

National Park Service
U.S. Department of the Interior

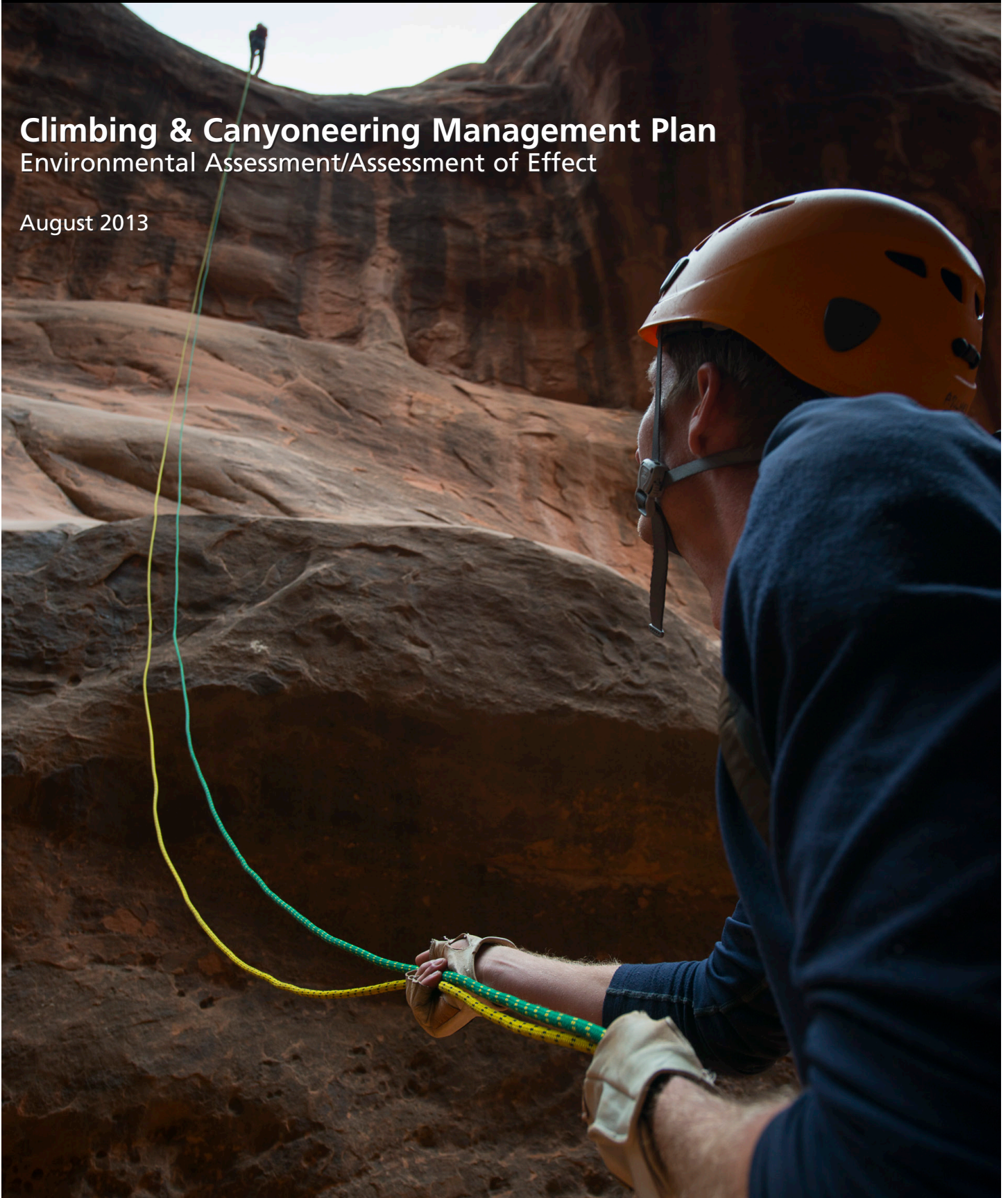
Arches National Park
Moab, Utah



Climbing & Canyoneering Management Plan

Environmental Assessment/Assessment of Effect

August 2013



Climbing and Canyoneering Management Plan

Environmental Assessment/Assessment of Effect

Summary

The National Park Service (NPS) has prepared an environmental assessment/assessment of effect (EA/AEF) to determine what the impacts of rock climbing, canyoneering, and associated activities are in Arches National Park and to consider how the NPS should further manage those activities in a management plan. Issues identified include effects on natural and cultural resources and wilderness character, increase in use levels, the development of new routes, use of fixed gear, development of approach trails, rock alteration, visual impacts and the effects of climbing/canyoneering on visitor safety and experiences.

This EA/AEF evaluates three alternatives: a no-action alternative and two action alternatives. Alternative A (No Action) describes the current management of rock climbing and canyoneering in the park which is regulated under the authority of the Code of Federal Regulations. The CFR sets NPS-wide regulations and also delegates authority to park superintendents to make certain park decisions which are then described in the Superintendent's compendium. Although the establishment of new routes is prohibited in this alternative, the levels of climbing and canyoneering use on existing routes will likely increase over time, while the impacts of increasing use levels on park resources and values will be unknown. Alternative B (Preferred) proposes to manage climbing and canyoneering activities through group size limits and a permit system as well as other management strategies based on an assessment of current climbing and canyoneering uses and resource conditions. Monitoring data will be used to evaluate patterns in usage and resource conditions over time, and to determine the need for future actions to improve management and protect park resources and values. Alternative C proposes a minimum management approach. Management will emphasize educational efforts via the park website and social media, Visitor Center displays, and other methods to provide canyoneers and climbers with information on park resources, safety, and techniques to minimize resource impacts. Relatively little management emphasis will be placed on law enforcement and resource monitoring, although additional use restrictions could be imposed if determined necessary to protect park resources and values.

This EA/AEF has been prepared in compliance with the National Environmental Policy Act (NEPA) 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 Arches National Park resources and values, and 3) identifies mitigation measures to lessen the degree or extent of these impacts. Resource topics included in this document because the resultant impacts may be greater-than-minor include geological resources, soil resources, special status species, archeological resources, wilderness character, visitor use and experience, and park operations. All other resource topics were dismissed because the project will result in negligible or minor effects to those resources. Public scoping was conducted to assist with the development of this document. During the 30-

day scoping period in July 2010, a total of 343 public responses were received. 308 responses were received from the 2007 scoping period.

Public Comment

If you wish to comment on the EA/AEF, you may post comments online at <http://parkplanning.nps.gov/arch> for the Climbing and Canyoneering Management Plan or mail comments to: Planning and Compliance Coordinator, Southeast Utah Group, National Park Service, 2282 S. West Resource Blvd, Moab, Utah 84532

This EA/AEF 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. Although you can ask us in your comment to withhold your personal identifying information from public view, we cannot guarantee that we will be able to do so.

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Abbreviations

ACHP	Advisory Council of Historic Properties
AEF	Assessment of Effect
BCMP	Backcountry Management Plan
CE	Categorical Exclusions
CEQ	Council of Environmental Quality
CFR	Code of Federal Regulations
CUA	Commercial Use Authorization
DO	Director's Order
DOI	Department of Interior
EA	Environmental Assessment
GMP	General Management Plan
IDT	Interdisciplinary Team
LNT	Leave No Trace
NEPA	National Environmental Policy Act
NHPA	National Historical Protection Act
NPS	National Park Service
RSS	Resource Stewardship and Science
RVP	Resource Visitor Protection
SEUG	Southeast Utah Group
SHPO	State Historical Preservation Office
USFWS	United States Fish and Wildlife Service
VC	Visitor Center
§	Section

CHAPTER 1 - PURPOSE AND NEED

Introduction

Arches National Park is located in southeastern Utah adjacent to the Colorado River, in the high desert physiographic province known as the Colorado Plateau. The 76,679 acre park lies entirely within Grand County, Utah, five miles northwest of the county seat of Moab, Utah. The park contains over two thousand sandstone arches, the largest concentration in the country, and a variety of unique geological resources and formations such as balanced rocks, fins, and pinnacles that are highlighted in striking foreground and background views created by contrasting colors, landforms, and textures. Its extraordinary geological features are easily accessible, many by park roads and established trails.

