* var. *stansburyana*) form an understory of scattered shrubs. Grasses and forbs form a discontinuous cover between trees and shrubs. This vegetation type covers approximately 7,476 acres within the park.

The Breaks communities of BRCA occur along the cliffs and badlands of the park. This community is characterized by widely scattered trees, including Bristlecone pine (*Pinus longaeva*), Ponderosa pine (*Pinus ponderosa*), and Limber pine (*Pinus flexilis*). It also contains a perennial forbs component of soil and substrate adapted endemics. As such, this community contains the majority of the sensitive plants found within the park.

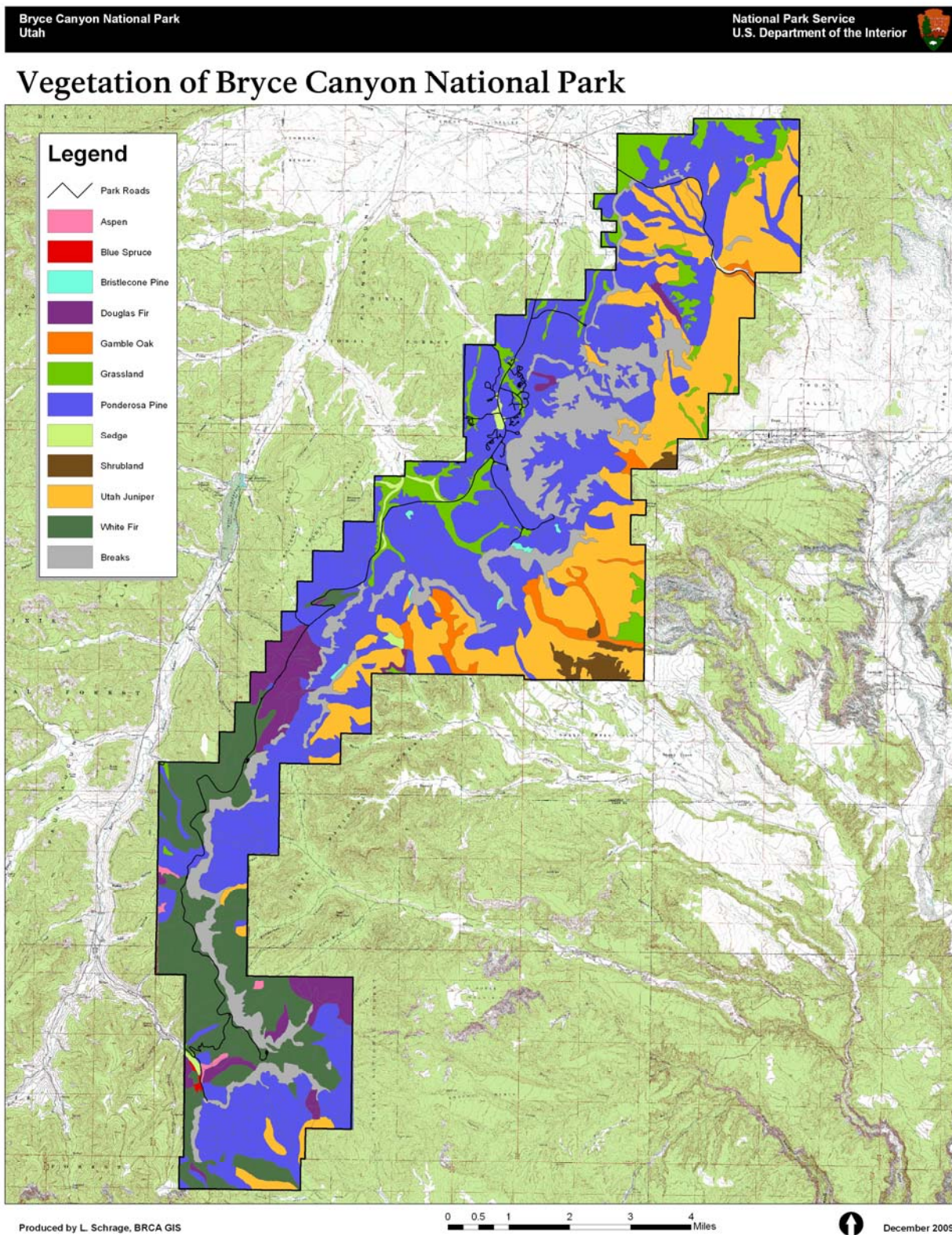
Ponderosa pine (*Pinus ponderosa*) forest covers approximately 15,093 acres within the park. Ponderosa pine is the most fire-resistant conifer in the park and is a climax community at favorable sites on the high plateau of the park. Common understory species include greenleaf manzanita, serviceberry, mountain mahogany (*Cercocarpus ledifolius* var. *intermontanus*), and snowberry (*Symphoricarpos oreophilus* var. *utahensis*).

Bryce Canyon contains approximately 2,309 acres of grassland. The mountain grasslands exist mainly along drainages in the north end of the park. The primary species found in the grasslands include black sagebrush (*Artemisia nova*), needle and thread (*Stipa comata* var. *comata*), cinquefoil (*Potentilla* sp.), buckwheat (*Eriogonum* sp.), and sedges (*Carex* sp.).

The Fir-Spruce-Aspen forests are closed forests of White fir (*Abies concolor*), Douglas-fir (*Pseudotsuga menziesii*), Blue spruce (*Picea pungens*), and Quaking aspen (*Populus tremuloides*). These species occur primarily in the high elevation, southern portion of the park and are the dominant species on approximately 6,231 acres within the park. Common understory plants include Oregon grape (*Mahonia repens*) and common juniper (*Juniperus communis*).

Non-native plants exist throughout the park (see Appendix A), but are concentrated along the road corridor and areas heavily impacted by park operations, visitor use, and livestock facilities. Common invasive species include whitetop (*Cardaria draba*), yellow salsify (*Tragopogon dubius*), yellow sweet-clover (*Melilotus officinalis*), black medic (*Medicago lupulina*), smooth brome (*Bromus inermis*), cheatgrass (*Bromus tectorum*) and several species of knapweed and thistle. The park has successfully controlled the two known non-native tree species in the region: Russian olive (*Elaeagnus angustifolia*) and Tamarisk (*Tamarix chinensis*). The park's intermittent and perennial streams are essentially devoid of these species with very few individual trees identified during annual vegetation surveys. However, cattle grazing adjacent to the park and frequent livestock trespass into riparian areas within the park requires monitoring of these species to prevent future establishment.

Map B: Vegetation of Bryce Canyon



Impact Threshold Definitions

Impact Intensity	Intensity Definition
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 plant species' populations. The effects would be on a small scale.
Minor	The alternative would affect some individual plants and would also affect a relatively limited 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 within the park. Mitigation to offset adverse effects could be extensive, but would likely be successful.
Major	The alternative would have a considerable effect on individual native plants and affect a sizeable segment of the species' populations over a relatively large area in and out of the park. Mitigation measures to offset the adverse effects would be required, extensive, and success of the mitigation measures would not be guaranteed.

Duration of vegetation impacts is considered short-term if vegetation recovers in three years or less and long-term if the vegetation takes longer than three years to recover.

Alternative I: No Action

Impact Analysis: Under this alternative no invasive vegetation treatments or restoration activities would occur. Without treatment invasive vegetation would spread and infest a larger portion of the park. Disturbed sites would naturally revegetate without intervention but the process may be impeded due to the compaction of soils and trampling.

As part of this alternative current sensitive plant management practices would continue. Inventorying, monitoring, and surveying for sensitive plants would occur sporadically. Since there is no procedure in place for determining when and where monitoring should occur, many impacts to sensitive plants may go undetected.

Cumulative Impacts: Development and farming adjacent to the park is resulting in the loss of native plant communities and introduction and spread of invasive plants. Park construction projects would have localized impacts on native vegetation. Increasing recreation and road traffic within the park would continue to spread invasive species and potentially impact native plant communities. Without any treatment, invasive vegetation would quickly spread at Bryce Canyon. Thus, when combined with other past, present, and foreseeable future actions that would result in impacts to vegetation, Alternative I would have minor, adverse short- and long-term cumulative impacts on the vegetation.

Conclusion: Impacts to vegetation under this alternative would be minor, adverse in the short-term and moderate, adverse in the long-term as infestations of invasive species are not treated and would continue to spread. Cumulative impacts would be minor, adverse when considered in the context of ongoing loss of native plant communities in and around the park.

Alternative II: Preferred Alternative – Full use of IPM techniques (fire, mechanical, chemical, and biological control) to manage invasive plants; implementation of a sensitive plant species monitoring/protection program; implementation of a restoration program.

Impact Analysis: Using an integrated approach to manage invasive plant infestations would allow the park to maximize the areas treated using the most effective methods including fire, mechanical, chemical, and biological control. The localized soil disturbance from mechanical removal of invasive plants could impact adjacent native plants by disturbing underground root systems. This impact would be minimized by tamping the soil back into place after removal of the invasive plants. Chemical treatments have the potential to impact non-target species. This would be minimized by the selection of the most appropriate and least toxic herbicide to control an invasive plant infestation. Herbicides could be used throughout the park including UPD habitat, if determined the most appropriate treatment for the project. Biological

control is not being considered at this time, but could include introducing predators or pathogens to reduce invasive plant infestations. All biological control methods would be approved by the USDA Animal and Plant Health Inspection Service and evaluated to ensure they do not impact non-target plant species.

Implementation of a comprehensive restoration program would benefit vegetation. The areas in most need would receive treatment since an inventory and prioritization procedure would be employed. Restoration would be a requirement of construction projects so all applicable projects would include re-vegetation.

Vegetation would benefit from implementation of a more comprehensive sensitive plant management program. Under this alternative there would be a system in place to determine what projects need sensitive plant surveys and additional monitoring of sensitive plant populations would occur. These actions support conservation of sensitive plant species in BRCA which in turn helps sustain a diverse community of vegetation.

Although meadow grasslands and wetlands make up only a small portion of the vegetation present in BRCA, there are several miles of this habitat type adjacent to the main park road and impacts from invasive species is a constant challenge. Meadows and wetlands represent an especially important habitat and food source for prairie dogs and other wildlife. Many of the plant species present in the meadows are not found elsewhere in the park. Under this alternative, a range of techniques would be available to help manage these habitats. Implementation of invasive plant management activities and restoration work at just a few meadow locations would beneficially affect a sizable portion of the grassland habitat in BRCA.

Cumulative Impacts: Development and farming adjacent to the park is resulting in the loss of native plant communities and introduction and spread of invasive plants. Park construction projects would have localized impacts on native vegetation. Increasing recreation and road traffic within the park would continue to spread invasive species and potentially impact native plant communities. With the full use of IPM techniques, the invasive vegetation within the park would be more effectively controlled. Thus, when combined with other past, present, and foreseeable future actions that would result in impacts to vegetation, Alternative II would have minor, beneficial short and long-term cumulative impacts on the vegetation.

Conclusion: The benefits to the vegetation resource are greatest under this alternative with impacts to vegetation being minor, beneficial in the short-term and moderate, beneficial in the long-term. The most acres of invasive plant populations would be treated under this alternative, including those in meadow habitat. The treatment of invasive plants would directly benefit the native vegetation of the park by reducing competition and displacement from invasive species. Under this alternative, restoration work would occur in meadow habitat and sensitive plants would be better protected, which would help sustain a diverse community of vegetation. Cumulative impacts would be minor, beneficial when considered in the context of ongoing loss of native plant communities in and around the park.

Alternative III: Limited use of IPM techniques (fire and mechanical) to manage invasive plants; implementation of a sensitive plant species monitoring/protection program; implementation of a restoration program.

Impact Analysis: Under this alternative, invasive plant species would be controlled primarily by mechanical methods with some use of fire. The localized soil disturbance from mechanical removal of invasive plants could impact adjacent native plants by disturbing underground root systems. This impact would be minimized by tamping the soil back into place after removal of the invasive plants. Many invasive plant infestations would not be effectively managed under this alternative because of the large amount of labor it takes to treat populations solely by mechanical means; therefore, populations not treated could spread to adjacent areas further impacting native plant communities. Some serious

infestations would not be effectively treated because mechanical methods are not very effective on these species (e.g. tamarisk, Russian knapweed). These species are stimulated to sprout with mechanical disturbance and would require numerous re-treatments. No chemical herbicides would be used; therefore the risk of killing non-target species would not occur. No biological controls would be used under this alternative.

Implementation of a comprehensive restoration program would benefit vegetation. The areas in most need would receive treatment since an inventory and prioritization procedure would be employed. Restoration would be a requirement of construction projects so all applicable projects would include revegetation. Under this alternative restoration activities would be performed in the meadow habitat of the UPD. Meadows cover only a small percent of the park but are important habitat and forage for the UPD and other wildlife. Many of the species present in the meadows are not found elsewhere in the park. Restoration work in the meadows would have a beneficial impact on a sizeable portion of the population of meadow plant species within the park.

Vegetation would benefit from implementation of a more comprehensive sensitive plant management program. Under this alternative there would be a system in place to determine what projects need sensitive plant surveys and additional monitoring of sensitive plant populations would occur. These actions support conservation of sensitive plant species in BRCA which in turn helps sustain a diverse community of vegetation.

Cumulative Impacts: Development and farming adjacent to the park is resulting in the loss of native plant communities and introduction and spread of invasive plants. Park construction projects would have localized impacts on native vegetation. Increasing recreation and road traffic in the park would continue to spread invasive species and potentially impact native plant communities. With the limited use of IPM techniques, the invasive vegetation within the park would not be effectively controlled. Thus, when combined with other past, present, and foreseeable future actions that would result in impacts to vegetation, Alternative III would have negligible cumulative impacts on the vegetation.

Conclusion: The impacts of implementing this alternative would be minor and adverse in the short-term since only a small portion of invasive plant infestations would be treated allowing many native plant populations to continue being displaced by invasive vegetation. Impacts would be moderate and adverse in the long-term as many invasive plant populations would continue to increase due to the limited acreage that could be treated by time-intensive mechanical methods. Many highly invasive species that are not effectively treated with mechanical methods would continue to spread and reduce native vegetation. Implementation of this alternative would have direct adverse impacts on the native vegetation of the park from the continued displacement and competition from invasive species. Sensitive plant species would be better managed under this alternative, helping to sustain a diverse plant community. Restoration activities would be implemented but without adequate tools to control invasive vegetation the ability to restore native habitat is limited. Cumulative impacts would be negligible when considered in the context of ongoing loss of native plant communities in and around the park.

Wetlands

Affected Environment

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. 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. Two of the larger wetlands are the Dave's Hollow meadow and the wetland 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 with Baltic rush (*Juncus balticus*) as the dominant species. 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. This former wetland was approximately 10 acres in size (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. The actions of the preferred alternative are designed specifically for the purpose of preserving and restoring native plant populations including those species found in natural wetland, stream, riparian, or other aquatic habitats. For this reason these actions are excepted from the Statement of Findings and compensation requirements (DO 77-1 *Wetland Protection*).

Impact Threshold Definitions

Impact Intensity	Intensity Definition
Negligible	Wetlands would not be affected or the effects to the resource would be below or at the lower levels of detection. No long-term effects to wetlands or floodplains would occur and any detectable effects would be slight.
Minor	The effects to wetlands or floodplains would be detectable and relatively small in terms of area and the nature of the change. No long-term effects to wetlands or floodplains would occur.
Moderate	The alternative would result in effects to wetlands or floodplains that would be readily apparent, including a long-term effect on wetland vegetation. Wetland or floodplain functions would not be affected in the long-term.
Major	Effects to wetlands or floodplains would be observable over a relatively large area, would be long-term, and would require a U.S. Army Corps of Engineers 404 permit. The character of the wetland or floodplain would be changed so that the functions typically provided by the wetland or floodplain would be substantially changed.

Duration of wetland impacts are considered short-term if wetlands recovers in three years or less and long-term if the wetlands takes longer than three years to recover.

Alternative I: No Action

Impact Analysis: Under this alternative no invasive plant treatments or restoration activities would occur in wetlands. Since no activity would occur there would be little to no impacts to wetlands in the short term. One of the larger infestations of exotic vegetation is of smooth brome located on the old roadbeds in East Creek meadow. Smooth brome and other invasive vegetation located in or near wetlands would be expected to spread under this alternative, further altering the plant composition of the wetlands.