The purpose of this Environmental Assessment/Assessment of Effect (EA/AEF) is to determine which impacts technical rock climbing, canyoneering, and associated activities, commercial and noncommercial, have at Arches National Park, and to consider whether the NPS should further manage those activities. This EA was 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 NPS Director's Order 12 (*Conservation Planning, Environmental Impact Analysis, and Decision-Making*) (DO 12). The assessment of effect was developed in conjunction with this EA to meet its obligations for NEPA and under §106, in accordance with the Advisory Council on Historic Preservation's (ACHP) regulations implementing §106 (36 CFR 800.8, Coordination with the National Environmental Policy Act).

Background

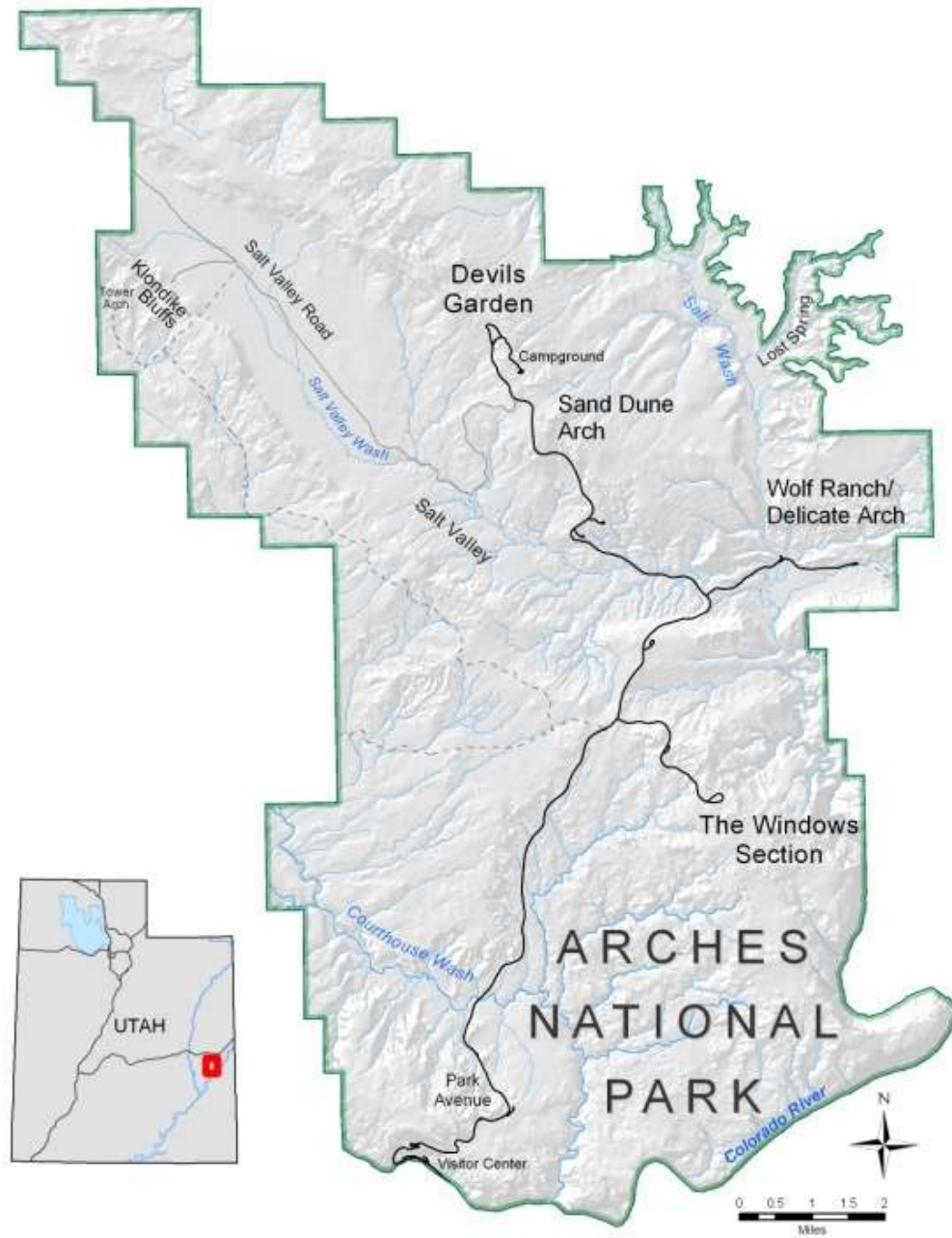
(Please refer to *Appendix A* for a glossary of terms used for the scope of this document).

Rock Climbing

Rock climbers have been active in the Colorado Plateau region for many decades. The unique geological features and unique landscapes of the region have attracted many of America's best climbers (Annerino, 1999).

Early ascents in Arches National Park revolved around some of the more prominent and unique features that were scattered about the park. In 1939, Philip S. Miner, a nineteen-year-old climber and member of the Wasatch Mountain Club of Salt Lake City made the first ascent of Landscape Arch, one of the largest spans in the world (Hoffman 1981). Fred Ayres, a chemistry professor and rock climber from Portland, Oregon, made the second ascent of Landscape Arch in 1949 with his sister Irene. The third attempt to climb Landscape Arch resulted in the first recorded tourist fatality at Arches. Nineteen-year-old Frederick Semisch reached the summit of the arch's north abutment, slipped on the sandstone and fell to his death (Hoffman 1981).

Figure 1: Arches National Park



Many of the other arches at the park were climbed in the 1940s, '50s and '60s. As interesting as the arches were, the towers in the south portion of the park saw most of the climbing activity in the 1960s, although climbing itself was at that time not allowed in the park. Consequently, many covert ascents were completed.

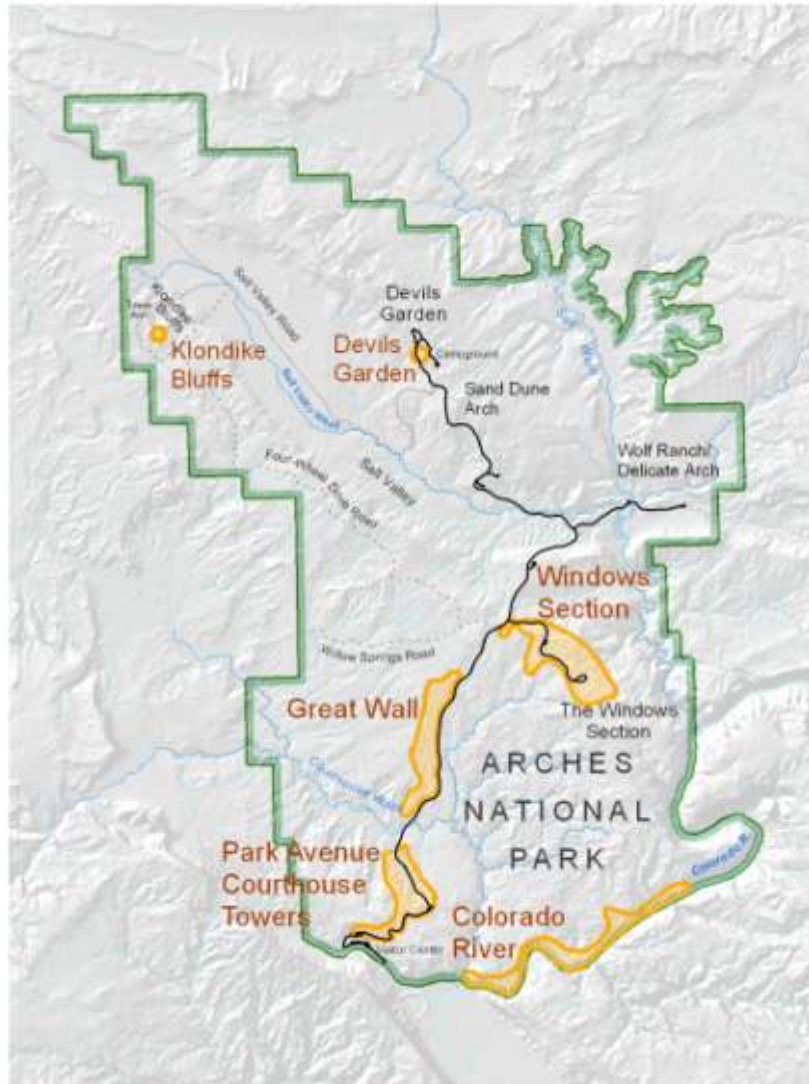
Climbing activity surged in the mid-1980s, with the towers in the south portion of the park, known as Courthouse Towers, having many of its routes first established. Rock climbing had gained popularity and finally became an accepted and respectable pastime. Moab locals and Wasatch Front climbers flocked to Arches to be the first to surmount these majestic formations and stand atop to behold the magnificent awe-inspiring beauty of the park.