Monitoring and inventorying of rare plants would occur under this alternative. The majority of rare plants at Bryce Canyon are located in the breaks but there is the potential for rare wetland plant species to be present. The surveying for rare plants would have a negligible impact on wetlands.

Cumulative Impacts: Development and agricultural operations adjacent to the park are adversely impacting wetlands. Park facilities, such as the lagoon and roads, have impacted wetlands. The introduction and spread of exotic plants in Bryce Canyon and the surrounding area are altering the plant composition of wetlands. When combined with other past, present, and foreseeable future actions that would result in impacts to wetlands, taking no action to control exotic vegetation would have minor, adverse impacts to wetlands.

Conclusion: In the short-term the impacts of this alternative on wetlands are negligible. In the long-term as invasive vegetation spreads altering the wetland communities, the impacts to wetlands are expect to be moderate, adverse. Cumulative impacts would be minor, adverse when considering the continued alteration of wetland plant composition in the area.

Alternative II: Preferred Alternative – Full use of IPM techniques (fire, mechanical, chemical, and biological control) to manage invasive plants; implementation of a sensitive plant species monitoring/protection program; implementation of a restoration program.

Impact Analysis: Using an integrated approach to manage invasive plant infestations would allow the park to maximize the areas treated using the most effective methods including fire, mechanical, chemical,

and biological control. The localized soil disturbance from mechanical removal of invasive plants could impact adjacent native wetland plants by disturbing underground root systems. This impact would be minimized by tamping the soil back into place after removal of the invasive plants. Chemical treatments have the potential to impact non-target species. This would be minimized by the selection of the most appropriate herbicide and application method that reduces the potential drift. Only herbicides approved for use near water would be applied in or around wet meadow habitat. Biological control is not being considered at this time, but could include introducing predators or pathogens to reduce invasive plant infestations. All biological control methods would be approved by the USDA Animal and Plant Health Inspection Service and evaluated to ensure they do not impact non-target plant species.

Implementation of a comprehensive restoration program would benefit wetlands. Restoration would be a requirement of construction projects so all applicable projects would include re-vegetation. Planting and seeding following invasive plant treatments or construction activities would be employed in wetlands, helping maintain a healthy, diverse wetland habitat.

Monitoring and inventorying of rare plants would occur under this alternative. The majority of rare plants at Bryce Canyon are located in the breaks but there is the potential for rare wetland plant species to be present. The surveying for rare plants would have a negligible impact on wetlands.

Cumulative Impacts: Development and agricultural operations adjacent to the park are adversely impacting wetlands. Park facilities, such as the lagoon and roads, have impacted wetlands. The introduction and spread of invasive plants in Bryce Canyon and the surrounding area are altering the plant composition of wetlands. When combined with other past, present, and foreseeable future actions that would result in impacts to wetlands, taking action to control invasive vegetation and restore habitat would have minor, beneficial impacts to wetlands.

Conclusion: In the short-term the impacts of this alternative on wetlands are minor, adverse as soils and plants in wetlands would be disturbed as a result of vegetation management activities. This alternative would provide the tools to help maintain and restore healthy wetlands. Therefore, in the long-term the impact to wetlands is expect to be moderate, beneficial as invasive vegetation is removed and native plants restored. Cumulative impacts would be minor, beneficial.

Alternative III: Limited use of IPM techniques (fire and mechanical) to manage invasive plants; implementation of a sensitive plant species monitoring/protection program; implementation of a restoration program.

Impact Analysis: Under this alternative, invasive plant species would be controlled primarily by mechanical methods with some use of fire. The localized soil disturbance from mechanical removal of invasive plants could impact adjacent native wetland plants by disturbing underground root systems. This impact would be minimized by tamping the soil back into place after removal of the invasive plants. Many invasive plant infestations are not effectively managed by mechanical methods as mechanical disturbance stimulates sprouting, therefore requiring numerous re-treatments. No chemical herbicides would be used so there is little risk of killing non-target species. No biological controls would be used under this alternative.

Implementation of a comprehensive restoration program would benefit wetlands. Restoration would be a requirement of construction projects so all applicable projects would include re-vegetation. Planting and seeding following invasive plant treatments or construction activities would be employed in wetlands, helping maintain a healthy, diverse wetland habitat.

Monitoring and inventorying of rare plants would occur under this alternative. The majority of rare plants at Bryce Canyon are located in the breaks but there is the potential for rare wetland plant species to be present. The surveying for rare plants would have a negligible impact on wetlands.

Cumulative Impacts: Development and agricultural operations adjacent to the park are adversely impacting wetlands. Park facilities, such as the lagoon and roads, have impacted wetlands. The introduction and spread of invasive plants in Bryce Canyon and the surrounding area are altering the plant composition of wetlands. With the limited use of IPM techniques, the ability to maintain and restore wetlands would be reduced. When combined with other past, present, and foreseeable future actions that would result in impacts to wetlands, this alternative would have negligible impacts to wetlands.

Conclusion: In the short-term the impacts of implementing this alternative would be minor, adverse from treatments of invasive plants. Mechanical treatment of invasive plants disturbs the soil and potentially native plants in the vicinity. Without the option to use herbicides certain infestations would be treated mechanically, although they do not respond well to mechanical methods, potentially requiring numerous treatments. Due to the possible need for numerous treatments and the reduced ability to control invasive vegetation, this alternative would have minor, adverse impacts in the long-term. Cumulative impacts would be negligible when considered in the context of ongoing alterations of wetland plant composition in the area.

Special-Status Species

Threatened, Endangered and Sensitive Plant Species

Affected Environment

The following list (Table 3) was provided through consultations with the USFWS and Utah Division of Wildlife Resources. These plant species may occur within the two counties in which the park lies.

Table 3: Federally Listed Plant Species*

Common name	Scientific Name	Federal Status	Found in BRCA
Autumn Buttercup	<i>Ranunculus aestivalis</i>	Endangered	No
Kodachrome Bladderpod	<i>Lesquerella tumulosa</i>	Endangered	No
Siler Pinchusion 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
Maguire daisy	<i>Erigeron maguirei</i>	Threatened	No
Ute Ladies'-tresses	<i>Spiranthes diluvialis</i>	Threatened	No

*List based on "County Lists of Utah's Federally Listed Threatened, Endangered, and Candidate Species," Utah Division of Wildlife Resources, updated September 15, 2009

Autumn buttercup (*Ranunculus aestivalis*) 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.

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.

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

Ute 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.

Bryce Canyon hosts several plant species considered sensitive because of their limited distribution (endemism) or because they are disjunct from more abundant population centers (Table 4). Many of these species are found on barren areas along the breaks and in open pine woodland habitats on bare, gravelly soils that are not heavily infested with invasive vegetation.

Table 4: Sensitive Plant Species of Bryce Canyon National Park¹

Common name	Scientific Name	Status ²
Fragrant sand-verbena	<i>Abronia fragrans</i>	N
Navajo Lake milkvetch	<i>Astragalus limnocharis</i> var. <i>limnocharis</i>	G2T1
Reveal paintbrush	<i>Castilleja parvula</i> var. <i>revelii</i>	G2TNR
Yellowish cryptanth	<i>Cryptantha ochroleuca</i>	G1?
Least spring-parsley	<i>Cymopterus minimus</i>	G1G2Q
Widtsoe buckwheat	<i>Eriogonum aretioides</i>	G2
Cedar Breaks goldenbush	<i>Haplopappus zionis</i>	G2
Jones goldenaster	<i>Heterotheca jonesii</i>	G2
Claron pepperwort	<i>Lepidium montanum</i> var. <i>claronense</i>	G5?T1?
Jones' locoweed	<i>Oxytropis oreophila</i> var. <i>jonesii</i>	W
Paria breadroot	<i>Pedimelum pariense</i>	G2G3
Platy penstemon	<i>Penstemon bracteatus</i>	G2
Nipple Bench phacelia	<i>Phacelia mammillarensis</i>	W
Arizona bladderpod ³	<i>Physaria arizonica</i>	W
Claron twinpod	<i>Physaria chambersii</i> var. <i>sobolifera</i>	W
Lepidote twinpod	<i>Physaria lepidota</i> var. <i>membranacea</i>	G3T2?
Podunk groundsel	<i>Senecio malmstenii</i>	G1
Barkley's groundsel	<i>Senecio wernerifolius</i> var. <i>barkleyi</i>	W
Maguire campion	<i>Silene petersonii</i>	G2G3
Head sphaeromeria	<i>Sphaeromeria capitata</i>	G3
Bryce Canyon townsendia	<i>Townsendia montana</i> var. <i>minima</i>	W

¹List based on 2004 Utah Rare Plant Guide, 2009 UNPS Utah rare plant list and Annotated checklist of vascular flora: Bryce Canyon National Park (Fertig and Topp 2009)

²NatureServe Conservation Status Ranks and UNPS Priority Level

³Historically present in the park

Impact Threshold Definitions

Impact Intensity	Intensity Definition
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.

Special-status species' impacts are considered short-term if the species recovers in one year or less and long-term if it takes longer than one year for the species to recover.

Alternative I: No Action

Federally Listed Species: None of the seven federally listed plant species that occur within Garfield or Kane counties are known to occur within BRCA. Therefore, Alternative I would have no effect on federally listed plant species.

State-Listed or Other Sensitive Species: Sensitive plant species within the park are expected to be found primarily along the breaks or on bare, gravelly soils where vegetation is sparse. Since no treatments would occur under this alternative no direct impacts to sensitive plants would be expected. Indirect impacts could include the encroachment of invasive vegetation. As invasive vegetation is sparse around sensitive plant populations this impact is minimal.

Although not as proactive as Alternatives II or III, sensitive plant species would receive protection under this alternative whenever their location is known or discovered. With limited monitoring or compiling of past studies, identifying sensitive plant populations at risk due to construction projects or visitor impacts is more difficult. If impacts to sensitive plants were detected, such as trampling by hikers, steps would be taken to mitigate the impacts.

Cumulative Impacts: Because no federally listed plant species occur within the park, none of the alternatives would result in cumulative effects on these species. Cumulative impacts to other sensitive plant species include the effects of disturbances in and outside the park, such as the potential for trampling or disturbance from visitor use in the park and off-road vehicle use in areas surrounding the park. 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 I, combined with impacts of other actions that could affect sensitive plant species, would result in negligible cumulative impacts to these species.

Conclusion: Alternative I would result in no adverse impacts on federally listed plant species, since none are present in the park and minor, beneficial impacts on sensitive plant species in the short- and long-term. This alternative would provide for the protection of some of the sensitive plant populations known to occur in BRCA, although a comprehensive inventory of sensitive plant locations would not be undertaken. Cumulative impacts to sensitive plants would be negligible.

Alternative II: Preferred Alternative – Full use of IPM techniques (fire, mechanical, chemical, and biological control) to manage invasive plants; implementation of a sensitive plant species monitoring/protection program; implementation of a restoration program.

Federally Listed Species: Alternative II would have no effect on federally listed plant species, since none are known to occur within the park.

State-Listed or Other Sensitive Species: Invasive plant treatments would have negligible impacts to sensitive plant species, since these are generally limited to barren habitats along the breaks where invasive plants are sparse. Using an integrated approach would allow the park to use the most appropriate treatment methods and minimize the adverse impacts of the treatments. Although chemical and biological treatments are an option under this alternative, in most instances mechanical treatment would be the most appropriate method and poses little threat to sensitive plant species when properly implemented. If invasive plant management work were proposed in or near areas that would contain these species, pre-treatment surveys would be conducted to ensure that sensitive species are identified and protected. Access routes to the treatment sites would be selected that avoids impact to these sensitive plants.

Sensitive plant species within the park are expected to be found primarily along the breaks or on bare, gravelly soils where vegetation is sparse. The necessity for restoration in these areas is limited, especially since the desired condition is often bare ground or sparse vegetation. Restoration activities are therefore expected to have negligible impacts on sensitive plants.

Sensitive plants would benefit under this alternative because a procedure would be in place to determine what projects require sensitive plant surveys. Additional monitoring of sensitive plant populations would

also occur under this alternative. The development of maps showing the known locations of sensitive plants or associated habitat, surveying prior to construction projects, and additional monitoring would serve to improve sensitive plant conservation.

Cumulative Impacts: Because no federally listed plant species occur within the park, none of the alternatives would result in cumulative effects on these species. Cumulative impacts to other sensitive plant species include the effects of disturbances in and outside the park, such as the potential for trampling or disturbance from visitor use in the park. 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, the comprehensive sensitive plant management program described under Alternative II, combined with impacts of other actions that could affect sensitive plant species, would result in minor, beneficial cumulative impacts to these species.

Conclusion: Alternative II would result in no adverse impacts on federally listed plant species, since none are present in the park. Impacts to sensitive plant species would be moderate, beneficial in the short- and long-term as more sensitive plant populations are monitored and impacts from construction projects and visitors are mitigated. Impacts to sensitive plant species from invasive plant treatments and native plant restoration is negligible and would be mitigated by conducting a sensitive plant survey prior to any work in the breaks or other habitats where rare plants may be encountered. Cumulative impacts to sensitive plants would be negligible.

Alternative III: Limited use of IPM techniques (fire and mechanical) to manage invasive plants; implementation of a sensitive plant species monitoring/protection program; implementation of a restoration program.

Federally Listed Species: None of the seven federally listed plant species that occur within Garfield or Kane counties is known to occur within BRCA. Therefore, Alternative III would have no effect on federally listed plant species.

State-Listed or Other Sensitive Species: The 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 conducive to the establishment of invasive vegetation. Sensitive plant species are found primarily along the breaks or on bare, gravelly soils in or near open pine woodlands, where vegetation is minimal. Invasive plants are uncommon in this area and when present consist of a few individuals that can be effectively treated with mechanical methods, without impacts to nearby sensitive species. If invasive plant management work were proposed in or near areas that may contain these species, pre-treatment surveys would be conducted to ensure that sensitive species are identified and protected. Access routes to the treatment sites would be selected to avoid impact to these sensitive plants.

Sensitive plant species within the park are expected to be found primarily along the breaks or on bare, gravelly soils where vegetation is sparse. The necessity for restoration in these areas is limited, especially since the desired condition is often bare ground or sparse vegetation. Restoration activities are therefore expected to have negligible impacts on sensitive plants.

Sensitive plants would benefit under this alternative because a procedure would be in place to determine what projects need sensitive plant surveys. Additional monitoring of sensitive plant populations would also occur under Alternative III. The development of maps showing the known locations of sensitive plants or associated habitat, surveying prior to construction projects, and additional monitoring would serve to improve sensitive plant conservation.

Cumulative Impacts: The cumulative impacts are the same as Alternative II.

Conclusion: Alternative III would result in no adverse impacts on federally listed plant species, since none are present in the park. The short- and long-term impacts on sensitive plant species would be moderate, beneficial as additional sensitive plant populations are monitored and impacts from construction projects and visitors are mitigated. Impacts to sensitive plant species from invasive plant treatments and restoration efforts is negligible and would be mitigated by conducting a sensitive species survey prior to any work in the breaks or other habitats where rare plants may be encountered. Cumulative impacts to sensitive plants would be negligible.

Threatened, Endangered, and Sensitive Animal Species

Affected Environment

The animal species listed in Table 5 and described below either occur or have the potential to occur within BRCA. The list is based on consultation with the USFWS and Utah Division of Wildlife Resources. If the species is also listed by the State of Utah, its state status is indicated.

Table 5: Federally Listed and Candidate Animal Species

Common name	Scientific Name	Federal Status	State Status ¹	Found in BRCA ²	Comments
Mexican Spotted Owl	<i>Strix occidentalis lucida</i>	Threatened	Tier I	No	Never found during several park surveys
California Condor	<i>Gymnogyps californianus</i>	Endangered	Tier I	Yes	Intermittent visitor; experimental population
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	Candidate	Tier I	Yes	One sighting in Sheep Creek; no known nesting
Southwestern Willow Flycatcher	<i>Empidonax traillii Extimus</i>	Endangered	Tier I	Yes	A few sightings along Sheep and Yellow Creek; no nesting
Utah Prairie Dog	<i>Cynomys parvidens</i>	Threatened	Tier I	Yes	Breeds in park; several colonies
Kanab Ambersnail	<i>Oxyloma kanabense</i>	Endangered	Tier I	No	Limited habitat
Coral Pink Sand Dunes Tiger Beetle	<i>Cincindela limbata Albissima</i>	Candidate		No	No habitat
Colorado Pikeminnow	<i>Ptychocheilus lucius</i>	Endangered	Tier I	No	Limited habitat
Razorback Sucker	<i>Xyrauchen texanus</i>	Endangered	Tier I	No	Limited habitat
Humpback Chub	<i>Gila cypha</i>	Endangered	Tier I	No	Limited habitat
Bonytail	<i>Gila elegans</i>	Endangered	Tier I	No	Limited habitat

¹ Utah Comprehensive Wildlife Conservation Strategy, 2005. Utah Division of Wildlife Resources Publication number 05-19.

²Based on surveys, park staff knowledge, presence of preferred habitat, and known range.

Mexican spotted owl (*Strix occidentalis lucida*) is a federally threatened species and a state-listed Tier I species that has not been 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. Additional surveys were completed in 2008 and 2009 in select areas of the park and no owls were documented at that time (Bryce Canyon National Park 2009). Bryce Canyon contains very limited suitable habitat for the owl, so these results are not unexpected.

California condor (*Gymnogyps californianus*) is an intermittent visitor in the park and is part of an experimental population in Utah. This federally threatened species and state-listed Tier I species is not known to use the park consistently and does not use the park as a breeding area.

Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) is a federal candidate species and state-listed Tier I 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 2002). Their primary breeding habitat is an over-story of cottonwood canopy, which is rare in the park.

Southwestern willow flycatcher (*Empidonax traillii extimus*) is federally endangered and a state-listed Tier I 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; 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 2002). Currently, no non-native plant species that would provide suitable nesting areas exists within Yellow Creek or Sheep Creek/Swamp Canyon. Additionally, treatments of non-native trees (greater than 2" DBH) along riparian areas would be limited to after the breeding bird season to minimize any impacts to the species.

Utah prairie dog (*Cynomys parvidens*), a federally threatened species and state-listed Tier I species, occurs in several colonies in the central and northern portions of the park that contain open, grassy meadows. The UPD, 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 UPD is the most restricted of the three members of this group. Its total numbers declined drastically from the 1920s to 1960s. 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 UPD is still threatened over much of its range by loss of habitat. Despite the problems listed above, the UPD increased in overall population numbers between 1976 and 1991 (USFWS 1991; Utah Prairie Dog Recovery Implementation Team 1997). At BRCA, UPD reintroductions occurred between 1976 and 1988, after being absent from the park since the 1960's. Since the reintroduction program, the annual spring prairie dog counts at BRCA have fluctuated from under 50 animals to over 150 (Bryce Canyon National Park 2009). Several active colonies are found in the meadows of the park, including a relatively large colony west of the park road near maintenance facilities. The impact analysis in this section focuses on UPD due to potential vegetation management activities that would occur in proximity to colonies.

Kanab ambersnail (*Oxyloma haydeni kanabensis*), a federally endangered and state-listed Tier I species, is not known to occur in the park. Kanab ambersnails are found in two distinct localities in Utah: Three Lakes and Kanab Creek (Oliver and Bosworth 1999). All of these areas are disjunct from the park.

Coral Pink Sand Dunes tiger beetle (*Cincindela limbata albissima*), a federally listed candidate species, is not found in BRCA. Its distribution is limited to the sand dunes within Coral Pink Sand Dunes State Park and also on adjacent lands managed by the BLM (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 species are found within Bryce Canyon, primarily due to a lack of appropriate habitat.

Several species on the Utah Sensitive Species List (UDWR 2007) and listed in the Utah Comprehensive Wildlife Conservation Strategy (UDWR 2005) as a species of concern have been documented within the park seasonally or throughout the year including: bald eagle (*Haliaeetus leucocephalus*, occasional winter visitor), ferruginous hawk (*Buteo regalis*, occasional winter visitor), greater sage-grouse (*Centrocercus urophasianus*, rare year-round inhabitant), Lewis's woodpecker (*Melanerpes lewis*, rare winter visitor), three-toed woodpecker (*Picoides tridactylus*, rare winter visitor), long-billed curlew (*Numenius americanus*, migrant), American white pelican (*Pelecanus erythrorhynchos*, migrant), spotted bat (*Euderma maculatum*) and fringed myotis (*Myotis thysanodes*). Two sensitive bird species known to breed in Bryce Canyon are associated with special management/monitoring actions discussed below:

Peregrine falcon (*Falco peregrinus anatum*) was removed from the federal list of endangered and threatened species in 1999 and is state-listed as a Tier III species. Bryce Canyon staff continues to

conduct protocol monitoring on this species semi-annually and keeps data on nesting sites within the park. There are several known eyries within the park, all located along the breaks or cliffs; however, birds have been observed hunting in surrounding open woodlands and grasslands.

Northern goshawk (*Accipiter gentilis*), is a state-listed Tier I and Conservation Agreement species in the state of Utah, and is known to nest in the park and hunt over open grasslands. Northern goshawks are monitored within the park and protocol surveys are conducted prior to prescribed burns.

Impact Threshold Definitions

Impact Intensity	Intensity Definition
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.

Special-status species' impacts are considered short-term if the species recovers in one year or less and long-term if it takes longer than one year for the species to recover.

Alternative I: No Action

Impact Analysis: Under this alternative invasive plant treatments and restoration activities would not take place in UPD habitat so colonies would not be distressed by staff working adjacent to burrows. However, without treatment the composition of the meadows would continue to degrade and provide less native forage for the UPD colonies. Federally listed bird species found in BRCA are not known to nest in the park. These birds are primarily scavengers, carnivores, and/or insectivores, not herbivores. State listed species that occur within BRCA are generally absent during the summer season, with the exception of a few species that use the park during breeding. A lack of vegetation management activities would have no noticeable impact on special status bird species.

The sensitive plant species found at BRCA are not a main source of food or habitat for any of the federally or state-listed animal species. Changes in the population of sensitive plants would not have a detectable affect on federally listed animal species.

Cumulative Impacts: Development in Southern Utah is resulting in loss of habitat that is essential to the survival of special status species. The lack of vegetation management activities at Bryce Canyon would result in further degradation of UPD habitat. In the short-term fire in and around UPD colonies has adverse impact on the species but in the long-term is beneficial as it reduces the encroachment of shrubs into the meadows. When combined with other past, present, and foreseeable future actions that would result in impacts to special status species, this alternative would have minor, adverse cumulative impacts to special status species.

Conclusion: This alternative would have negligible short-term impacts to special status species as no activities would occur. Impacts to the Utah prairie dog would be moderate, adverse in the long-term due to the lack of vegetation treatments in prairie dog habitat, leading to the spread of invasive vegetation and degradation of habitat and forage. Cumulative impacts would be minor, adverse when considered in the context of ongoing impacts on the habitat of UPD in the area with negligible effects on other special status species.

Alternative II: Preferred Alternative – Full use of IPM techniques (fire, mechanical, chemical, and biological control) to manage invasive plants; implementation of a sensitive plant species monitoring/protection program; implementation of a restoration program.

Impact Analysis: Under this alternative, the most effective and efficient invasive plant treatment methods would be used. Chemical treatments have the potential to impact non-target species. This would be minimized by the application methods and chemicals selected for use. The use of backpack sprayers for spot treatment and cut stump application minimizes the potential of listed species being exposed to herbicides. Biological control is not likely to be used, but could include introducing predators or pathogens to reduce invasive plant infestations. Using biological control could have minor, adverse short-term impacts on special-status wildlife (e.g. through competition for food) if the agent is not selected and monitored carefully.

Under this alternative, restoration treatments may occur in the meadows, including seeding and planting around UPD burrows, which could cause some distress to the colonies. However, in the long-term restoration would help restore the native plant community and thus improve the forage for the UPD. Invasive plant treatments would take into account the presence of Utah prairie dogs in selection of the most appropriate method that would reduce negative impacts on park colonies. Potential impacts to UPD would be addressed through approved mitigation measures and consultation with USFWS. Mitigation methods would include restrictions on timing of treatment, acceptable distance of treatments to active burrows, and type of equipment/herbicides used. Development of these mitigation measures have been coordinated with and approved by the USFWS to ensure that the species would not be adversely affected if Alternative II is selected.

Federally listed birds species found in BRCA are not known to nest in the park. These birds are primarily scavengers, carnivores, and/or insectivores, not herbivores. State listed species that occur within BRCA are generally absent during the summer season, with the exception of a few species that use the park during breeding. Vegetation management activities would have negligible to minor, direct impacts on these species (depending on individual species' foraging needs); indirect impacts to food sources would be negligible. Restoration of native plant communities would have no direct impacts on these species.

The sensitive plant species found at BRCA are not a main source of food or habitat for any of the federally or state-listed animal species. Changes in the population of sensitive plants would not have a detectable affect on federally listed animal species.

Cumulative Impacts: Development in Southern Utah is resulting in loss of habitat that is essential to the survival of special status species. Implementation of a vegetation management program at Bryce Canyon would help maintain and restore UPD habitat. In the short-term, fire in and around UPD colonies has adverse impacts on the species but in the long-term is beneficial as it reduces the encroachment of shrubs into the meadows. Thus, when combined with other past, present, and foreseeable future actions that would result in impacts to special status species, this alternative would have minor, beneficial cumulative impacts.

Conclusion: The preferred alternative would have short-term, minor, adverse impacts to special-status species due to the disruption to UPD caused by implementation of invasive plant management and restoration treatments in meadow habitat. The long-term impacts would be moderate and beneficial as invasive plant treatment and native plant restoration activities would help restore meadow habitat occupied by UPD and improve forage. Impacts to other special status species would be indirect and result from improvement of habitat, not from direct impacts to any individual species. Cumulative impacts would be minor, beneficial when considered in the context of ongoing impacts to habitats of special status species.

Alternative III: Limited use of IPM techniques (fire and mechanical) to manage invasive plants; implementation of a sensitive plant species monitoring/protection program; implementation of a restoration program.

Impact Analysis: Mechanical and prescribed fire treatments would not be sufficient to control invasive vegetation and would likely spread under this alternative. The spread of invasive vegetation may alter the plant composition of the meadows in which the UPD forages. Mechanical control methods are more labor intensive and would require staff to be in the vicinity of prairie dog burrows for much longer periods of time than with other treatments. The lack of chemical treatments under this alternative would eliminate the risk of herbicide exposure to UPD colonies. Federally listed birds species found in BRCA are not known to nest in the park. These birds are primarily scavengers, carnivores, and/or insectivores, not herbivores. State listed species that occur within BRCA are generally absent during the summer season, with the exception of a few species that use the park during breeding. Mechanical vegetation treatments and prescribed fire activities would have temporary, minor impacts on these species and indirect impacts to their food sources would be negligible.

Under this alternative restoration treatments may occur in the meadows, including seeding and planting around UPD burrows which would cause distress to the colonies. Mitigation measures have been developed in consultation with the USFWS that include timing of treatment, acceptable distance of treatments to active burrows, and appropriate type of equipment used in meadow habitat. Implementation of these mitigation measures would ensure that the species is not adversely affected if Alternative III is selected. Restoring the native plant community would help improve the forage for the UPD. However, without being able to effectively control invasive vegetation, the success of restoration activities and the benefit to UPD colonies within the park would be limited.

The sensitive plant species found at BRCA are not a main source of food or habitat for any of the federally or state-listed animal species. Changes in the population of sensitive plants would not have a detectable affect on federally listed animal species.

Cumulative Impacts: Development in Southern Utah is resulting in loss of habitat that is essential to the survival of special status species. In the short-term fire in and around UPD colonies has adverse impact on the species but in the long-term is beneficial as it reduces the encroachment of shrubs into the meadows. The success of UPD habitat restoration at Bryce Canyon would be minimal due to the limited techniques available to treat invasive vegetation. Thus, when combined with other past, present, and foreseeable future actions that would result in impacts to special status species, this alternative would have negligible cumulative impacts.

Conclusion: This alternative would have minor, adverse short-term impacts to threatened, endangered, and sensitive animal species since mechanical treatments would disturb the habitat of UPD. Long-term impacts would be moderate and adverse due to degradation of meadow habitat essential for UPD because invasive species would be expected to expand since mechanical and fire treatments alone are not effective to control the spread of non-native species. Impacts to special status species would be primarily indirect and result from degradation of habitat, not from direct impacts to any special status species. Cumulative impacts would be negligible when considered in the context of ongoing loss of habitat for special status species.

Wilderness Character

Affected Environment

A total of 22,325 acres (62%) of the park has been recommended as wilderness (Map C). 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 1987). While not yet legislatively

designated, this recommended wilderness (which was proposed in 1974) is managed as wilderness in accordance with NPS *Management Policies* (NPS 2006). These areas provide visitors an opportunity to experience Bryce Canyon's backcountry unimpaired by the sounds of development and human civilization.

The 1964 Wilderness Act states that wilderness areas "shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character." There are four qualities of wilderness character:

- **Untrammeled** - Wilderness is essentially unhindered and free from modern human control or manipulation.
- **Natural** - Wilderness ecological systems are substantially free from the effects of modern civilization.
- **Undeveloped** - Wilderness retains its primeval character and influence, and is essentially without permanent improvement or modern human occupation.
- **Solitude or a primitive and unconfined type of recreation** - Wilderness provides outstanding opportunities for solitude or primitive and unconfined recreation.

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."

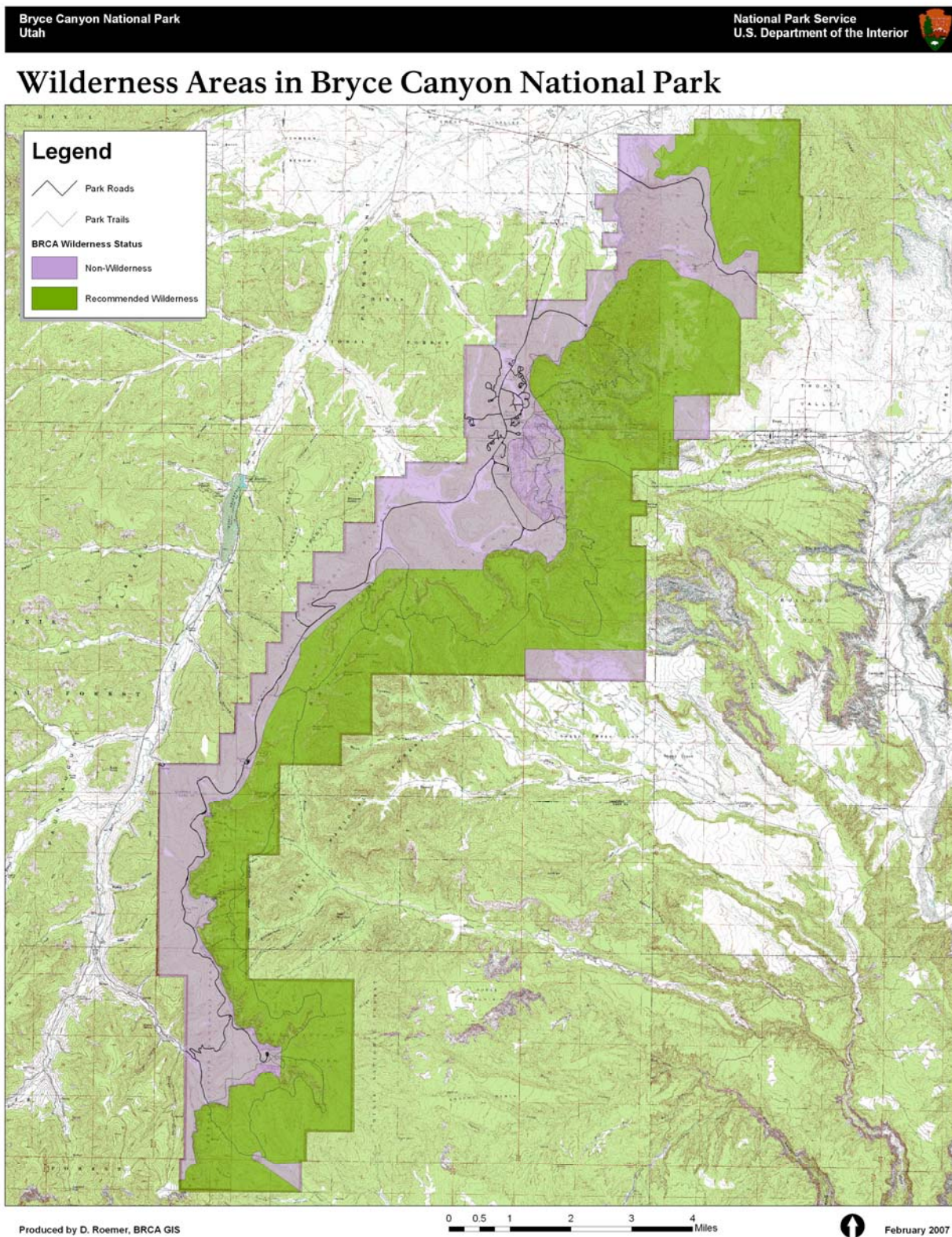
All invasive plant management activities affecting wilderness would be consistent with the minimum requirements process. This concept is a documented process used to determine if administrative activities affecting wilderness resources or the visitor experience are necessary and how to minimize impacts. The minimum requirements decision guide is a two-step process that determines (1) whether or not the proposed vegetation 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. The first step of this process has been completed and it was determined that administrative action is necessary to preserve the natural quality of the vegetation within the recommended wilderness of Bryce Canyon (Appendix D). Determination of the minimum activity (Step 2) would be conducted prior to any vegetation management actions in the wilderness.