Difficult free climbing and aid climbing became popular with many of the obvious crack systems, dihedrals and smaller towers seeing first ascents. The pioneer spirit of first ascents has been one of the founding principles of traditional climbers, exploring terrain that others have yet to challenge.

Since the 1980s climbing has continued to grow in popularity. The nature of the sport has changed over the years as advances in technology, newer equipment, and improved physical conditioning and training among climbers have resulted in higher and more difficult climbing standards. From the days of hip belaying to the development of sticky rubber shoes, to the use of dynamic ropes and the innovation of top of the line gear to the advent of portable motorized battery-powered drills to place bolts; all this has created a tremendous change in the nature of the sport. Rock climbing is a potentially dangerous activity, yet climbers still seek to push limits, experience magnificent vistas, and seek the ultimate adventure.

As climbing evolved over the years and its popularity grew, the need for a new look at management of climbing as a recreational use in the park became apparent, and the park began the work of developing a climbing management plan.

Figure 2: Rocking Climbing Areas in Arches National Park

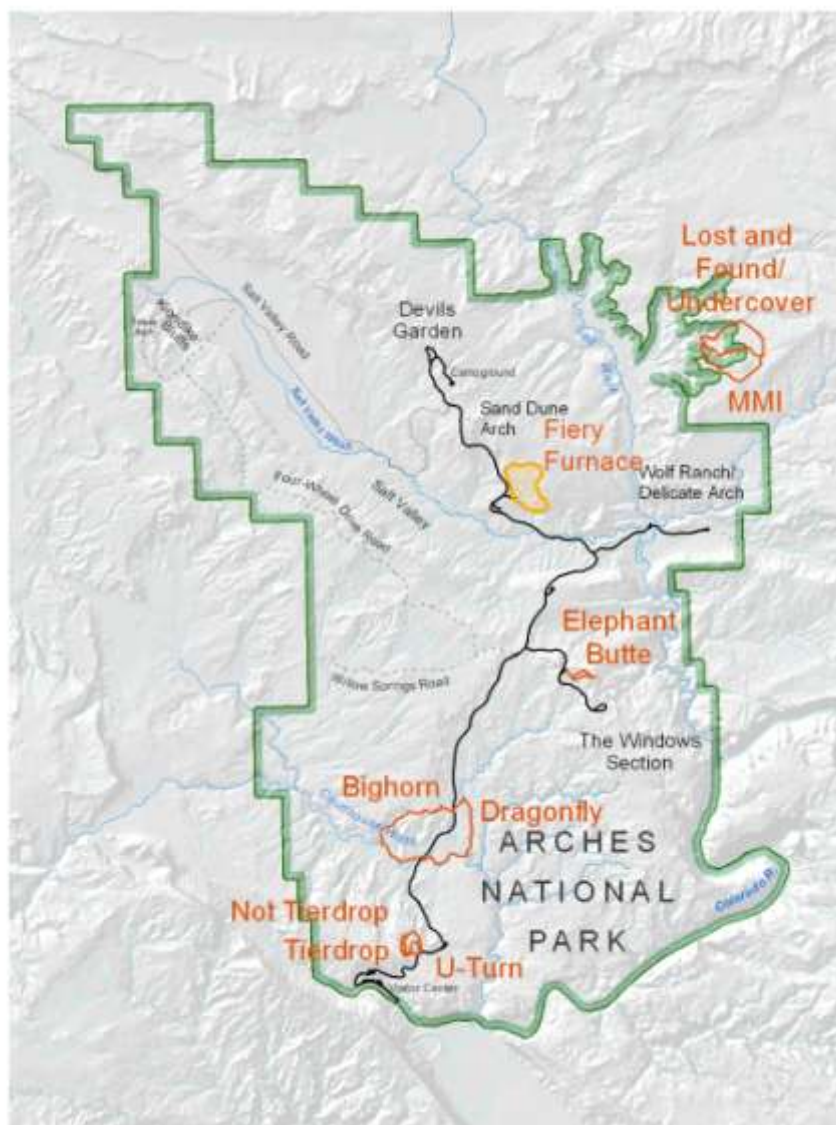


Canyoneering

Canyoneering is not a new sport, but the popularity of the sport is somewhat newer, possibly influenced by guidebooks and the internet, both of which give written directions, GPS coordinates and maps of routes to once generally unknown canyons. Historically, canyons have been explored by Native Americans, cowboys, surveyors and uranium miners in southern Utah and the known history of canyoneering is sporadic at best. Exploring slot canyons in Glen Canyon was a popular activity in the 1960's prior to the filling of Lake Powell. In the 1970's, Zion National Park's slot canyons were extremely popular. West of Arches National Park the San Rafael Swell is filled with slot canyons and has been another popular destination for canyoneers. In the 1960s and 1970s this activity wasn't even called canyoneering. The terms "canyoneering" or "canyoning" is, in fact, a more modern term for the activity of cross-country hiking through canyons involving occasional ascent or descent of rock formations utilizing a variety of techniques that require rappels and ropework.

Canyoneering in Arches National Park is even more recent compared to the other areas in southern Utah. In the early 1980s a few canyoneering routes were developed by Moab locals. Pitons were installed on routes that required ropes to descend in order to continue on with the exploration of the canyon or for search and rescue efforts. As canyoneering use grew, popular canyons began to show the effects. Social trails developed into routes, the sensitive soils were being trampled, and rope grooves on the rock were starting to develop. The need for a new look at management of canyoneering as a recreational use in the park became apparent, and the park added canyoneering to the activities to be considered in the development of a climbing management plan, which then became known as Climbing and Canyoneering Management Plan.

Figure 3: Canyoneering Routes in Arches National Park



Purpose and Significance of Arches National Park

Park Purpose

Purpose statements identify the specific reason for the establishment of a particular park. Purpose statements are crafted through a careful analysis of the enabling legislation and legislative history that influenced the development of Arches National Park. The park was first designated as Arches National Monument when the initial enabling legislation was passed and signed into law on April 12, 1929. The purpose statement reinforces the foundation for future park management administration and use decisions. The following is the purpose statement for Arches National Park:

The purpose of Arches National Park is to protect extraordinary examples of geologic features including arches, natural bridges, windows, spires, balanced rocks, as well as other features of geologic, historic, and scientific interest, and opportunities to experience these resources and their associated values in their majestic natural settings.

Park Significance

Significance statements express why Arches National Park resources and values are important enough to merit national park unit designation. Statements of significance describe why an area is important within a global, national, regional, and system wide context. These statements are linked to the purpose of the park unit, and are supported by data, research, and consensus. Significance statements describe the distinctive nature of the park and inform management decisions, focusing efforts on preserving and protecting the most important resources and values of the park unit.