Impact Threshold Definitions

Impact Intensity	Intensity Definition
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 of wilderness character impacts is considered short-term if effects extend only through the duration of the proposed treatment and long-term if effects extend beyond the period of the proposed treatment.

Map C: Recommended Wilderness



Alternative I: No Action

Impact Analysis: Under this alternative both invasive vegetation and disturbed park land in recommended wilderness would not be treated. As no treatments would occur the solitude and untrammelled qualities of the wilderness character would not be impacted. However, in the long-term the lack of treatments would have an adverse impact to natural quality of wilderness as an effect of modern civilization (i.e. introduction of exotic vegetation) becomes more prevalent.

Many of the known sensitive plant populations are located in the main amphitheater outside of recommended wilderness. However, a few known sensitive plant populations exist in the recommended wilderness. The presence of staff to conduct inventory and monitoring of sensitive plants would disrupt the natural quiet, adversely impacting the solitude quality of wilderness character.

Cumulative Impacts: Disturbances from park maintenance, commercial helicopter and airplane flights over the park, fire management activities, increased recreation, cattle grazing along the park boundary, and private development near the park all impact the wilderness character. The introduction and spread of invasive vegetation is a threat to the natural quality of the wilderness character. When combined with other past, present, and foreseeable future actions that would result in impacts on wilderness character, this alternative would have minor, adverse cumulative impacts on wilderness resources.

Conclusion: Negligible short-term impacts are predicted as no activities would occur, so solitude and untrammelled qualities of the wilderness character would not be affected. Under this alternative the introduction and spread of invasive vegetation is expected to be the greatest, which would adversely affect the natural quality of the wilderness resulting in long-term moderate, adverse impacts. Cumulative effects would be minor when considered in context of other activities occurring around the park.

Alternative II: Preferred Alternative – Full use of IPM techniques (fire, mechanical, chemical, and biological control) to manage invasive plants; implementation of a sensitive plant species monitoring/protection program; implementation of a restoration program.

Impact Analysis: Under this alternative, the use of an integrated approach to manage invasive plant infestations would allow the park to maximize the areas treated using the most effective methods including: prescribed fire, mechanical, chemical, and biological control. Mechanical and chemical treatments would cause short-term impacts to solitude and untrammelled qualities of the wilderness character. The natural quiet would be disrupted from human presence and the use of motorized tools, if determined appropriate under the minimum requirement concept impacting opportunities for solitude. Invasive plant control is a form of human manipulation that adversely impacts the untrammelled quality of the wilderness.

Biological control is not likely to be used, but could include introducing predators or pathogens to reduce invasive plant infestations. Wilderness character, specifically untrammelled and natural qualities, would be impacted by biological control as it is a human manipulation that could alter the natural processes. These impacts would be mitigated by the selection of appropriate biological controls with consultation with the USFWS and careful monitoring. In the long-term, vegetation management activities would have a beneficial impact to natural quality of wilderness by removing an effect of modern civilization (i.e. introduction of exotic vegetation).

Most of the sites within the park in need of restoration are a result of high visitor use or construction activities, both of which primarily occur in non-recommended wilderness. However, there is the possibility that restoration activities would be implemented in the wilderness, particularly following treatment of invasive vegetation. The natural quiet would be disrupted from human presence and the use of tools thus impacting the solitude quality of the wilderness temporarily. The untrammelled quality

would also be adversely impacted owing to human manipulation of native vegetation. The natural quality would be beneficially impacted due to restoration of the native vegetation.

Many of the known sensitive plant populations are located in the main amphitheater which is not recommended wilderness. However, a few known sensitive plant populations exist in the recommended wilderness. The presence of staff to conduct inventory and monitoring of sensitive plants would disrupt the natural quiet, adversely impacting the solitude quality of wilderness character.

Cumulative Impacts: Disturbances from park maintenance, commercial helicopter and airplane flights over the park, fire management activities, increased recreation, cattle grazing along the park boundary, and private development near the park all impact the wilderness character. The introduction and spread of invasive vegetation is a threat to the natural quality of the wilderness character. When combined with other past, present, and foreseeable future actions that would result in impacts on wilderness character, this alternative would have minor, beneficial cumulative impacts on wilderness resources.

Conclusion: The preferred alternative would have short-term, minor, adverse impacts on wilderness resources as mechanical, chemical, and biological treatments could directly or indirectly impact the wilderness character, specifically untrammelled, natural, and solitude. Long-term impacts are expected to be minor and beneficial as plant communities revert to more pristine, native conditions due to vegetation treatments improving the natural quality. Cumulative effects would be minor, beneficial.

Alternative III: Limited use of IPM techniques (fire and mechanical) to manage invasive plants; implementation of a sensitive plant species monitoring/protection program; implementation of a restoration program.

Impact Analysis: Plant infestations would not be as effectively managed under this alternative because of the large amount of labor required to mechanically remove populations; therefore populations not treated could spread to adjacent areas further altering the natural quality of the recommended wilderness. Mechanical treatments would adversely impact the untrammelled and natural qualities in localized areas within the recommended wilderness. The opportunities for solitude would be disrupted from human presence and the use of motorized tools, if determined appropriate under the minimum requirement concept.

Most of the sites within the park in need of restoration are a result of high visitor use or construction activities, both of which primarily occur in non-recommended wilderness. However, there is the possibility that restoration activities would be implemented in the wilderness, particularly following treatment of invasive vegetation. The natural quiet would be disrupted from human presence and the use of tools thus impacting the solitude quality of the wilderness temporarily. The untrammelled quality would also be adversely impacted owing to human manipulation of native vegetation. The natural quality would be beneficially impacted due to restoration of the native vegetation. Many of the known sensitive plant populations are located in the main amphitheater which is not recommended wilderness. However, a few known sensitive plant populations in the recommended wilderness exist. The presence of staff to conduct inventory and monitoring of sensitive plants would disrupt the natural quiet, adversely impacting the solitude quality of wilderness character.

Cumulative Impacts: Disturbances from park maintenance, commercial helicopter and airplane flights over the park, fire management activities, increased recreation, cattle grazing along the park boundary, and private development near the park all impact the wilderness character. The introduction and spread of invasive vegetation is a threat to the natural quality of the wilderness character and would not be as effectively managed at Bryce Canyon under this alternative. When combined with other past, present, and foreseeable future actions that would result in impacts on wilderness character, this alternative would have negligible cumulative impacts on wilderness resources.

Conclusion: Under this alternative, short-term impacts on the wilderness character qualities of solitude and untrammelled would be minor due to the noise associated with the presence of staff and equipment, invasive plant treatments, and restoration activities. The spread of invasive plants would continue under this alternative and would result in long-term, minor, adverse impacts on the natural quality of the wilderness. Cumulative effects would be negligible.

Park Operations

Affected Environment

Implementation of the proposed plan would affect the operations of the park including: the number of employees needed; the type of duties that need to be conducted; when/who would conduct these duties; how activities would be conducted; and administrative procedures. Potentially staff would need to be hired to carry out implementation of the vegetation management plan. Equipment and tools would need to be purchased. The proposed action would affect construction activities, as revegetation and invasive plant prevention/control could become standard practice.

Impact Threshold Definitions

Impact Intensity	Intensity Definition
Negligible	Park operations would not be affected or the effect would be at or below the lower levels of detection, and would not have an appreciable effect on park operations.
Minor	The effect would be detectable, but would be of a magnitude that would not have an appreciable adverse or beneficial effect on park operations. If mitigation were needed to offset adverse effects, it would be relatively simple and successful.
Moderate	The effects would be readily apparent and would result in a substantial adverse or beneficial change in park operations in a manner noticeable to staff and the public. Mitigation measures would probably be necessary to offset adverse effects and would likely be successful.
Major	The effects would be readily apparent and would result in a substantial adverse or beneficial change in park operations in a manner noticeable to staff and the public, and be markedly different from existing operations. Mitigation measures to offset adverse effects would be needed, could be expensive, and their success could not be guaranteed.

Duration of impacts to park operation are considered short-term if the proposed action would affect one year or less of daily park operations and long-term if park operations are affected for greater than one year.

Alternative I: No Action

Impact Analysis: Under this alternative there would be limited vegetation management activities associated with other approved projects or plans. There would not be the need to hire addition staff, supervise a vegetation crew, or purchase extra equipment. However, disturbed land and invasive plant infestations would still need to be monitored for GPR reporting. Without designated vegetation staff this job would be added to the duties of the current Resource Management staff at Bryce Canyon. Native and invasive vegetation grow in and around the sewage lagoon ponds, affecting the integrity of pond liners. Without vegetation management activities the operation and condition of the sewage lagoon would be negatively impacted.

Cumulative Impacts: Nearly any project that occurs in the park has an effect on park operations. Planning for projects, such as the sewer line replacement or construction of wildlife viewing pullouts and bike trails, typically requires involvement from a variety of park staff to contribute their expertise and assistance. Other resource management projects such as soundscape monitoring and fire management involve resource management staff and the hiring of additional seasonal staff. Fire management has the potential to greatly alter park operations depending on the size and location of fires. The maintenance of trails requires the mobilization of large crews and the use of specialized equipment. Under this alternative, there would be a negligible to minor effect on park operations, which would cumulatively have a negligible impact to park operations when considered with other past, present, and reasonably foreseeable future actions.

Conclusion: In the short-term, the impacts from Alternative I would be negligible as very few changes to park operations would occur. The lack of vegetation treatments at the lagoon would over time weaken the integrity of the liners resulting in long-term, minor, adverse impact to park operations. Cumulatively, these effects would have a negligible impact on park operations when considered with other past, present, and reasonably foreseeable future actions.

Alternative II: Preferred Alternative – Full use of IPM techniques (fire, mechanical, chemical, and biological control) to manage invasive plants; implementation of a sensitive plant species monitoring/protection program; implementation of a restoration program.

Impact Analysis: This alternative would facilitate the need to hire additional staff, supervise a vegetation crew, and purchase extra equipment. Revegetation and invasive plant prevention/control would be standard practice and impact the scope of work for construction projects within the park. Vegetation treatments would occur at the lagoons to help maintain the integrity of the pond liners. Dedicated staff would be necessary to organize and execute inventorying, monitoring, and protecting of sensitive plants for the park.

Cumulative Impacts: Nearly any project that occurs in the park has an effect on park operations. Planning for projects, such as the sewer line replacement or construction of wildlife viewing pullouts and bike trails, typically requires involvement from a variety of park staff to contribute their expertise and assistance. Other resource management projects such as soundscape monitoring and fire management involve resource management staff and the hiring of additional seasonal staff. Fire management has the potential to greatly alter park operations depending on the size and location of fires. The maintenance of trails requires the mobilization of large crews and the use of specialized equipment. When considered in the context of the numerous projects occurring at Bryce Canyon this alternative would cumulatively have a minor, adverse impact to park operations.

Conclusion: Short and long-term impact to park operations under the preferred alternative would be minor, adverse. The implementation of the proposed vegetation management plan would enable the park to effectively manage plant communities. Minor, adverse effects to park operations would occur due to the additional duties, staff, and administrative procedures. Cumulatively, the impacts from this alternative would have a minor, adverse effect on park operations when considered with other past, present, and reasonably foreseeable future actions.

Alternative III: Limited use of IPM techniques (fire and mechanical) to manage invasive plants; implementation of a sensitive plant species monitoring/protection program; implementation of a restoration program.

Impact Analysis: This alternative would necessitate the hiring of additional staff, supervision of a vegetation crew, and purchasing of extra equipment. Mechanical methods would be the primary means of controlling invasive vegetation. Mechanical methods are not effective on certain species and are labor intensive; therefore, additional staff may need to be hired compared to staff needs under Alternative II. Revegetation and invasive plant prevention/control would be standard practice and impact the scope of work for construction projects within the park. Vegetation treatments would occur at the lagoons to help maintain the integrity of the pond liners. Dedicated staff would be necessary to organize and execute inventorying, monitoring, and protecting of sensitive plants for the park.

Cumulative Impacts: Nearly any project that occurs in the park has an effect on park operations. Planning for projects, such as the sewer line replacement or construction of wildlife viewing pullouts and bike trails, typically requires involvement from a variety of park staff to contribute their expertise and assistance. Other resource management projects such as soundscape monitoring and fire management involve resource management staff and the hiring of additional seasonal staff. Fire management has the

potential to greatly alter park operations depending on the size and location of fires. The maintenance of trails requires the mobilization of large crews and the use of specialized equipment. When considered in the context of the numerous projects occurring at Bryce Canyon this alternative would cumulatively have a minor, adverse impact to park operations.

Conclusion: Impact to park operations under this alternative would be minor, adverse in the short and long-term. Impacts would result from the hiring and supervision of a vegetation management crew. Further, there would be impacts to construction projects as revegetation and invasive plant prevention/control requirements are added components. Cumulatively, these effects would have a minor, adverse impact on park operations when considered with other past, present, and reasonably foreseeable future actions.

Cultural Landscapes

Affected Environment

A cultural landscape is a reflection of human adaptation and use of natural resources, and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. Five cultural landscapes are listed within the Cultural Landscapes Inventory (CLI) website for the park: Bryce Canyon Lodge/Deluxe Cabins, Bryce Inn, NPS Housing Historic District, Rim Road, and Rim Trail. The only landscape for which a CLI has been completed is the Rim Road. Cultural Landscape Reports (CLR) - more detailed documents with treatment guidelines - have been completed for the Bryce Canyon Lodge area and the NPS Historic Housing area. The CLR for the Lodge and Housing area contains an evaluation of what vegetation patterns are contributing (historic) and need to be preserved. The CLR can be used as a reference for desired vegetation conditions and appropriate definitions of defensible space in these two areas.

Impact Threshold Definitions

Impact Intensity	Intensity Definition
Negligible	Impact is at the lowest levels of detection – barely measurable with no perceptible consequences, either adverse or beneficial.
Minor	Disturbance of a cultural landscape results in little, if any, loss of integrity and impacts would not affect the character defining pattern(s) or feature(s) of a National Register of Historic Places eligible or listed property.
Moderate	Disturbance of a cultural landscape results in a loss of integrity but does not impact character defining pattern(s) or feature(s) of a property to the extent that its National Register eligibility is jeopardized.
Major	Disturbance of a cultural landscape results in loss of integrity and impacts would alter a character defining pattern(s) or feature(s) of a property to the extent that it is no longer eligible to be listed in the National Register.