The following significance statements have been identified for Arches National Park:

- Arches National Park contains the largest concentration of natural arches on earth.
- The geographic location of Arches National Park provides visitors with the opportunity to enjoy iconic Colorado Plateau landscapes in a majestic natural setting, with striking geologic features in the foreground and the towering La Sal Mountains in the distance creating expansive views of contrasting colors and textures.
- Arches National Park protects representative examples of Colorado Plateau ecosystems, providing opportunities for scientific studies of natural and human systems in diverse landscape settings over long periods of time.
- Arches National Park protects a notable array of cultural sites and features that reflect the many different ways people have occupied and used Colorado Plateau landscapes over the last 12,000 years.

Legislative History

All National Parks are founded upon two basic authorizing laws: The National Park Service Organic Act of 1916 and the enabling legislation unique to each park.

In the 1916 act, Congress established a broad framework for the administration of park areas, namely that:

“The Service thus established shall promote and regulate the use of the Federal areas known as National Parks, Monuments, and

reservations...by such means and measures as conform to the fundamental purpose of the said Parks, Monuments, and Reservations, which purpose is to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.”

Arches was originally designated as a national monument of 4,520 acres, established by Presidential Proclamation No. 1875 on April 12, 1929. Over the years, additional proclamations and legislation either increased or decreased the size of the monument. In 1971, Public Law 92-155 changed the status of the monument to national park, with an adjusted boundary of 73,379 acres. The addition of Lost Spring Canyon in 1998 brought the park to its current size.

The purpose and significance of the park as stated in the 1929 Presidential Proclamation is to:

“...protect extraordinary examples of wind erosion in the form of gigantic arches, natural bridges, ‘windows’, spires, balanced rocks, and other unique wind-worn sandstone formations, the preservation of which is desirable because of their educational and scenic value.”

The 1938 Proclamation included language preserving

“...prehistoric structures of historic and scientific interest...”

and added contiguous land to the monument which is

“...necessary for the proper care, management, and protection of the objects of scientific interest situated on the lands included in the monument...”

The 1969 Proclamation restated the purpose of the earlier proclamation as

“...and to reserve and set apart areas containing extraordinary examples of wind-eroded sandstone formations and other features of geological, historic and scientific interest...”

The 1971 Congressional act re-designated Arches as a national park and re-emphasized Congress’ intent that the park be managed according to the 1916 Organic Act.

Purpose and Need for the Plan

With rapid growth in the popularity of climbing and canyoneering, the NPS recognized a need for a systematic assessment of potential impacts and an evaluation of potential management strategies for mitigating impacts. Park staff and visitors expressed concerns about impacts of climbing and canyoneering activities on soil and geologic resources, rare plants and other vegetation, water resources, sensitive wildlife species, and cultural resources. In addition, concern was expressed about potential conflicts with other park uses and user groups, and with the increasing amounts of staff time that were being expended to monitor and manage climbing and canyoneering activities.

Climbing and canyoneering activities have been largely unregulated over past years. Park management did not know the full extent of climbing and canyoneering use and the impacts on the park’s resources and potentially with other visitors. Many social trails have been developed through climbing and canyoneering areas impacting park

resources adversely. Access and egress routes, which typically involve traveling across the backcountry to both rock climbs and canyoneering routes, have not been assessed for the presence and condition of cultural resources or other natural resources. New routes, both climbing and canyoneering, have become established within park boundaries and park management is unaware of the location and installation of fixed gear. Climbing rope use for canyoneering and climbing has caused permanent grooving in the sandstone along routes.

Adventure companies began to show an interest in conducting commercial guided trips for canyoneering and rock climbing in Arches. Because there was never an official determination of whether commercial canyoneering nor rock climbing was a necessary and appropriate commercial visitor service in Arches National Park as is required per 2006 NPS *Management Policies* and the Wilderness Act of 1964, a commercial visitor service analysis needed to be completed prior to authorizing additional commercial canyoneering and rock climbing in the park.

Also due to the increasing availability of information on climbing and canyoneering routes in the park from internet sites, visitors rarely contact the park for accurate information. Some internet sites have misleading information on where and how to traverse the route causing social trails to develop and opportunities for a visitor's safety to be compromised. These issues have prompted the NPS to look at ways to provide important educational information and opportunities regarding these two backcountry activities.

For all of the above reasons, it was determined necessary to undertake this planning effort and to develop a climbing and canyoneering management plan. This Climbing and Canyoneering Management Plan (CCMP) will provide management guidance for five to ten years, and will be revised as monitoring and research data are acquired and updated, as use patterns change, or as new impacts are observed.

Management Goals and Objectives

The goals of this planning effort is to provide opportunities for canyoneering and rock climbing in Arches National Park and to create a management tool that will adequately address resource protection and visitor use issues related to climbing and canyoneering activities. Specifically, this plan is needed to accomplish the following objectives:

- Implement management strategies which protect the park's resources and values while providing opportunities for climbing and canyoneering;
- Monitor the status of natural resources, climbing and canyoneering routes and use patterns as a basis for future decision making for maintaining desired conditions;
- Establish appropriate levels of canyoneering and rock climbing use;
- Identify opportunities to provide educational venues and materials for rock climbing and canyoneering activities;
- Engage the climbing and canyoneering community in cooperative stewardship of park resources, values, and visitor-experience opportunities;

Relationship to Other Plans and Policies

Current plans and policy that pertain to this proposal include the 1989 Arches National Park *General Management Plan* (NPS 1989), the Arches National Park *Backcountry Management Plan* (NPS 1988), the *Commercial Visitor Services Plan* (NPS 1993) and the

National Park Service (NPS) *2006 Management Policies* (NPS 2006). This document meets the goals and objectives of these plans and policies:

- This project is consistent with the 1989 Arches National Park *General Management Plan*, which states “*protection and preservation of the natural environment to ensure ecosystem integrity while providing for visitor enjoyment will be the principal consideration.*” The GMP provides vision and policy guidance for the preservation of park resources, visitor use and experience, the types and general intensities of development, and visitor carrying capacities.
- This project is consistent with the 1988 *Backcountry Management Plan (BMP)* which includes the following objectives: “(1) *to provide for visitor enjoyment and high quality backcountry experience compatible with the park’s purpose and resources,* (2) *to preserve the natural and cultural resources, maintain ecological processes, and minimize the environmental impacts of visitor use in the backcountry...*”. *Technical rock climbing is listed as a visitor use activity in the BMP.*
- This project is consistent with the 1993 *Commercial Visitor Services Plan* which includes the following objectives: “(1) *preserve the natural and cultural resources, maintain ecological processes and minimize the environmental impacts of commercial use,* (3) *minimize conflict among and between different types of users,* (4) *guide the park staff in the selection and management of commercial visitor services.*
- This project is consistent with Section 8.2.2 of the NPS *2006 Management Policies* which states the National Park Service will “*encourage recreational activities that are consistent with applicable legislation, that promote visitor enjoyment of park resources through a direct association or relation to those resources, and that are also consistent with the protection of the resources. Recreational activities that may be allowed include...mountain and rock climbing...* However, not all of these activities will be appropriate or allowable in all parks; that determination must be made on the basis of park- specific planning. Restrictions placed on recreational uses that have been found to be appropriate will be limited to the minimum necessary to protect park resources and values, and promote visitor safety and enjoyment.”
- Other laws, regulations, and/or policies relevant to this plan are the following:
 - Director’s Order 12: Conservation Planning, Environmental Impact Analysis, and Decision Making
 - Council on Environmental Quality Regulations, 40 CFR 1500–1508
 - Endangered Species Act of 1973
 - Wilderness Act of 1964
 - National Parks Omnibus Management Act of 1998

Scoping

Scoping is a process to identify the resources that may be affected by a project proposal, and to explore possible alternative ways of achieving the proposal while minimizing adverse impacts. Internal scoping was conducted by an interdisciplinary team of professionals from Arches National Park and the Southeast Utah Group. Interdisciplinary team members met several times over the 2010 year to discuss the purpose and need for the project. In 2011, the IDT met to discuss various alternatives and potential environmental impacts, evaluate past, present, and reasonably foreseeable projects that

may have cumulative effects and to develop possible mitigation measures. Over the course of the project, team members have conducted individual site visits to survey and conduct natural resource assessments and evaluate rock climbing and canyoneering activities within the park. The results of these meetings and site visits are documented in this EA/AEF.