Duration of cultural landscape impacts are considered short-term if the resource would recover in less than three year and long-term if requires more than three years to recover.

Alternative I: No Action

Impact Analysis: Adverse impacts to cultural landscapes are expected to be greatest under this alternative as no action would be taken to treat invasive vegetation or restore native vegetation. Invasive vegetation is known to be present within the cultural landscapes. Without treatment these infestations would spread, further altering the plant composition and impacting the character of the cultural landscape. The high visitation to and around these cultural landscapes has lead to trampling of native vegetation and development of ‘social trails.’ Under this alternative steps would not be taken to restore these areas.

Cumulative Impacts: Cultural landscapes located within the park are being impacted through natural and anthropogenic processes. Growing visitation will result in increased soil disturbance and potential for the introduction of invasive vegetation. Fire plays an important role in shaping the landscape. Modifying the

fire regime has altered the landscape at Bryce Canyon, including the cultural landscapes. Thus, when combined with other past, present, and foreseeable future actions that would result in impacts to cultural landscapes, this alternative would have minor cumulative adverse impacts to the park's cultural landscapes.

Conclusion: Taking no action would have negligible impact on cultural landscapes in the short-term; however, in the long-term the impact would be moderate, adverse. Invasive plants would be expected to spread under this alternative, altering the vegetation found within the cultural landscapes. Impacts to the cultural landscape from visitors (i.e. trampling or social trails) would not be mitigated with restoration activities allowing for further alteration of the landscape. Cumulatively, this alternative would have a minor, adverse effect to cultural landscapes when considered with other past, present, and reasonably foreseeable future actions.

Alternative II: Preferred Alternative – Full use of IPM techniques (fire, mechanical, chemical, and biological control) to manage invasive plants; implementation of a sensitive plant species monitoring/protection program; implementation of a restoration program.

Impact Analysis: Under this alternative, the use of an integrated approach to manage invasive plant infestations would allow the park to most control exotic vegetation within cultural landscapes. Mechanical, chemical, and biological methods could be employed. Removal of invasive plants by mechanical means would disturb soils and create barren patches. Herbicides would be used on species not effectively treated by mechanical means and has the benefit that it would not create ground disturbance or barren patches within the cultural landscape. Biological control is an option, although it is not being considered at this time. Biological control agents that would be considered for use would be evaluated to make sure they do not impact native plant species. Native vegetation would be restored by closing and rehabilitating social trails, spreading native seed mix, and planting of seedlings which would help preserve the character of the cultural landscapes. The Bryce Canyon Lodge CLR identifies a specific meadow area as a defining characteristic within one of the cultural landscapes. This alternative would provide the tools to maintain/restore this habitat. As sensitive plants are not known to occur within the cultural landscapes the inventorying, monitoring, and protecting of sensitive plants would not impact the cultural landscapes.

Cumulative Impacts: Cultural landscapes located within the park are being impacted through natural and anthropogenic processes. Growing visitation will result in increased soil disturbance and potential for the introduction of invasive vegetation. Fire plays an important role in shaping the landscape. Modifying the fire regime has altered the landscape at Bryce Canyon, including the cultural landscapes. Vegetation would be improved, which would cumulatively have a minor, beneficial impact to cultural landscapes when considered with other past, present, and reasonably foreseeable future actions.

Conclusion: The preferred alternative would have a minor, beneficial, long-term impact as infestations in the cultural landscapes would be treated using the most effective treatment methods and native vegetation is restored. Minor, adverse impact would occur in the short-term as a result of disturbance to sites from invasive plant treatments and plant restoration activities. Cumulatively, these effects would have a minor, beneficial impact on cultural landscapes when considered with other past, present, and reasonably foreseeable future actions.

Alternative III: Limited use of IPM techniques (fire and mechanical) to manage invasive plants; implementation of a sensitive plant species monitoring/protection program; implementation of a restoration program.

Impact Analysis: Under this alternative mechanical control would be the primary method used to treat invasive vegetation and would limit the park's ability to successfully control invasive species within cultural landscapes. Removal of invasive plants by mechanical means would disturb soils and create

barren patches. Certain invasive plant species are not effectively treated by mechanical means and would be difficult to control under this alternative. Native vegetation would be restored by closing and rehabilitating social trails, spreading native seed mix, and planting of seedlings. The restoration of native plant communities would help preserve the vegetation character within cultural landscapes. The Bryce Canyon CLR had identified a specific meadow area as a defining characteristic within one of the cultural landscapes. This alternative would provide some of the tools to maintain/restore this habitat. As sensitive plants are not known to occur within the cultural landscapes the inventorying, monitoring, and protecting of sensitive plants would not impact the cultural landscapes.

Cumulative Impacts: Cultural landscapes located within the park are being impacted through natural and anthropogenic processes. Growing visitation will result in increased soil disturbance and potential for the introduction of invasive vegetation. Fire plays an important role in shaping the landscape. Modifying the fire regime has altered the landscape at Bryce Canyon, including the cultural landscapes. Cumulatively, the impacts from this alternative would have a minor, adverse effect on cultural landscapes when considered with other past, present, and reasonably foreseeable future actions.

Conclusion: Impacts to cultural landscapes from this alternative are predicted to be minor, adverse in the short-term from soil disturbance as a result of invasive plant treatments and restoration activities. Under this alternative some invasive plants would be treated and native plants restored, which would be beneficial. However, long-term impacts would be minor, adverse as certain invasive plants would not be effectively controlled under this alternative, potentially altering the vegetation character of cultural landscapes. Cumulatively, these effects would have a minor, adverse impact on cultural landscapes when considered with other past, present, and reasonably foreseeable future actions.

Unacceptable Impacts

The National Park Service must prevent any activities that would impair park resources and values. The impact threshold at which impairment occurs is not always readily apparent. Therefore, the Service will apply a standard that offers greater assurance that impairment will not occur. The Service will do this by avoiding impacts that it determines to be unacceptable. These are impacts that fall short of impairment, but are still not acceptable within a particular park's environment. Park managers must not allow uses that would cause unacceptable impacts; they must evaluate existing or proposed uses and determine whether the associated impacts on park resources and values are acceptable. Virtually every form of human activity that takes place within a park has some degree of effect on park resources or values, but that does not mean the impact is unacceptable or that a particular use must be disallowed. To determine if unacceptable impacts could occur to the resources and values of the park, the impacts of proposed actions in this environmental assessment were evaluated based on monitoring information, published research, and professional expertise, and compared to the guidance on unacceptable impacts provided in *Management Policies* 1.4.7.1 that defines unacceptable impacts as impacts that, individually or cumulatively, would:

- Be inconsistent with a park's purposes or values, or
- Impede the attainment of a park's desired future conditions for natural and cultural resources as identified through the park's planning process, or
- Create an unsafe or unhealthful environment for visitors or employees, or
- Diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values, or
- Unreasonably interfere with:
 - o Park programs or activities, or
 - o An appropriate use, or

- o The atmosphere of peace and tranquility, or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the park.
- o NPS concessioner or contractor operations or services.

By preventing unacceptable impacts, park managers also ensure that the proposed use of park resources will not conflict with the conservation of those resources. In this manner, the park managers ensure compliance with the Organic Act's separate mandate to conserve park resources and values. Using the guidance above (see bullets), the following text analyzes the potential for unacceptable impacts for all alternatives carried forward in this environmental assessment:

- All alternatives are consistent with the park's purposes and values. The park was established for the scenic beauty, scientific interest and importance, and enjoyment of the people. If Alternative I or III were implemented, then park operations would continue to operate in a similar manner, with vegetation management activities being somewhat inefficient due to limitation on the type of acceptable activities; however, these inefficiencies would not impede the park from maintaining its purposes and values as established in the park's enabling legislation. Under Alternative II (Preferred) vegetation management activities to help preserve the scenic beauty would be more efficient, which would be consistent with the park's enabling legislation. None of the alternatives would interfere with the preservation of the park's natural and cultural resources. However, Alternative II would most effectively promote the integrity of the natural and cultural resources within the park.
- None of the alternatives impede the attainment of the parks' desired future conditions as this project is consistent with previous planning efforts. The park's General Management Plan (GMP) identifies the need to address exotic plants, but does not specify the methods of treatment. All alternatives address exotic vegetation but vary by the range of techniques.
- Under Alternatives II herbicide would be applied. Herbicides do pose a risk to employees and visitors. Mitigation methods, such as required training and certification for all applicators, would be employed. As long as mitigation methods for herbicide use are followed, the impact to employee health and safety would be minor and is not considered unacceptable. The safety concerns would be less under Alternative III, as herbicides would not be used.
- Under all alternatives, visitors would continue to have opportunities to enjoy, learn about, or be inspired by park resources and values. None of the alternatives would change the overall opportunities available to visitors including interpretive talks, evening programs, hours of operation, scenic drives, or access to facilities. In fact, under Alternatives II and III there would be a progression towards a minor, beneficial improvement of the visitor experience from the restoration of native plant communities.
- All alternatives provide a vegetation management plan that does not unreasonably interfere with park programs, an appropriate use, the atmosphere of peace and tranquility, or concessioner activities. There would be no interference under Alternative I as no vegetation management activities would occur. The atmosphere of peace and tranquility would be disturbed under Alternatives II and III due to the presence of vegetation crews and the use of motorized equipment, such as chainsaws. The disturbances would be minor and short-term and are not considered unacceptable.

Overall, the analysis of effects on resources, park operations, and employee and visitor health and safety indicated that there are no major adverse effects under any of the alternatives; effects were analyzed as negligible to minor. Based on this, and the above analysis, there would be no unacceptable impacts from Alternative I, II, or III.

Impairment

National Park Service's *Management Policies, 2006* require analysis of potential effects to determine whether or not actions would impair park resources. The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended,

begins with a mandate to conserve park resources and values. National Park Service managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values.

However, the laws do give the National Park Service the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the National Park Service the management discretion to allow certain impacts within park, that discretion is limited by the statutory requirement that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values. An impact to any park resource or value may, but does not necessarily, constitute an impairment, but an impact would be more likely to constitute an impairment when there is 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
- identified as a goal in the park's general management plan or other relevant NPS planning documents.

Impairment may result from National Park Service activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park. The NPS's threshold for considering whether there could be an impairment is based on whether an action would have major (or significant) effects. This EA identifies less than major effects for all resource topics. Guided by this analysis and the Superintendent's professional judgment, there would be no impairment of park resources and values from implementation of any of the proposed alternatives.

CONSULTATION AND COORDINATION

Public Involvement Summary

External (public) scoping was conducted to inform various agencies and the public about the proposal to implement a vegetation management plan at BRCA, and to generate input on the preparation of this environmental assessment. External scoping was initiated with the distribution of a scoping letter that was mailed in January 2009 to over 200 addressees (see below) including landowners adjacent to the Park, various federal and state agencies, affiliated Native American tribes, local governments, and regional and local news/media organizations. The recipient list has developed over time and is regularly updated to elicit feedback from a large spectrum of stakeholders, both in the private and public sector, within and outside of Utah. Information on the environmental assessment was also posted on the NPS Planning, Environment, and Public Comment website (PEPC) at <http://parkplanning.nps.gov/>. The public was given 30 days to comment on the project ending. One comment was received during that time expressing interest in being kept informed about the project. No concerns or issues were raised, and no other alternatives were proposed.

Agency Consultations

Utah State Historic Preservation Office (SHPO)

Bryce Canyon National Park contains numerous historic properties which are listed in the National Register of Historic Places. Any action taken under this project which has the potential to affect historic properties on or eligible for the National Register of Historic Places are subject to separate compliance with §106 of the National Historic Preservation Act. The determination of effect for all three alternatives under §106 would be no adverse effect. Concurrence with this determination was requested in a letter to Utah SHPO in a letter dated February 22, 2010.

U.S. Fish and Wildlife Service (USFWS)

The Endangered Species Act of 1973 requires examination of impacts on all federally-listed threatened, endangered, and candidate species. Section 7 of the Endangered Species Act requires all federal agencies to consult with the USFWS to ensure that any action authorized, funded, or carried out by the agency does not jeopardize the continued existence of listed species or critical habitats. A letter dated February 3, 2010 was sent to the USFWS with proposed conservation measures within UPD habitat and determination of may affect, not likely to adversely affect the Utah prairie dog. Concurrence was received from the USFWS on February 18, 2010.

Environmental Assessment Review

The environmental assessment will be released for public review on April 13, 2010. To inform the public of the availability of the environmental assessment, the NPS will publish and distribute a letter or press release to various agencies, tribes, and members of the public on the Bryce Canyon National Park's mailing list, as well as place an ad in the local newspaper. Copies of the environmental assessment will be available for review at the following locations: Panguitch Library; Salt Lake City Library; Tropic Centennial Hall; Southern Utah University Library, Cedar City; Brigham Young University Library, Provo; University of Utah Library, Salt Lake City; and Utah State University Library, Logan. Copies will be provided to interested individuals upon request. Copies of the document will also be available for review at the Park's visitor center and on the internet at the National Park Service Planning, Environment, and Public Comment website (<http://parkplanning.nps.gov/>).

The environmental assessment is subject to a 30-day public comment period ending May 15, 2010. During this time, the public is encouraged to submit written comments online at the NPS Planning,

Environment, and Public Comment website at <http://parkplanning.nps.gov/>. If you are not able to submit comments electronically through this website, then you may also mail comments to: Superintendent Bryce Canyon National Park, P.O. Box 640201, Bryce, UT 84764. Following the close of the comment period, all public comments will be reviewed and analyzed, prior to the release of a decision document. The National Park Service will issue responses to substantive comments received during the public comment period and will make appropriate changes to the environmental assessment, as needed.

List of Recipients

Federal Agencies

Advisory Council on Historic Preservation
Army Corps of Engineers
Department of Interior
Fish and Wildlife Service
U.S. Geological Survey
Bureau of Land Management
National Park Service: Multiple parks in the region
Environmental Protection Agency
Forest Service
Kaibab NF
Dixie NF
Natural Resource Conservation Service

Indian Tribes

Aneth Chapter
Chemehuevi Indian Tribe
Dennehotso Chapter
Goshute Indian Tribe
Kaibab Band of Paiute Indians
Las Vegas Paiute Tribe
Moapa Paiute Tribe
Northwestern Band of Shoshone Tribe
Oljato Chapter
Paiute Tribe of Utah
Pueblo of Zuni
Red Mesa Chapter
San Juan Southern Paiute Tribe
Shivwits Paiute Band
Skull Valley Band of Goshute Indians
Teec Nos Pos Chapter
The Hopi Tribe, Cultural Preservation Office
Utah Navajo Trust Fund
Ute Indian Tribe
Ute Mountain Ute Tribe
White Mesa Ute Council

State and Local Agencies

City of Cannonville
City of Cedar City
City of Hatch
City of Panguitch
City of Tropic
City of Kanab

Orderville
Garfield County
Iron County
Kane County
Anasazi Indian Village State Park
Coral Pink Sand Dune State Park
Kodachrome Basin State Park
State Historic Preservation Office
Utah Department of Agriculture and Food
Utah Department of Transportation
Utah Department of Water Resources
Utah Division of Air Quality
Utah Division of Drinking Water
Utah Division of Water Quality
Utah Division of Water Rights
Utah Division of Wildlife Resources
Utah Natural Heritage Program
Utah Office of Planning and Budget
Utah Office of the Governor
Utah State Clearinghouse
Utah State Parks and Recreation

Organizations

Audubon Society
Bryce Valley Business Association
Defenders of Wildlife
Grand Canyon Trust
Grand Canyon Wildlands Council
National Park Foundation
National Parks Conservation Association
National Trust on Historic Preservation
National Wildlife Federation
Partners in Parks
Sierra Club
The Nature Conservancy
The Wilderness Society
Utah Heritage Foundation
Utah Native Plant Society
Utah Wilderness Association
Wilderness Watch
Garfield County Insider
Newspapers: Associated Press, The Spectrum, Las Vegas Sun, Salt Lake Tribune,
Southern Utah News
Radio Stations: KALL, KISN, KSGI, KSVC-AM 980, KTKK

Individuals and Businesses

Over 30 individuals and businesses, mostly in the surrounding communities, received notification of availability of this environmental assessment. The list of individuals and businesses on the mailing list for this environmental assessment is available from Bryce Canyon National Park.

List of Preparers

- Jacque Lavelle, Acting Superintendent, NPS, Bryce Canyon National Park, Bryce, UT
- Laura Schrage, Natural Resource Specialist, NPS, Bryce Canyon National Park, Bryce, UT
- Sarah Haas, Compliance Biologist, NPS, Bryce Canyon National Park, Bryce, UT
- Juanita Bonnifield, Cultural Resources Specialist, NPS, Bryce Canyon National Park, Bryce, UT
- Rebecca Biglow, Physical Scientist, NPS, Bryce Canyon National Park, Bryce, UT

REFERENCES

- Bryce Canyon National Park. 2009. Surveys for Mexican spotted owl in Bryce Canyon National Park: 1993, 1994, 1995, 2008, and 2009. Available at the park.
- Bryce Canyon National Park. 2009. Utah prairie dog survey database 1974-2009. Available at the park.
- Bryce Canyon National Park. 2002. Observation sheet for Yellow-Billed cuckoo. 5/29/02. Available at the park.
- Bryce Canyon National Park. 2002. Survey results for Southwestern willow flycatcher: 1995, 1996, 1998, 1999, and 2002. Available at the park.
- Bryce Canyon National Park. 2003. Wetlands statement of findings, Bryce Canyon road reconstruction project. Available at the park.
- Fertig, W. and S. Topp. 2009. Annotated checklist of vascular flora: Bryce Canyon National Park, Natural Resource Technical Report NPS/NCPN/NRTR-2009/153. National Park Service, Fort Collins, Colorado.
- Ironside, K.E., D.H. Ikeda, and N.S. Cobb. 2008. Fifty years of changes in Bryce Canyon National Park forests: Final report on a research project involving repeated sampling.
- Millar, C. I. and W. J. Libby. 1989. Restoration: Disneyland or native ecosystem? Restoration & Management Notes 7(1):18–24.
- NPS. 2007. Seed collection reference manual. Bryce Canyon National Park. Bryce, Utah.
- NPS. 2006. Management Policies 2006. U.S. Department of the Interior, National Park Service. Washington, DC.
- NPS. 2005. Fire management plan and environmental assessment: Bryce Canyon National Park. U.S. Department of the Interior, National Park Service, Washington, D.C.
- NPS. 2004. Bryce Canyon National Park wildland and prescribed fire monitoring plan. September 2004.
- NPS. 1987. General Management Plan Bryce Canyon National Park.
- Oliver, G. and W. Bosworth. 1999. Rare, imperiled, and recently extinct or extirpated mollusks of Utah: A literature review. Publication number 99-29. Utah Division of Wildlife Resources, Salt Lake City, Utah. 231pp.
- UDWR. 2005. Utah Comprehensive Wildlife Conservation Strategy. Utah Division of Wildlife Resources Publication number 05-19.
- UDWR. 2007. Utah Sensitive Species List. Utah Division of Wildlife Resources, December 14.
- USFWS. 1997. Notice of an interagency agreement for the conservation of the Coral Pink Sand Dunes tiger beetle. Federal Register, Volume 62, No. 84. FR Doc. 97-11286.
- USFWS. 1991. Utah prairie dog recovery plan. U.S. Fish and Wildlife Service, Denver, Colorado. 38pp.

Utah prairie dog recovery implementation team. 1997. Utah prairie dog conservation strategy. Interagency Report. 27 pp.

APPENDIX A: NON-NATIVE PLANT SPECIES OF BRYCE CANYON NATIONAL PARK

Scientific Name	Common Name
<i>Agropyron cristatum</i>	Crested wheatgrass
<i>Agrostis stolonifera</i>	Redtop
<i>Arctium minus</i>	Burdock
<i>Asparagus officinalis</i>	Asparagus
<i>Bassia scoparia</i>	Summer-cypress
<i>Brassica nigra</i>	Black mustard
<i>Bromus inermis</i> var. <i>inermis</i>	Smooth brome
<i>Bromus japonicus</i>	Japanese chess
<i>Bromus tectorum</i>	Cheatgrass
<i>Capsella bursa-pastoris</i>	Shepherd's-purse
<i>Cardaria draba</i>	Whitetop
<i>Carduus nutans</i>	Musk thistle
<i>Centaurea maculosa</i>	Spotted knapweed
<i>Centaurea repens</i>	Russian knapweed
<i>Chenopodium album</i> var. <i>album</i>	Lambsquarter
<i>Cichorium intybus</i>	Cichory
<i>Cirsium arvense</i>	Canada thistle
<i>Cirsium vulgare</i>	Bull thistle
<i>Conringia orientalis</i>	Hare's-ear mustard
<i>Convolvulus arvensis</i>	Field bindweed
<i>Cynoglossum officinale</i>	Common hound's-tongue
<i>Dactylis glomerata</i>	Orchard grass
<i>Descurainia sophia</i>	Flixweed
<i>Elaeagnus angustifolia</i>	Russian-olive
<i>Elymus hispidus</i>	Intermediate wheatgrass
<i>Elymus junceus</i>	Russian wildrye
<i>Erodium cicutarium</i>	Stork's-bill
<i>Eschscholzia californica</i>	California poppy
<i>Euphorbia esula</i>	Leafy spurge
<i>Festuca pratensis</i>	Meadow fescue
<i>Halogeton glomeratus</i>	Halogeton
<i>Lactuca serriola</i>	Prickly lettuce
<i>Lepidium perfoliatum</i>	Clasping pepperwort
<i>Malcolmia africana</i>	African mustard
<i>Malus pumila</i>	Common apple
<i>Malva neglecta</i>	Common mallow
<i>Marrubium vulgare</i>	Common horehound
<i>Medicago lupulina</i>	Black medick
<i>Medicago sativa</i>	Alfalfa
<i>Melilotus officinalis</i>	Yellow sweet-clover
<i>Phleum pratense</i>	Timothy
<i>Plantago lanceolata</i>	English plantain
<i>Poa compressa</i>	Canada bluegrass
<i>Poa pratensis</i>	Kentucky bluegrass
<i>Polygonum aviculare</i>	Yard knotweed
<i>Polygonum convolvulus</i>	Black-bindweed
<i>Rumex crispus</i>	Curly dock
<i>Salsola tragus</i>	Russian-thistle
<i>Setaria viridis</i>	Green bristlegrass
<i>Solanum rostratum</i>	Buffalobur
<i>Solanum sarrachoides</i>	Ground-cherry nightshade

<i>Sonchus asper</i>	Spiny-leaf sow-thistle
<i>Sonchus uliginosus</i>	Marsh sow-thistle
<i>Tamarix chinensis</i>	Five-stamen tamarisk
<i>Taraxacum officinale</i>	Common dandelion
<i>Thlaspi arvense</i>	Field pennycress
<i>Tragopogon dubius</i>	Yellow salsify
<i>Trifolium repens</i>	White clover
<i>Ulmus pumila</i>	Siberian elm
<i>Verbascum thapsus</i>	Woolly mullein

(Fertig and Topp 2009)

APPENDIX B: 10 STEPS FOR INVASIVE PLANT MANAGEMENT

The 10 Steps for Invasive Plant Management outlined below were developed from information contained in NPS Director's Order 77-7 and Tumacácori National Historic Park *Invasive Plant Management Plan and Environmental Assessment* (NPS 2008).

Invasive Plant Management 10 Steps:

1. Prevent new infestations by employing prevention and early detection techniques

The most effective, economical, and ecologically sound approach to managing invasive species with zero risk to resources of value is to prevent their invasion in the first place. Often, managers direct limited resources to fighting firmly established infestations but by that stage management is expensive and eradication is likely impossible. While it is desirable to manage infestations in order to limit the spread of invasive plants into non-infested areas, limited resources might be spent more efficiently on proactive invasive plant management that both contains existing invasive plant infestations and focuses strongly on prevention or early detection of new invasions.

BRCA seeks to adopt a set of invasive plant prevention guidelines as outlined in Appendix C. These are practical and proactive techniques designed to prevent invasion and permanent establishment of invasive plants during the course of daily or routine activities and operations.

2. Educate visitors and staff about invasive plants and their management

There are several programs already in place that make connections with the public regarding invasive species. The park has a very active environmental education program that teaches students about the importance of protecting our natural resources. An article on invasive plants is included in the park's newspaper, *The Hoodoo*. BRCA will increase efforts to inform the public and staff about invasive plants and the park's strategy for managing them.

3. Inventory of invasive plants in Bryce Canyon National Park

The checklist of vascular plants of Bryce Canyon National Park was revised in 2006. Appendix A lists the 60 introduced plant species found on the vascular plant checklist. Discovery of additional exotic plants will be documented (i.e. voucher specimens collected) and the checklist of vascular plants updated.

4. Monitor effectiveness of control efforts

Monitoring is the repeated collection and analysis of information to evaluate progress and effectiveness in meeting resource management objectives and is an essential part of an integrated invasive plant program. Based on inventory and ranking criteria, a good monitoring program saves time and money by telling managers which control techniques are working and which ones are not. Monitoring programs can range from simple, such as taking photo points, to more complex plot and transect data collection. All are ongoing processes that will detect useful trends with each year of repetition. Without monitoring, there is no way of knowing whether control efforts are contributing to fulfillment of desired management objectives (CNAP 2000).

5. Track invasive plant management efforts

Invasive plant management efforts will be tracked at the park. Information such as location, species, and treatment type will be recorded. If work is conducted by an NPS Exotic Plant Management Team (EPMT), they will be responsible for the collection and reporting of this information as part of their reporting process. EPMTs will share that data with the park for reporting in the Pesticide Use Proposal System, Performance Management Data System, and for inclusion in the park natural resource GIS database.

6. Prioritize both invasive plant species and locations to be controlled

Because it is impossible to control every invasive species, it makes sense to focus management efforts on those species that have, or could have, the greatest impact to the park resources or to neighboring agro/economic activities. Prioritizing management activities by both species and location will help guide the most efficient use of resources (specifically staff time and budget) according to predetermined invasive plant management objectives. Species that are not likely to pose a large threat to resources may be treated with volunteer labor, when available.

State government agencies may list any plant that is deemed an economic, environmental, or public health threat as “noxious”. Utah has a State Noxious Weed List, of which 7 species are found in BRCA.

7. Work with adjacent landowners, local, state and federal agencies, local interest groups, invasive plant cooperative networks, and others to develop and achieve common goals of invasive plant management

The spread of invasive plants throughout Utah poses a serious environmental and economic threat to public lands, rangeland, farmland, and private property in Garfield and Kane counties. Because the success of an invasive plant management program is, in part, dependent on the actions of one’s neighbors, BRCA resource staff participates in the Canyon Country Cooperative Weed Management Area (CWMA). Canyon Country CWMA is a partnership between federal, state, and local government agencies, non-profit organizations, and private landowners in Garfield and Kane counties to develop cooperative efforts to address invasive weeds in southwestern Utah.

8. Identify most appropriate control techniques

Control techniques will be selected that achieve maximum effectiveness in control while minimizing risks to humans and natural and cultural resources. The selected control actions should be effective at killing invasive plants or managing infestations at an acceptable threshold level. The treatments fall into four basic categories: mechanical, fire, chemical, and biological. Each category is described below.

A. Mechanical Control

Mechanical techniques for control of invasive plants in BRCA include mowing, cutting/sawing, digging, pulling, spudding (severing of roots below the root crown), discing/plowing, and smothering. Mechanical techniques can be especially effective in preventing seed production in annual and biennial forbs and in exhausting root reserves in perennial plants (Meunscher 1980). Timing of these controls can be extremely important in determining outcome.

For species that reproduce vegetatively from root parts (such as tamarisk), mechanical treatments are generally not expected to provide complete control, even when repeated. Most often, they can be used as a tool for stressing the plants to make other treatments more effective (Derscheid et al. 1961, Renz and DiTomaso 1998).

B. Fire

Prescribed burning consists of planning, setting, and managing fire to accomplish resource management objectives (CNAP 2000). Fire is necessary to prompt germination of some plants, but it can also reduce the abundance of some species. The most successful uses of fire for invasive species control result from burns that try to mimic or restore historical (natural) fire regimes, which have been disrupted by land use changes, suppression practices, fire breaks, or development (Tu et al. 2001).

C. Chemical Control

Chemical control refers to the use of herbicides to kill or injure target plants, as well as chemicals applied along with herbicides that improve their efficacy (adjuvants). Chemical treatments include the use of a number of recommended herbicides including both pre- and post-emergent herbicides. Additional herbicides may be used, including known herbicides found to be effective

on additional species and herbicides that may be developed in the future. Other herbicides that will be considered for use are the relatively new ‘smart herbicides’ such as Habitat™ that provide ‘intelligent’, long-term vegetation control by affecting enzymes found only in plants – not in birds, mammals, fish, insects or humans. Habitat™ breaks down quickly in water, allowing desirable vegetation to germinate and repopulate a treated site. Because it is considered a low volume herbicide, it provides more control with less chemical load on the environment, compared to other herbicides. Most herbicides are applied in the park using backpack sprayers.

D. Biological Control

Biological control can be defined as the deliberate introduction or manipulation of an invasive plant’s natural enemies (e.g. insects and pathogens) with the goal of suppressing the invasive population (Wilson and Huffaker 1976). The theoretical framework for the use of biological controls is based on the hypothesis that the success of many non-native invasive plants is the result of their release from predators or pathogens found in their native range when introduced in a new range (Cronk and Fuller 1995). By introducing predators or pathogens, usually from the invasive plants’ native range, their success can be curbed, allowing native plants to compete on more equal terms. Bio-control agents are not capable of completely eradicating an invasive plant population, because as the number of host plants declines, so does the population of bio-control agents. However, bio-control can be a useful tool in reducing the initial size or density of an invasive plant infestation, making other treatments more efficacious.

At this time biological control of invasive species found at BRCA are limited and are not being considered. The literature was reviewed for information on biological control agents for a number of the invasive species known to occur at BRCA. A leaf beetle (*Diorhabda elongate*) from central Asia is being used for biological control of tamarix in Utah. Due to the small amount of riparian area in BRCA for tamarix to infest, the park has been able to contain tamarix with mechanical and chemical treatments. So although biological control with *D. elongate* has been successful, it is not being considered at BRCA because the tamarix population has been greatly reduced such that biological control would not be an appropriate treatment. There are biological control agents for other invasive plant species found at BRCA. However, these biological control agents are still being investigated, shown little success, attack native vegetation, or are for species which although present in BRCA are not abundant enough to necessitate biological control. If biological controls were selected for invasive plant treatments, only biological control agents approved by the USDA Animal and Plant Health Inspection Service (APHIS) would be considered for use. Additional consultation with USFWS would be conducted prior to the release of biological control agents to ensure there are no unintended impacts to non-target species.

Evaluation of Control Techniques

Control techniques will be evaluated based on the following attributes:

A. The control technique poses little to no risk to native vegetation, wetlands, wildlife, or other natural resources.

Bryce Canyon will continue to make a good faith effort and use extreme care in evaluating treatment options and ensuring all environmental compliance standards are met. BRCA will continue to review new relevant scientific literature, references, and support research to ensure a control technique is biologically sound. BRCA efforts to prevent/reduce risks to natural resources include active cooperation with NPS professional EPMT’s from Lake Mead NRA and frequent consultations with NPS Integrated Pest Management staff.

Herbicide label directions will be strictly followed. No open containers of herbicides are allowed in areas of native vegetation, in riparian areas, or near areas of open water. All refilling of

herbicide tanks and sprayers will be conducted in designated staging areas where there is no risk to native vegetation or water quality.

B. The control technique poses little to no risk to cultural resources.

BRCA will continue to make a good faith effort to evaluate treatment options and ensure all Section 106 compliance standards are met. If a control technique is determined to affect a cultural resource, site specific compliance will be initiated by the park staff in consultation with the State Historic Preservation Office. Staff will continue to review new relevant scientific literature and references to ensure control techniques are sound for use in areas of cultural significance.

C. The control technique poses little to no risk to the human environment or to the safety of park visitors or park employees.