Impact Topics Retained for Further Analysis

Impact topics for this project were identified on the basis of federal laws, regulations, and orders; NPS *2006 Management Policies*; and NPS knowledge of resources in the park. Impact topics that are carried forward for further analysis in this EA/AEF include:

- Geologic Resources
- Soil Resources
- Special Status Species
- Archeological Resources
- Wilderness Character
- Visitor Use and Experience
- Park Operations

Impact Topics Dismissed From Further Analysis

In this section, NPS takes a “hard look” at all potential impacts by considering the direct, indirect, and cumulative effects of the proposed action on the environment, along with connected and cumulative actions. Impacts are described in terms of context and duration. The context or extent of the impact is described as localized or widespread. The duration of impacts is described as short-term, ranging from days to three years in duration, or long-term, extending up to 20 years or longer. The intensity and type of impact is described as negligible, minor, moderate, or major, and as beneficial or adverse. The NPS equates “major” effects as “significant” effects. The identification of “major” effects will trigger the need for an EIS. Where the intensity of an impact could be described quantitatively, the numerical data is presented; however, most impact analyses are qualitative and use best professional judgment in making the assessment.

The NPS defines “measurable” impacts as moderate or greater effects. It equates “no measurable effects” as minor or less effects. “No measurable effect” is used by NPS in determining if a categorical exclusion applies or if impact topics may be dismissed from further evaluation in an EA or EIS. The use of “no measurable effects” in this EA/AEF pertains to whether NPS dismisses an impact topic from further detailed evaluation in the EA/AEF. The reason NPS uses “no measurable effects” to determine whether impact topics are dismissed from further evaluation is to concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail in accordance with CEQ regulations at 1500.1(b).

In this section of the EA/AEF, NPS provides a limited evaluation and explanation as to why some impact topics are not evaluated in more detail. Impact topics are dismissed from further evaluation in this EA if:

- they do not exist in the analysis area, or
- they will not be affected by the proposal, or the likelihood of impacts are not reasonably expected, or
- through the application of mitigation measures, there will be minor or less effects

(i.e. no measurable effects) from the proposal, and there is little controversy on the subject or reasons to otherwise include the topic.

Due to there being no effect or no measurable effects, there will either be no contribution towards cumulative effects or the contribution will be low. For each issue or topic presented below, if the resource is found in the analysis area or the issue is applicable to the proposal, then a limited analysis of direct and indirect, and cumulative effects is presented.

Air Quality

The Clean Air Act of 1963 (42 U.S.C. 7401 *et seq.*) was established to promote the 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 National Park Service units. Section 118 of the Clean Air Act requires a park unit to meet all federal, state, and local air pollution standards. Further, the Clean Air Act provides that the federal land manager has an affirmative responsibility to protect air quality-related values (including visibility, plants, animals, soils, water quality, cultural resources, and visitor health) from adverse pollution impacts (EPA 2009).

Arches National Park is designated as a Class I air quality area under the Clean Air Act. The law requires for Class I areas that ambient air quality must essentially remain unchanged and cannot sustain increases in air pollution above baseline levels. Climbing or canyoneering activities will have negligible effects to air quality. The Class I air quality designation for the park will not be affected by the proposal. Because there will be negligible effects on air quality, this topic is dismissed from further analysis in this document.

Wildlife

According to NPS *2006 Management Policies*, NPS strives to maintain all components and processes of naturally evolving park unit ecosystems, including the natural abundance, diversity, and ecological integrity of native animal populations (NPS 2006). Types of wildlife commonly found in the park include lizards, snakes, toads, and many small mammals such as bats, mice, squirrels, and rabbits. In addition, over 170 native bird species have been documented to occur in the park. Of these, about 45 species are considered to be common. Larger animals such as desert bighorn sheep, coyotes, mule deer, porcupines, raccoons, and beavers are present but relatively uncommon. Mountain lions are rare in the park (NPS 2012).

Climbing and canyoneering activities have the potential to impact terrestrial wildlife species adversely by generating unnatural sounds and other disturbance stimuli that alter behavior and habitat-use patterns of individual animals or groups of animals. With the exception of some special status species that are particularly sensitive to human-caused disturbance, these effects will be localized, short-term, and negligible to minor overall. In some cases, repeated use of a route by canyoneers or climbers over an extended period of time could result in localized displacement of individual animals for the duration of the repeated use. Canyoneering also has the potential to adversely impact individual amphibians and local amphibian populations in narrow canyons where it is necessary for canyoneers to wade or swim through ephemeral pools in order to traverse the route. Although repeated traversal by canyoneers has the potential to accelerate the depletion of these water sources, adverse impacts on amphibians will be localized,

restricted to a single route (such as Dragonfly Canyon), and negligible to minor overall. For these reasons, the topic of wildlife is dismissed from further analysis in this document. However, impacts to desert bighorn sheep and raptors will be further analyzed in Special Status Species section.

Vegetation

According to NPS *2006 Management Policies*, NPS strives to maintain all components and processes of naturally evolving park unit ecosystems, including the natural abundance, diversity, and ecological integrity of native plant populations and vegetative communities (NPS 2006). Approximately 475 native plant species and 74 introduced (exotic) plant species are known to occur in the park (Fertig et al. 2009). Because exotic plants are not native to park ecosystems, NPS policy is to prevent the introduction and spread of new exotic species and to eradicate existing exotic species if prudent and feasible to do so (NPS 2006). Park vegetation recently has been mapped and classified into 75 distinct plant associations that vary from one another in composition and structure due to factors such as environmental setting and disturbance history (Coles et al. 2009). Vegetation of the park is characteristic of the surrounding Colorado Plateau region and consists of grasslands, shrublands, and sparse woodlands. Native plant species that are common in areas traversed by climbing and canyoneering routes include the conifers Colorado pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*); shrubs such as blackbrush (*Coleogyne ramosissima*), single-leaf ash (*Fraxinus anomala*), and cliffrose (*Purshia mexicana*); and herbaceous taxa such as Indian ricegrass (*Stipa hymenoides*), dropseed grasses (*Sporobolus* spp.), penstemons (*Penstemon* spp.), and milkvetches (*Astragalus* spp.). Common exotic plants in the vicinity of climbing and canyoneering routes include cheatgrass (*Bromus tectorum*), ripgut brome (*Bromus diandrus*), and tumbleweed (*Salsola* spp.).

Climbing and canyoneering activities have the potential to impact native plant populations and vegetative communities primarily by trampling or otherwise breaking branches of individual plants while traversing routes. Individual woody plants also may be damaged if used by canyoneers as anchors for rappelling. Like other park users, climbers and canyoneers have the potential to introduce new exotic species if seeds or other propagules are inadvertently carried into the park from elsewhere. Climbers and canyoneers also have the potential to contribute to the spread of exotic plant species that already occur in the park by disturbing soil and thus creating conditions favorable for exotic plant establishment or by dispersing propagules to new locations in the park. Due to their localized extent, potential adverse effects on native plant populations and vegetative communities will be negligible to minor. For these reasons, the topic of vegetation is dismissed from further analysis in this document.

Water Resources

The Clean Water Act establishes the basic structure for regulating discharges of pollutants into the waters of the United States and for regulating water quality standards for surface waters. The purpose of the Clean Water Act is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." NPS *2006 Management Policies* requires protection of water quality consistent with the Clean Water Act and states that NPS will perpetuate surface waters and groundwaters as integral components of park aquatic and terrestrial ecosystems. Due to the park's arid climate, water resources are scarce and are particularly important for sustaining a disproportionately high diversity of native plant and animal species. Water resources

associated with canyoneering and climbing routes in the park primarily consist of ephemeral pools in bedrock catchments and canyon bottoms where water accumulates from runoff following precipitation events.

Canyoneering activities have the potential to impact water resources in narrow canyons where it is necessary for canyoneers to wade or swim through ephemeral pools in order to traverse the route. Although repeated traversal by canyoneers has the potential to introduce contaminants and accelerate the depletion of water found in these pools, adverse impacts on these water resources and associated organisms will be localized, restricted to a single route (such as Dragonfly Canyon), and negligible to minor overall. Climbing activities are unlikely to impact water resources because routes do not traverse narrow canyons and because of existing restrictions on entering water sources except where necessary to traverse a route. For these reasons, the topic of water resources is dismissed from further analysis in this document.

Climate Change and Sustainability

In response to current and predicted future changes in climate, NPS policy is to include climate-change considerations in all park planning efforts (NPS 2010). In addition, NPS policy is to reduce carbon emissions associated with park operations as a means of mitigating NPS contributions to global climate change and enhancing the long-term sustainability of park operations (NPS 2010). In the Southwest, there is increasing evidence that human-induced climate change currently is affecting temperatures, mountain snowpack, and streamflow (Karl et al. 2009). Climate models project increasing aridity in the region in coming decades (Seager et al. 2007). These changes likely will affect park resources, visitor experiences, and park operations in multiple ways that cannot be predicted accurately with our current level of scientific understanding. For this reason, the topic of climate change and sustainability will not be discussed further in this document.

Cultural Landscapes

Cultural landscapes are settings humans have created in the natural world. They reveal the ties between the people and the land. These ties are based on the need to grow food, build settlements, recreate, and find suitable land to bury their dead. They range from prehistoric settlements to cattle ranches, from cemeteries to pilgrimage routes. They are the expressions of human manipulation and adaptation of the land. One cultural landscape inventory has been completed and found that the Wolfe Ranch Historic District is within a cultural landscape. However, this cultural landscape is not near areas where climbing or canyoneering routes occur and will not be impacted. Because there will be no effects to cultural landscapes, this topic is dismissed from further analysis in this document.

Historic Structures

§106 of the National Historic Preservation Act, as amended in 1992 (16 USC 470 *et seq.*); the NPS Director's Order 28 *Cultural Resource Management Guideline*; and NPS 2006 *Management Policies* require the consideration of impacts on historic structures that are listed on or eligible to be listed on the National Register of Historic Places. The National Register is the nation's inventory of historic places and the national repository of documentation on property types and their significance. The above-mentioned policies and regulations require federal agencies to coordinate consultation with State

Historic Preservation Officers regarding the potential effects to properties listed on or eligible for the National Register of Historic Places.

The term “historic structures” refers to both historic and prehistoric structures, which are defined as constructions that shelter any form of human habitation or activity. Because there are no historic structures in the project area, there will be no unacceptable impacts. Therefore, this topic is dismissed from further analysis in this document.

Museum Collections

According to Director’s Order 24, *Museum Collections*, the National Park Service 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, National Park Service museum collections. Curatorial workload will be considered especially if surveys have discovered cultural resources that need to be collected and archived along climbing and canyoneering routes. A climbing and canyoneering management plan does not address preservation and protection standards and requirements for museum objects. It has also been determined that any artifacts that are collected along routes from the archeological surveys will have negligible impacts to the NPS museum staff and collections. Therefore, this topic is dismissed from further analysis in this document.

Natural Soundscape

In accordance with NPS *2006 Management Policies* Section 4.9 and Director’s Order 47 *Sound Preservation and Noise Management*, an important component of the National Park Service’s mission is the preservation of natural soundscapes associated with national park units (NPS 2006). 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 park units, 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 National Park Service units as well as, potentially, throughout each park unit, being generally greater in developed areas and less in undeveloped areas.

Climbers and canyoneers have the ability to impact the natural soundscape by using power drills or hand drills or hammers and by communicating with each other along routes. However, motorized drills will be prohibited in wilderness areas and the impact of using a hand drill or hammer will be very specific in location. Motorized drills could be authorized in non wilderness areas through an approval process and preserving the natural soundscape will be analyzed during this process. Seasonal closures of routes within spatial buffers of sensitive nesting raptors and lambing bighorn sheep will occur to minimize potential impacts of human caused sound on these sensitive wildlife species. The park will also stress through education the importance of preserving the natural soundscape by conversing in low tones, and being cognizant of group noise impacts when in the backcountry and wilderness. Overall, the impacts of climber and canyoneering activities on the natural soundscape of the park will be minor or less and short-term in duration. Therefore, this topic is dismissed from further analysis in this document.

Scenic Values

NPS *2006 Management Policies* states that the park's scenery and scenic features are considered highly valued associated characteristics. There are no regulations requiring special protection of these integral vistas, but NPS will strive to protect these park-related resources through cooperative means.

Visitors come to Arches to take in the spectacular vistas and marvel at the unique scenery which is composed of contrasting topography, geologic features, and vegetation that combine to create the visual landscape. Two primary components to consider in the management of scenic values are the resources within the park boundaries and those that extend beyond the boundaries. Within park boundaries the visual landscape can be maintained through careful NPS management. The vistas that encompass visual resources beyond park boundaries can be more challenging, but just as important, to maintain unimpaired for future generations. Actions specific to climbing and canyoneering which may impact the park's scenic value will include brightly colored nylon slings, bolts, chains, chalk residue, or even climbers on the rock. The visual impacts of these climbers and their equipment varies depending on location, position, color, and type and will be more appropriate to analyze under the visitor use and experience topic. Overall these impacts will be minor in relation to the park's very broad majestic visual landscape. Therefore, this topic is dismissed from further analysis in this document.

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 will 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 (NRCS), 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. According to the NRCS, Arches National Park does not contain prime or unique farmlands (NRCS 2003). Because there will be no effects to prime and unique farmlands, this topic is dismissed from further analysis in this document.

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. Climbing and canyoneering activities are available to all visitors regardless of race or income, and developing the climbing and canyoneering management plan will not have disproportionate health or environmental effects on minorities or low income populations or communities. Because there will be no disproportionate effects, this topic is dismissed from further analysis in this document.

CHAPTER 2 - ALTERNATIVES

During January 2010 an interdisciplinary team of National Park Service employees met for the purpose of developing a climbing and canyoneering management plan. This meeting and subsequent meetings resulted in the definition of project objectives as described in the *Purpose and Need* section of this document. In February 2011 park management developed a list of alternatives that could potentially meet these objectives and presented it to the public. A total of six alternatives were originally identified for this project. Three alternatives were dismissed from further consideration for various reasons, as described later in this chapter. The no-action alternative and two action alternatives are carried forward for further evaluation in this EA/AEF. A summary table comparing alternative components is presented at the end of this chapter.

(Please refer to *Appendix A* for a glossary of terms used for the scope of this document).

Actions Common to All Alternatives

In addition to park management objectives, the interdisciplinary team identified actions which are common to all alternatives considered. These actions are currently in place or will be implemented regardless of a specific alternative selected. Several of these actions are considered as mitigation measures to minimize the degree and/or severity of adverse effects of climbing and canyoneering activities.

Access Routes

Travel on designated trails, slickrock, and dry washes will be encouraged in the park.

Permit Requirements

Permits are required for all entry into the Fiery Furnace.

Fixed Gear

Canyoneering and rock climbing will be free climbing or clean aid climbing. Clean aid climbing involves the use of temporary equipment and anchors that can be placed and removed without altering the environment (e.g. slings, cams, nuts, chocks, and stoppers).

If an existing item or fixed anchor is judged unsafe, it may be replaced without a permit. When existing anchors are deemed to be unsafe, a reasonable effort to remove the existing hardware will be made and existing drill holes will be used in the installation of replacement fixed anchors whenever possible.

All old holes will be filled with epoxy and topped with sand to best camouflage the unused hole.

Software left in place will be required to match the rock surface in color.

Bolts, hangers and chains painted the color of the rock surface or primed brown will be required.