Some techniques have the potential to harm humans. Injuries can occur when using everything from a shovel or saw to fire and herbicides. Staff can be harmed as well as visitors if treatment is occurring in areas frequented by the public. For this reason, job hazard analyses (JHA) are developed for activities such as herbicide application and vegetation restoration. The purpose of these analyses is to define the techniques and tools required for the activity, identify potential hazards for each step or phase of the activity, and mitigate the potential for problems and injuries during each step or phase. JHAs are reviewed every year for thoroughness and are required readings for everyone (volunteer or staff) participating in the activity. In addition, staff is required to obtain the proper training prior to performing certain tasks such as sawing.

Other precautions for reducing and eliminating risk to humans during invasive plant activities include posting notice of the activity in high use areas or scheduling the activity (when possible) during periods of low visitor use in the area (both time of day and time of year). BRCA will continue to review and refine treatment activities to avoid negatively impacting human use and safety in and near treatment areas.

D. The control technique is cost-effective to implement.

Cost is not the only driving factor in selecting control techniques, but is considered in the context of size, location, integrity of resources threatened, and management goal (eradication, suppression, containment) for a particular infestation or area. Choice of techniques and management strategy has both short and long-term cost implications. Short-term impacts are mostly negative and include the cost of the initial treatments and possibly foregoing an activity (such as closing a hiking trail) while the area recovers. However, in the long-term, protecting surrounding non-infested areas or ecosystem functions is key to realizing and understanding the actual versus potential future costs of invasive plant management not just for the acreage actually infested but for the entire park and the surrounding lands.

9. Create annual work plans to guide invasive plant management activities

An annual work plan will be created to guide control, monitoring, restoration, and prevention/education efforts. If complete eradication is not feasible, the management objective (by area or by species) will be to suppress or contain the infestation below the threshold level with consideration to any federal and state management directives on the particular species. The annual work plan will also be used to guide sources of labor to invasive plant projects of appropriate size and nature. While staff and volunteers are the primary source of invasive plant management labor in the park, adoption of an invasive species work plan will also enable the park to make better use of the NPS EPMT's.

10. Restoration

Restoration is defined as a method to mitigate disturbed areas or control invasive plant problems by restoring native vegetation communities to conditions existing prior to disturbance or invasion. In many cases, no active restoration may be necessary if bare ground/rock is the desired condition or if there is enough desired vegetation in proximity to occupy niches opened by invasive plant control procedures. However, when desired vegetation canopy is nonexistent or inadequate for the site conditions, active restoration is required to speed recovery of a healthy and competitive plant community. Restoration techniques used in BRCA may include, but are not limited to seeding, shrub/sapling plantings, soil amendments, tilling, and erosion-proofing.

References

- Colorado Natural Areas Program (CNAP). 2000. Creating an Integrated Invasive plant Management Plan: A Handbook for Owners and Land Mangers of Lands with Natural Values. Colorado State Parks. http://parks.state.co.us/cnap/IWM_handbook/IWM_index.htm. 4/04
- Cronk, Q. C. B., and J. L. Fuller. 1995. Plant Invaders. Chapman and Hall, New York.
- Derscheid, L. A., K. E. Wallace, and R. L. Nash. 1961. Russian knapweed control with cultivation, cropping and chemicals. *Invasive Plants* 8:(268-278).
- Meunscher, W. C. 1980. *Invasive Plants*. Cornell University Press, Ithaca, NY.
- NPS. 2008. Invasive plant management plan and environmental assessment. Tumacácori National Historic Park. Tumacácori, AZ.
- Renz, M. J., and J. M. DiTomaso. 1998. The effectiveness of mowing and herbicides to control perennial pepperweed in rangeland and roadside habitats. *Proceedings of the Western Society of Invasive plant Scientists*. 129.
- Tu, M., C. Hurd, and J. Randall. 2001. *Invasive Plant Control Methods Handbook*. The Nature Conservancy. <http://tncinvasiveplants.ucdavis.edu>. 5/04
- Wilson, F. and C.B. Huffaker. 1976. The philosophy, scope and importance of biological control. In: Huffaker, C.B. and P.S. Messenger (eds.), *Theory and Practice of Biological Control*. Academic Press, New York, 3-1.

APPENDIX C: PREVENTING THE INTRODUCTION AND SPREAD OF INVASIVE PLANTS

The steps for preventing the introduction and spread of invasive plants outlined below were developed from information contained in Sequoia and Kings Canyon National Parks Management Directive No. 038 Preventing the Introduction and Spread of Invasive Non-Native Plants (August 2004) and Pacific West Region Weed Prevention in Parks Best Management Practices (2009).

This policy establishes guidelines to prevent the introduction and spread of invasive plant species within Bryce Canyon National Park. It covers all activities performed by government employees, park concessioners, permittees, contractors, and partners.

By far the most efficient and cost-effective way to keep invasive plants from displacing native species is to (1) prevent the entry of non-native plants into the parks and (2) prevent the spread of existing non-native plant populations within the park. Once new populations of invasive plants establish they may multiply rapidly. As a consequence, removal can be extremely difficult and costly. The importance of a strong prevention program as a vital component in the management of invasive non-native plants cannot be overstated.

Seeds of non-native plants travel wherever and whenever soil is moved from one location to another. Seeds can lodge in the treads of car tires, bicycle tires, or shoe soles. Soil, sand, or gravel imported for construction or other activities can contain non-native plant seeds. Hay, used to feed livestock, or straw, used in revegetation projects, can contain non-native plant seeds from the field where the hay was grown.

The list of Best Management Practices (BMPs) that follows is organized by topic, with each topic presented in two sections: those that are relevant to all park operations and those that are program specific. The topics are:

- Communication
- Vehicles and Transportation
- Tools and Equipment
- Clothing and Boots
- Environmental Compliance and Planning
- Routine Operations and Project/Activity Implementation
- Permits and Contracts
- Pre-work Assessments and Planning
- Imports (fill, rock, plant material, water)
- Post-work – Revegetation and Monitoring
- Visitor Impacts
- Pack and Saddle Stock Users

COMMUNICATION

Communication is the foundation for successfully implementing BMPs. Successful implementation is more likely if employees, contractors, permittees, and visitors understand the rationale driving the BMPs and have an opportunity to participate in developing and refining them.

- Require invasive plant awareness and education at orientation for both field and administrative work for every division. Provide annual refresher for field crews.
- Require invasive plant awareness and education at orientation for all applicable permittees.

- Provide information, training and appropriate weed identification materials to applicable special use permit holders.
- Develop curriculum or training that includes appropriate level of weed identification, biology, impacts, and effective prevention measures.
- Develop incentive programs encouraging weed awareness, detection, reporting, and locating new invaders.
- Post weed awareness messages and prevention practices at strategic locations, such as trailheads and popular camps.

Fire and Incident Management

- Ensure all individuals serving as agency representatives include weed issues as part of their focus on every incident.
- Include weed risk factors and weed prevention practices in Resource Advisor duties on all Incident Management Teams and Burn Rehabilitation Teams.
- Resource Advisors should provide briefings to identify operational practices to reduce invasive plant spread (for example: trying to avoid known weed infestation areas when locating fire lines). Agency Representatives need to ensure that prevention awareness information and operational practices are incorporated into the Incident Action Plan (I.A.P.)
- During incidents, provide the Resource Advisor(s) and/or Burn Area Emergency Rehabilitation (BAER) team with a local contact familiar with invasive plant distribution and management within the fire area.
- Provide Field Observer with invasive plant identification aids and avoid invasive plant infestations in fire line and fuel break location. Safety and holding ability remain the priority motivation for fire lines, however whenever feasible place fire lines in areas not infested with, or proximal to invasive plants.
- Provide helicopter managers with training in invasive plant prevention and mitigation measures. Initiate establishment of a network of helibases that are routinely maintained in an invasive plant-free condition.

VEHICLES AND TRANSPORTATION

Vehicles (including aircraft and construction equipment) are a key source of weed seed and propagule introductions into parks. Plant parts are easily transported on undercarriages, grills, bumpers, and the inside of vehicles. By routinely inspecting and cleaning vehicles, especially those that are moving between known infested sites and uninfested areas, we can stop weeds before they are introduced.

- Arrange your work route so that you travel from clean areas to infested areas and not vice versa. If you must travel from an infested area to a clean area and it is muddy, wash tires and undercarriage before leaving the infested area. If it is not muddy, visually inspect undercarriage and tires for seeds or plant matter.
- Routinely pressure wash all vehicles and equipment of mud, dirt, and plant parts from the undercarriage and grill work.
- Inspect and clean contract, rental, and support vehicles before and after each activity when traveling off road or through invasive plant infestations.

- Identify sites where heavy equipment and vehicles can be cleaned. Ideally, clean equipment before entering NPS lands; within-park cleaning sites should be approved in advance by the local weed specialist, and must comply with Clean Water Act requirements for collection of wash water. Remove mud, dirt, and plant parts from project equipment (preferably with a 2,000-PSI pressure washer) before moving it into a project area. Seeds and plant parts should be collected and incinerated. The cleaning area should be monitored for weeds for several years after project completion. This practice does not apply to service vehicles traveling frequently in and out of the project area that will remain on the roadway.
- Do not park on the side of the road in infested areas; do not park on or drive over known sites of invasive plants.
- Clean all equipment before leaving a site if operating in areas infested with weeds.
- Armor highly susceptible locations such as pull outs, campgrounds and parking lots, against weed introductions by gravelling or paving.
- Evaluate options to regulate the flow of traffic on sites where desired vegetation needs to be established or maintained.
- Ensure the park aviation plan contains airstrips, heliports, helibases, and helispots (both front country and backcountry) that have been carefully selected and evaluated to prevent transfer of invasive weeds from contaminated areas

TOOLS AND EQUIPMENT

If your work involves tools or equipment that will get dirty or covered in plant material consider the following:

- 1) Have multiple sets of tools – one for weed free areas and specific sets for specific weeds
 - 2) If you have only one set of tools or equipment that you will use in both clean and dirty areas – CLEAN your tools before leaving the infested area. A sufficient cleaning typically involves scrub brushes and picks to get out all seeds. Mechanized tools are notorious for transporting seed material. Cleaning chainsaws and other types of fast action equipment that have compartments that transport seed is essential.
- Encourage out-of-park crews and assistance to inspect and clean equipment, clothing and gear of weeds and their seeds before arriving on park lands.
 - Inspect, brush, and clean animals (pack animals and dogs), especially hooves and legs before entering park land. Inspect and clean tack and equipment.
 - Remove mud, dirt, and plant parts from project equipment before moving it into a project area.
 - Inspect and remove invasive plant seed and plant parts from all equipment prior to departure from site to avoid spread from park to outside.
 - Inspect and thoroughly clean all seeds and plant parts from small equipment, such as chainsaws, weed eaters, and mowers, before using them in a new location. Work with your local weed specialist to identify locations where this is most critical.
 - Ensure that rental equipment is free of weed seed and propagules before the contracting officer's representative accepts it.

- When feasible, inspect and remove invasive plant seed and plant parts from all cargo nets (air operations).

CLOTHING AND BOOTS

If you are traveling on foot, consider the following:

1. Plan an itinerary that starts in weed free areas and ends in infested areas.
 2. If you will be going between infested and clean areas, keep jugs of water and a boot scrubbing brush in your car. Wash boots between areas.
 3. If you will be traveling through plants with sticky seeds (thistles, grasses) and then going to uninfested areas, consider:
 - a. Having multiple pairs of socks
 - b. Using gaiters that you can take off when you leave the infested area
 - c. Wearing nylon or other clothing that will repel seeds
 - d. At the very LEAST, visually inspect your clothing before leaving an infested area
- Inspect, remove, and properly dispose of invasive plant seed and plant parts found on clothing and boots. Disposal should consist of knocking off the seed and plant parts from clothing and equipment at a spot near the infestation or bagging the seeds and plant parts and incinerating them and marking the site for monitoring and future control.
 - If visitor activities are very likely to spread weeds into backcountry areas, implement weed prevention practices as part of the backcountry permit process. These could include inspection of vehicles, boots, camping gear, equipment and stock.
 - Provide boot brushes and informational signs at trail heads leading to vulnerable areas.

ENVIRONMENTAL COMPLIANCE AND PLANNING

According to *Director's Orders 12: Conservation Planning, Environmental Impact Analysis, and Decision-making*, an environmental screening form is required for all proposed projects in National Parks. This provides an excellent opportunity to evaluate the risk of weed introduction or spread associated with a project, and to incorporate prevention and mitigation measures.

- Environmental analysis for any project should assess weed risks, analyze sites at high-risk for potential weed establishment and spread, and identify prevention practices. Determine weed prevention and management needs at the onset of project planning.
- If the risk analysis indicates high potential for importing or spreading weeds, ensure that responsible parties are identified for monitoring and three years of post-project weed monitoring and treatment are included in project funding.
- Environmental analysis for fire management plans shall include a park-wide invasive plant risk assessment written by resource management staff. Ensure that where feasible invasive plant prevention, control, and containment are included in every fire management action, e.g., required actions are incorporated into letters of delegation to incident teams.

ROUTINE OPERATIONS AND PROJECT/ACTIVITY IMPLEMENTATION

Park operations encompass a variety of management activities ranging from day-to-day campground maintenance to Incident Command emergency situations. Prior planning may avoid the introduction and/or spread of weed species. For example:

1. Implement a periodic monitoring program for detecting new weed infestations in highly susceptible locations such as pull outs, trailheads, campgrounds, parking lots, concessionaire locations, and backcountry areas.

2. Define “zero tolerance” zones in vulnerable, high-risk areas within the park committed to keeping weed-free through frequent monitoring and weed control efforts.

Minimize the extent and severity of soil disturbance

- Set up Incident Command Centers, staging areas, and equipment in a way that will minimize soil disturbance and avoid loss of desirable native vegetation.
- When working in vegetation types with relatively closed canopies, retain shade to the extent possible to suppress weeds and prevent their establishment and growth.
- Encourage “small operations footprint” to minimize soil disturbance and avoid loss of desirable native vegetation.
- Minimize the frequency of soil disturbance. For example, disturbing an area once every five years creates less risk than disturbing it every year. If a site has to be cleared of vegetation yearly (such as roadside blading, utility pole clearing, or clearing ditches), consider paving it.

Facilities

- Maintain long-term staging areas, such as pack stations, boneyards, dumps, helispots, and wilderness camps and pastures in weed-free condition. If necessary, treat sites annually for weeds, and assign this duty to an appropriate, trained Maintenance staff person. Consider ways of hardening these sites, such as paving, deep mulching, or planting a dominant (non-invasive) turfgrass.
- Sewage spray fields have high potential to be centers of weed infestations. Consider all other methods of treating effluent before constructing spray fields. If necessary, treat spray fields annually for weeds, and assign this duty to the appropriate, trained Maintenance staff person. If spray field is currently uninvaded, annual surveys to detect new introductions are particularly important.
- Establish and maintain invasive plant free camps, staging, drop points, and parking areas.
- Route traffic through camps to avoid invasive plant infested areas.
- Minimize invasive plant spread at helibases by incorporating invasive plant prevention and containment practices such as mowing, flagging or fencing invasive plant patches, and designating invasive plant free travel routes.
- Maintain trailheads, administrative, outfitter and public camps, roads leading to trailheads, and other areas of concentrated public use in a weed-free condition. Make high-use recreation areas a high priority for weed detection and eradication.

Fire Management

- Define park specific minimum impact appropriate preparation and suppression tactics to reduce disturbance to soil and vegetation while minimizing seedbed creation due to disturbance from fire effects within the fire management plan.
- Ensure that the appropriate use of fire retardant is discussed within the fire management plan.
- Identify acceptable and unacceptable water sources for fire management activities.
- Where applicable, include invasive plant issues in the After Action Review process.

- To prevent weed spread, detect and treat weeds in burned areas as part of the BEAR plan. For known infestations that will likely increase, the first preference is prevention, such as planting species to compete with unwanted plants.
- Establish responsibility for early detection monitoring to provide for rapid response post incident and to evaluate success of revegetation in relation to project plan.

PERMITS AND CONTRACTS

Permittees and contractors often engage in activities that pose a risk for introducing and spreading weeds in parks. Work with your weed specialist to provide training to these partners, and to incorporate prevention measures into specifications and prospectuses.