Fixed ropes left in place for more than 24 hours are prohibited. Fixed ropes left in place longer than 24 hours will be considered "abandoned property" and removed.

Closures

Routes may be closed, temporarily or permanently, or access and/or egress trails rerouted to avoid significant resource impacts based on natural and cultural resource monitoring (36 CFR 1.5).

Balanced Rock will be closed to climbing (36 CFR 1.5).

Any arch or natural bridge named on the United States Geological Survey 7.5 minute topographical map covering Arches National Park will be closed to climbing (36 CFR 1.5).

Bouldering, rock climbing, rock scrambling, and other similar activities will be prohibited in the area known as the "Arches Boulders" or "Highway 191 Boulders" (36 CFR 1.5).

Regulations

The physical altering of rock from its natural position such as chiseling, breaking rocks to reinforce crevices and pockets as anchors, glue reinforcement of existing holds, and gluing of new holds will be prohibited (36 CFR 2.1).

The intentional removal or "gardening" of lichen or plants from rock will be prohibited (36 CFR 2.1).

Use of deadman anchors is prohibited. A deadman is a buried object (e.g., a large rock or log) that functions as an anchor for an attached rope. The action of digging a hole to bury an object for use as an anchor will be prohibited (36 CFR Section 2.1).

Slacklining or "highlining" will be prohibited (36 CFR 1.5).

BASE jumping will be prohibited (36 CFR 2.17 (a)(3) and 2006 NPS Management Policies 8.2.2.7).

Bivvying overnight requires a backcountry permit and will adhere to the same rules and regulations set forth for backcountry camping. Bivvying overnight will be at least one mile from any designated road and one-half mile from any designated trail.

Bathing and immersing human bodies will be prohibited in water sources that do not have water flowing both in and out at the time of the activity. Swimming and wading also will be prohibited in water sources that do not currently have water flowing both in and out, except in cases where it will be necessary to enter the water source in order to traverse a route. (36 CFR 1.5).

All trash will be packed out and disposed of in a refuse receptacle (i.e., trash can or dumpster) (36 C.F.R. 2.14).

Toilet facilities will be used when available (36 C.F.R. 2.14). In undeveloped areas, the disposal of human body waste within 300 feet of a water source, campsite, road, or trail is prohibited. Leaving or burying toilet paper is prohibited. Provision and use of a bag system or portable toilet will be recommended.

Safety Considerations

Most technical climbing and canyoneering routes in Arches require advanced skills. The NPS cannot guarantee the safety of park visitors. Safety remains the sole responsibility of the climber or canyoneer. Climbers and canyoneers should understand the inherent danger of the activity. Climbers and canyoneers should have basic knowledge of self-rescue methods and plan accordingly. Climbers and canyoneers should not attempt routes that are not within their ability. Visitor education is the primary means through which the park will continue to encourage safe practices.

The replacement of fixed anchors will be allowed when necessary to enable a safe rappel when no other means of descent is possible, to enable emergency retreat, and during self-rescue situations.

The NPS will be not responsible for the replacement or maintenance of existing hardware or software but will work cooperatively with local climbers/canyoneers and organizations to develop a systematic program for the assessment and replacement and inventory of fixed anchors for climbing and canyoneering routes. The NPS explicitly disclaims all responsibility for the safety of equipment, bolts, or anchor systems in the park. However, the NPS may place and maintain fixed anchors for administrative and emergency purposes.

Education

The park will establish a proactive educational and outreach program. There will be a climber/canyoneering educational display at the Visitor Center to display closures and regulations and to promote "Leave No Trace" techniques and sound climbing and canyoneering ethics. The park will provide information to climbers and canyoneers before they arrive. This will be accomplished through the development of climbing and canyoneering-specific educational literature that could be distributed at the Visitor Centers, mailed, or posted on the park's web page. Additional efforts will be made to distribute this information to local outdoor gear shops and guide services. The park staff will work with journalists to develop articles for periodicals and guidebooks to provide educational information and foster a better appreciation and understanding of the park's resources. The park will ensure that information posted on official NPS internet sites about climbing routes and canyoneering routes will be accurate and up-to-date regarding closures.

Alternatives Carried Forward

Alternative A - Continue with Current Management (No Action Alternative)

Currently rock climbing and canyoneering are regulated under the authority of the Code of Federal Regulations (CFR). The CFR sets NPS-wide regulations and also delegates authority to park superintendents to make certain park decisions which are then described in the Superintendent's compendium. Although establishment of new routes is prohibited, levels of climbing and canyoneering use on existing routes likely will increase over time. Potential impacts of increasing use levels on park resources and values will be unknown.

The No Action Alternative is required under NEPA and establishes a baseline for comparing the present management direction and environmental consequences of the action alternative. Under the No Action Alternative the park will continue current management of climbing and canyoneering activities.

Access Routes

There will be no delineation of access trails to the base of rock climbing routes or to and through canyoneering routes. Social trailing will continue to be a problem. Travel on designated trails, slickrock, and dry washes will continue to be encouraged in areas where no designation of a trail is present.

Group Size

There will be no restrictions on group size or day use limits for climbers or canyoneers.

Permit Requirements

Permits will continue to be required only for the Fiery Furnace. All other climbing and canyoneering areas will not require a permit to access.

New Route Establishment

Establishment of new routes will continue to be prohibited. Climbers and canyoneers will continue to use limited routes that are available.

Fixed Gear

Installation of new fixed gear will continue to be prohibited. This will limit all climbing and canyoneering to existing routes or new routes not requiring placement of fixed anchors.

The use of motorized power drills will continue to be prohibited.

The park will not replace existing fixed gear to reduce resource impacts. Rope grooving and other abrasions to the rock will continue to occur from poor gear placement and will result in permanently damaging rock surfaces.

Monitoring

There will be no systematic monitoring (short or long-term) to evaluate and minimize potential impacts of climbing and canyoneering use on park resources and values. The park will continue to have no data on the trends in visitor usage nor will it have trends on the impacts of climbing and canyoneering activities on the parks resources.

Closures/Regulations

Use of white chalk will continue to be prohibited. Chalk or chalk substitutes used in the park will be required to be similar in color to the rock that is being climbed.

Alternative B - Action Alternative (Preferred Alternative)

Under this alternative, climbing and canyoneering activities will be actively managed and monitored to maintain desired resource and visitor experience conditions.

The desired condition of the backcountry zone is that the landscape is largely undisturbed and undeveloped by human activities with natural processes predominating. The environment offers a moderate to high degree of challenge and adventure. Opportunities for solitude and primitive recreation and the application of specialized skills are moderate to high. The probability of encountering other visitors is low. A moderate level of management is provided for resource protection and safety purposes. Some resources may be managed to restore an area that has been disturbed or to preserve cultural resources. Tolerance for resource modifications and resource degradation is low. Offsite management of visitors may require permits, limits on length of stay in area and reservation requirements.

Monitoring data will be used to ensure desired conditions are being met. If desired conditions are not being met, the following management strategies will be considered: Trail delineations, group-size limit adjustments, seasonal route closures, additional permit requirements, and placement and replacement of fixed gear. The following are proposed for implementation under Alternative B.

Access Routes

Access routes will be delineated and maintained as necessary to minimize impacts on park resources and values. Results of resource assessments and monitoring will be used to determine management strategies for access routes.

Short sections of routes may be maintained to prevent erosion or other resource degradation. In some instances signs may be placed to direct climbers and canyoneers away from problem or sensitive areas in order to protect resources. Signs or cairns will only be erected to protect resources or for safety concerns.

Access trails to the bases of well-known and heavily used climbing routes and access trails to canyoneering routes may be identified on a map, delineated and maintained in order to prevent further erosion and loss of vegetation. No more than one access route up/down a slope to the base of a climb, area, or canyon will be allowed. Social trails that are used infrequently or that traverse sensitive soils will be rehabilitated or blocked to discourage future use.

Group Size Limits

Rock climbing groups will be limited to five persons per group.