- Concessions managers can include weed prevention actions in permitting language. Consult with your local weed specialist to include specific descriptions of who, what, how, when, and why of weed prevention in permits and prospectuses.
- Ensure that film companies do not bring potentially invasive or invasive plants into parks as backdrops for their work.

PRE-WORK ASSESSMENTS AND PLANNING

Prevention begins with pre-work assessments and planning. The following are guidelines for general construction, maintenance, fire management, and other soil disturbing activities.

General construction/maintenance

- Inspect all potential and current permitted activity sites. Incorporate invasive plant prevention and containment practices such as mowing, flagging or fencing invasive plant patches, designating invasive plant free travel routes, and washing equipment. Where possible, avoid permitting activities that would result in the transfer of weed materials from an infested site to a non-infested site. Consider routes of travel, transport, and equipment use and address pathways and spread concerns with permittees.
- Before ground-disturbing activities begin, inventory and prioritize weed infestations for treatment in construction sites and along access routes. Identify what weeds are on site or within the project's vicinity and do a risk assessment accordingly. Control these weed infestations. Ideally, weeds should be managed three to five years prior to the planned disturbance to minimize weed seeds in the soil.
- Begin project operations in non-infested areas. Restrict movement of equipment or machinery from weed-contaminated areas to non-contaminated areas.
- Locate and use weed-free project staging areas. Avoid or minimize travel through weed-infested areas, or restrict travel to those periods when spread of seed or propagules is least likely, such as prior to seed development.
- Retain native vegetation in and around project sites to the extent possible.
- Schedule and coordinate blading or pulling of weed-infested roadsides or ditches in consultation with the local weed specialist. Do not blade or pull roadsides and ditches that are infested with invasive weeds unless doing so is required for public safety or protection of the roadway. If the ditch must be pulled, blade from least infested to most infested areas. Schedule activity when seeds or propagules are least likely to be viable and to be spread. Minimize soil surface disturbance and contain bladed material on the infested site.

- Schedule weed-free roadside and trailside mowing for after seed maturation, ensuring desirable plants grow unrestricted and produce seed for next year's stand. Weedy roadsides and trail sides should be treated when the weeds have reached the early flowering stage (well before seed development) to avoid spreading matured weed seed.

Fire Management

- Avoid ignition and burning in areas at high risk for weed establishment or spread due to fire effects. Treat weeds that establish or spread because of unplanned burning of weed infestations.
- Inventory project area prior to final planning effort and evaluate weeds present with regard to the effects on the weed spread relative to the fire prescription. Incorporate findings into final fire prescription to minimize invasive plant spread potential.

IMPORTS – FILL, ROCK, PLANT MATERIAL, WATER

Knowing your sources is critical to prevention of invasive plants through imported materials. If your project involves moving plants or soil please consider the following:

- Make sure your plants and soil are not contaminated with weed seeds – use a certified weed free source or sterilize soil prior to use.
- When possible, get the plants and soil from the site you will be working, that way you are less likely to introduce foreign material.
- Inspect materials at the source to ensure that they are weed-free before transport and use. If sources of sand, gravel, and fill are infested, eradicate the weeds, then strip and stockpile the contaminated material for several years, if possible, to further deplete the soil seed bank. Check regularly for weed re-emergence and treat as needed.
- Maintain stockpiled, non-infested material in a weed-free condition by preventing weed seed contamination with physical barriers and by frequently monitoring and quickly eradicating new weeds prior to seed production.
- Include penalties in contract specifications by which a contractor is assessed monetary damages for importing weeds as a result of non-compliance with contract specifications. Make sure that the contractor would not be assessed damages for introductions that occur while following contract specifications.
- Dispose of excess excavation or spoils in a way that won't spread weeds within the park or to park neighbors.
- Work with the weed specialist to develop guidelines for where earth materials can be moved within the park. For example, it may be fine to move materials from one location to another within a particular zone, such as weedy foothills, but moving materials from weedy foothills to weed-free higher elevations should be avoided.
- For routine purchase of material, such as sand used for winter operations, work with the procurement office and the local weed specialist to evaluate the risk, and if necessary develop a procedure for procuring weed-free material and/or inspecting materials sources.
- Maintain stockpiled, non-infested material in a weed-free condition by preventing weed seed contamination with physical barriers (e.g. tarps) and by frequently monitoring and quickly eradicating new weeds prior to seed production.

- Survey for, document, and treat weeds on construction sites annually for at least three years after project completion to ensure that any weeds transported to the site are promptly detected and eradicated. For on-going projects, continue to monitor until reasonably certain that weeds will not reappear. Plan for follow-up treatments based on inspection results.
- Inspect and document the area where material from treated weed-infested sources is used, annually for at least three years after project completion, to ensure that any weeds transported to the site are promptly detected and controlled. If 3 years is not sufficient to control invasive starts from this source, monitoring and treatment will need to be continued until confident invasion is brought to a controlled level (< 1% of initial infestation).
- Avoid use of water sources known to contain aquatic weedy plants and animals and undesirable fungus or bacteria for dust abatement, compaction, excavation, seeding, fire suppression, etc. to avoid introduction of non-native organisms.
- Avoid moving water buckets from infested lakes to lakes that are not infested prior to inspection and cleaning. List and map acceptable water sources before they are needed. As an extra precaution, avoid using water infested with aquatic weeds on terrestrial sites.
- Seed and mulch to be used for burn rehabilitation or slope stabilization (for wattles, straw bales, dams, etc.) should be inspected and certified that they are free of weed seed and propagules. Follow-up inspections of straw treated sites should be performed to ensure any undetected source seed are treated.

POST-WORK—REVEGETATION, MONITORING

Follow-up after the completion of construction or other park operations is critical to prevent the introduction and potential spread of weeds. Revegetation practices can encourage the growth of weeds as well as desired native vegetation. Monitoring work sites following the completion of a project allows for early detection and eradication of weeds.

General Guidelines

- Avoid using fertilizer in revegetation, as it often provides weeds with extra nutrients that native plants are unable to use efficiently.
- Revegetate disturbed soil to optimize establishment of desirable plants for that specific site. Define for each project what constitutes disturbed soil and objectives for revegetation.
- Revegetation may include topsoil replacement, planting, seeding, liming, and weed-free mulching as necessary. Use native material to the greatest extent possible. Consider hiring a contractor to chip local brush or cut and bale local weed-free grass for mulch – an added benefit is that mature seeds in the grass or brush can help restore local vegetation on the site. Use certified weed-free hay or straw when available; if not, arrange to inspect the source prior to purchase.
- Use local seeding guidelines to determine procedures and appropriate seed mixes. A certified seed laboratory should test each lot according to Association of Seed Technologists and Analysts (AOSTA) standards (which include an all-state invasive plant list) and provide documentation of the seed inspection test. Check state and federal lists (e.g. CalIPC) to see if any local weeds need to be added prior to testing. If AOSTA standards are not required, use state or regionally certified weed-free seed.
- Survey for, document, and treat weeds on construction and project sites annually for at least three years after project completion to ensure that any weeds transported to the site are promptly detected

and eradicated. For on-going projects, continue to monitor until reasonably certain that weeds will not reappear. Plan for follow-up treatments based on inspection results.

- Periodically inspect park roads, trails, and rights-of-way for invasive plants. Train Maintenance staff to recognize weeds and report locations to the local weed specialist. Inventory weed infestations and schedule them for treatment.
- Inspect and treat weeds that establish at equipment cleaning sites after fire incidents.
- Evaluate weed status and risks in BAER plans. To prevent weed spread, treat weeds in burned areas as part of the BEAR plan. For known infestations that will likely increase, the first preference is prevention, such as planting species which can outcompete unwanted plants.
- Inspect and document weed establishment at fire access roads, cleaning sites, all disturbed staging areas, and within burned areas; control infestations to prevent spread within burned areas. If you suspect the presence of invasive plants, request BAER funds to inspect for and document emergence in the spring. Request BAER funds for control if invasive plants are present and NEPA compliance has been completed.
- Use park or regional seeding guidelines for detailed procedures and appropriate mixes. Revegetate disturbed soil (except the travel way on native or surfaced roads) in a manner that optimizes plant establishment for that specific site - unless ongoing disturbance at the site will prevent invasive plant establishment. Use native material where appropriate and available. Use a seed mix that includes fast, early season species to provide quick, dense revegetation. To avoid invasive plant contaminated seed, each lot must be approved by the designated Invasive Plant Coordinator; or certified invasive plant-free or invasive plant-free seed by an approved seed laboratory.
- Monitor and evaluate the success of revegetation in relation to project plans and specifications.

VISITOR IMPACTS

Education is the most effective method to reach visitors and modify behavior. Engage visitors in weed-prevention using the most appropriate methods for your park. These may include:

1. Posting signs at visitor centers, kiosks, trailheads, and other places of interest;
 2. Handing out brochures to visitors or making brochures available to be picked up;
 3. Weed-focused interpretive talks and walks;
 4. Printing guidelines on permits;
 5. Mail brochures out with permit applications;
 6. Pre-trip orientation session.
- Establish weed-prevention guidelines that are directed toward visitors such as:
 - 1) Vehicle related messages
 - a) Clean dirt and seeds off your vehicle after leaving weedy areas and before entering less-weedy areas.
 - 2) Clothing and equipment related messages
 - a) Clean dirt, mud, and seeds off of clothing and boots after leaving weedy areas and before entering less-weedy areas.
 - 3) Behavior related messages
 - a) Stay on designated roads and trails.
 - b) Avoid cross-country travel through weed infested areas.
 - c) Don't pick any plants or flowers in the park.
 - d) Learn to identify weeds so you can avoid unintentionally spreading them.

- Work toward broader education of the public in general by: giving talks at local schools, service group meetings (Rotary Club etc.), and outdoor group meetings (Sierra Club etc.); setting up a table at public events; and developing or linking to weed awareness websites. Support and encourage service and area-wide weed awareness campaigns.
- Establish a weed awareness component to the Junior Ranger program.
- Limit visitor access to areas that are infested with high-priority weeds during the seed-dispersal season.
- Limit visitor access to highly vulnerable areas, e.g. sensitive habitats, or places with freshly disturbed ground, especially during the weed dispersal season.
- If visitor activities are very likely to spread weeds into backcountry or wilderness areas, implement weed prevention practices as part of the permit process, these should include inspection of vehicles, boots, camping gear, equipment or stock.

SADDLE STOCK USE

Saddle stock is used recreationally in Bryce Canyon National Park. Weed seed can be introduced into the park directly from hay or feed products, indirectly after traveling through the animals gut, and can travel in hooves and coats of animals. Coupled with ground and vegetation disturbance associated with holding animals in camps and trail riding, saddle animals are uniquely suited to introducing and encouraging the growth of weeds. The following practices can help minimize this risk.

Use clean feed:

- Implement the use of weed-free feed. If weed-free feed is available locally, this should be required under their contract. Include this as a line-item in concession bid renewals.
- When using supplemental feed, choose pellets over cubes or hay as any weed seeds are killed during processing. This is preferable to using certified weed-free hay or cubes (these are only inspected for a relatively short list of invasive plants and do not include some of the most pernicious invasive wildland weeds).
- Require stock operations to feed stock only weed-free feed for several days before and during their travel or work on park lands.
- Inspect winter pastures for invasive plants before moving animals into park pastures.

Minimize seed movement:

- Feed stock on top of tarps rather than on bare ground; pack out or burn residue of feed.
- Inspect, brush, and clean animals, especially hooves and legs before entering public land. Inspect and clean tack and equipment.
- Inspect and clean trucks and trailers of weeds and their seeds; contain and dispose of sweepings.
- Annually inspect all campgrounds, trailheads, and wilderness areas that are open to stock use for weeds; maintain in a weed free condition by treating new infestations.

Minimize disturbance in vulnerable areas:

- Tie or hold stock in ways that minimize soil disturbance and avoid loss of desirable native vegetation.

- In areas susceptible to weed infestation, limit pack stock to designated, maintained travel routes. Inspect and document presence of weeds on travel corridors and treat promptly as necessary.
- Regulate human and stock entry into burned areas at risk for weed invasion until soil conditions have stabilized and desirable site vegetation has recovered to sufficiently resist weed invasion.

APPENDIX D

ARTHUR CARHART NATIONAL WILDERNESS TRAINING CENTER



MINIMUM REQUIREMENTS DECISION GUIDE

WORKSHEETS

“ . . . except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act...”

– the Wilderness Act, 1964

Please refer to the accompanying MRDG [Instructions](#) for filling out this guide.

The spaces in the worksheets will expand as necessary as you enter your response.

Step 1: Determine if any administrative action is necessary.

Briefly describe the situation that may prompt action.

The diverse communities of plants present in Bryce Canyon are being altered. Changes in vegetation may be due to the introduction and spread of invasive species and human disturbances of native and sensitive plant species.

To determine if administrative action is necessary, answer the questions listed in A - F on the following pages.

A. Describe Options Outside of Wilderness

Is action necessary within wilderness?

Yes: ☒ No: ☐

Explain: Management of wilderness vegetation can only be done within the wilderness.

B. Describe Valid Existing Rights or Special Provisions of Wilderness Legislation

Is action necessary to satisfy valid existing rights or a special provision in wilderness legislation (the Wilderness Act of 1964 or subsequent wilderness laws) that allows consideration of the Section 4(c) prohibited uses? Cite law and section.

Yes: ☐ No: ☒ Not Applicable: ☐

Explain:

C. Describe Requirements of Other Legislation

Is action necessary to meet the requirements of other laws?

Yes: ☐ No: ☒ Not Applicable: ☐

Explain:

D. Describe Other Guidance

Is action necessary to conform to direction contained in agency policy, unit and wilderness management plans, species recovery plans, or agreements with tribal, state and local

Yes: ☒ No: ☐ Not Applicable: ☐

Explain: Bryce Canyon General Management Plan directs the Park to inventory, monitor, and treat invasive plants. The Utah Noxious Weed Act directs property owners to control and prevent the spread of noxious weeds.

E. Wilderness Character

Is action necessary to preserve one or more of the qualities of wilderness character including: untrammeled, undeveloped, natural, outstanding opportunities for solitude or a primitive and unconfined type of recreation, or unique components that reflect the character of this wilderness area?

Untrammeled: Yes: ☐ No: ☒ Not Applicable: ☐

Explain: Vegetation management activities would impair untrammeled quality because it would involve intentional human caused manipulations.

Undeveloped: Yes: ☐ No: ☒ Not Applicable: ☐

Explain:

Natural: Yes: ☒ No: ☐ Not Applicable: ☐

Explain: Action necessary to counteract the effects of modern civilization (i.e., introduction of exotic plants) and preserve its natural condition.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation:

Yes: ☐ No: ☒ Not Applicable: ☐

Explain: Vegetation management activities would impair solitude temporarily as a result of the noise associated with vegetation crew working in the wilderness

Other unique components that reflect the character of this wilderness:

Yes: ☐ No: ☒ Not Applicable: ☐

Explain:

F. Describe Effects to the Public Purposes of Wilderness

Is action necessary to support one or more of the public purposes for wilderness (as stated in Section 4(b) of the Wilderness Act) of recreation, scenic, scientific, education, conservation, and historical use?

Recreation: Yes: ☐ No: ☒ Not Applicable: ☐

Explain:

Scenic: Yes: ☐ No: ☒ Not Applicable: ☐

Explain:

Scientific: Yes: ☐ No: ☒ Not Applicable: ☐

Explain:

Education: Yes: ☐ No: ☒ Not Applicable: ☐

Explain:

Conservation: Yes: ☐ No: ☒ Not Applicable: ☐

Explain:

Historical use: Yes: ☐ No: ☒ Not Applicable: ☐

Explain:

Step 1 Decision: **Is any administrative action necessary in wilderness?**

Yes: ☒ No: ☐ More information needed: ☐

Explain: Administrative action is necessary to preserve the natural condition of the vegetation located at Bryce Canyon National Park. Although short-term adverse impacts on the solitude and untrammelled qualities would occur, long-term impacts would be beneficial to the natural quality of the wilderness character.

If action is necessary, proceed to Step 2 to determine the minimum activity.