Canyoneering groups in the Fiery Furnace and the Lost Spring Canyon canyoneering routes will be limited to six persons per group. Elsewhere, canyoneering groups will be limited to 10 persons per group. Larger groups must split and use different routes or use the same route at different times of the day to avoid queuing at rappel sites and to minimize impacts on resources and on other visitors.

Permit Requirements

A free user permit system will be implemented to enable monitoring of visitor use numbers, group sizes, and locations of use. The free permit process will be convenient and will benefit users by providing educational information on safety issues, route access, and low-impact Leave No Trace (LNT) techniques for off-trail travel in the backcountry. In the future, the permit system may be accessible online.

With the exception of entering the Fiery Furnace, permits will be available outside the park Visitor Center at an information/registration board.

Rock climbers will be *encouraged* to complete a free self-registration process at the park Visitor Center (VC) to allow NPS to gather information about levels, locations, and timing of climbing use in the park.

Canyoneers will be *required* to complete a free self-registration process at the park VC or at the Lost Spring Canyon trailhead for the Undercover / MMI routes to allow NPS to gather information about levels, locations, and timing of canyoneering use in the park.

New Route Establishment

Establishment of new routes will be allowed. The following guidelines for new routes are provided to maximize visitor safety and minimize potential impacts on park resources and values:

- Travel to and from routes must be within dry wash systems or on rock.
- Use of retrievable anchor systems will be encouraged.
- No new fixed gear can be installed without a special use permit.

Fixed Gear

Installation of new fixed gear on new and existing routes will require a free special use permit (Appendix G). However, in the future, and after a cost analysis has been completed to determine an appropriate fee, a cost recovery fee may be charged. The park will establish guidelines, which are also found in Appendix G, for new fixed gear installation to maximize visitor safety and minimize potential impacts on park resources and values. The placement of fixed anchors during new route development will not be allowed when rock features capable of accepting adequate removable protection are present. The installation of pitons will be prohibited.

Use of motorized drills outside of wilderness boundaries will require a special use permit (Appendix G). Applications to use motorized drills will be reviewed by park staff to evaluate potential impacts to adjacent wilderness character, wildlife concerns, or the experiences of other park users. Use of motorized drills within wilderness boundaries will be prohibited.

The park recommends hardware for new and replacement anchors be modern climbing-specific hardware and of a length adequate for rock conditions at the installation site. ¼ inch bolts are highly discouraged. Homemade hardware is prohibited. Best practices for the site should be followed.

The park recommends hardware for new and replacement anchors be a torque-in-sleeve expansion bolt (that can be removed with a wrench for inspection and maintenance) of a length adequate for rock conditions at the installation site. Climbing-specific hangers are also recommended. Appropriately colored chains are recommended to replace the use of nylon webbing when rap hangers cannot mitigate rope grooving.

New, bolt-intensive climbing routes (e.g., sport climbs, bolt ladders) are not appropriate in the park and will not be approved.

The park will actively seek input from the climbing/canyoneering community to assist the park in assessing the suitability and quality of new fixed gear placement proposals.

The park will work with climbing and canyoneering communities to place new fixed gear or to replace existing fixed gear to minimize resource impacts.

Monitoring

Indicators and standards of resource protection and visitor use (Appendix E) will be monitored to determine whether adjustments in the management system are required to achieve desired conditions. Indicators of visitor use will be based on data provided by the user permit system and will be augmented by trail counters and observations made during periodic patrols by staff or partners. Indicators of resource conditions could include raptor nest site occupancy; desert bighorn sheep habitat occupancy; evidence of disturbance to other wildlife, sensitive soil, vegetation, water, cultural and geologic resources; and soundscape characteristics. Specific climbing and canyoneering routes will be closed (seasonal or permanent) to address a specific resource condition (Appendix K). Closures will be kept to the minimum area and duration necessary to protect the affected resource.

A volunteer-based resource stewardship program could be developed in partnership with the canyoneering and climbing communities to enhance monitoring capacity and resource protection.

Closures/Regulations

To ensure protection of the geologic features for which the park was established, it will be prohibited to climb, scramble or walk upon, wrap webbing or rope around, or rappel off any named or unnamed arch with an opening greater than three feet.

The use of white chalk will be prohibited. Chalk or chalk substitutes used in the park will be required to be similar in color to the rock that is being climbed.

If monitoring data indicates that desired conditions are not being met, slight changes to group size and permit requirements may be made. If changes exceed the impacts assessed in this plan, then additional environmental analysis will be necessary. The standards for management changes are described in Appendix E *Resource Protection and Visitor Use Indicators and Standards*.

Alternative C - Minimum Alternative

Under this alternative, minimal restrictions will be placed on canyoneering and climbing activities. Management will emphasize educational efforts and will provide canyoneers and climbers with information on park resources and guidelines for ensuring safety and minimizing resource impacts via the park website and social media, Visitor Center displays, and other methods. Relatively little management emphasis will be placed on law enforcement and resource monitoring, although additional use restrictions could be imposed if determined necessary to protect park resources and values. The following are proposed for implementation under Alternative C.

Access Routes

There will be no delineation of access trails to the base of rock climbing routes or to and through canyoneering routes. Social trailing will continue to be a problem. Travel on designated trails, slickrock, and dry washes will continue to be encouraged in areas where no designation of a trail is present.

Group Size Limits

There will be no restrictions on group size or day use limits for climbers or canyoneers. Groups will be expected to self regulate themselves and to be informed of all route closures and park regulations prior to entering the park.

Permit Requirements

Permits will be required only for the Fiery Furnace. All other climbing and canyoneering areas will not require a permit to access.

New Route Establishment

Establishment of new routes will be allowed. The following guidelines for new routes are provided to maximize visitor safety and minimize potential impacts on park resources and values:

- Travel to and from routes must be within dry wash systems or on rock.
- Use of retrievable anchor systems will be encouraged.
- No new fixed gear can be installed without a special use permit.

Fixed Gear

Installation of new fixed gear outside of wilderness boundaries will be allowed without park approval. Installation of new fixed gear within wilderness boundaries will require park approval (Appendix G). The park will establish guidelines (Appendix G) for new fixed gear installation to maximize visitor safety and minimize potential impacts on park resources and values. Use of motorized drills will be prohibited.

Pitons will be allowed as anchors and removable gear. It will be recommended that pitons will only be used when any other reasonably safe means of protecting the climbing party is nonexistent. If pitons are used in the development of a new route that will be expected to receive regular traffic in the future, it will be recommended that the pitons be left fixed to reduce future damage to the rock.

Monitoring

A minimal amount of monitoring will be conducted to evaluate and minimize potential impacts of canyoneering and climbing use on park resources and values. Park efforts to minimize potential resource impacts attributable to canyoneering and climbing will focus on providing educational information to promote backcountry safety and resource protection will continue. The park's website, displays at the VC, and signing at trailheads also provide opportunities to educate visitors on climbing and canyoneering safety. A minimal amount of effort will be devoted to monitoring for compliance with park regulations since few restrictions will be placed on canyoneering and climbing activities.

Closures/Regulations

The use of white chalk will be allowed. More education and awareness of the impacts of chalk use will be encouraged through flyers and at informational kiosks at the VC and near climbing areas throughout the park.

The park will establish guidelines for use of chalk substitutes and other techniques designed to minimize white chalk usage and associated impacts. The encouragement of the leave- no- trace- ethic will be encouraged.

Alternatives Considered and Dismissed

The following three alternatives were considered for project implementation, but were ultimately dismissed from further analysis.

- Active Alternative to include commercial rock climbing and canyoneering

This alternative was considered in the preliminary alternatives to be included in the range of management actions in Alternative B. Commercial visitor services in NPS units are subject to provisions of the NPS Concessions Management Improvement Act of 1998 and NPS *2006 Management Policies* (NPS 2006), as well as be consistent with provisions of current park management plans. In a commercial visitor service analysis (Appendix J), the park interdisciplinary team noted all applicable laws, policies and regulations to authorize a commercial visitor service to operate in a national park. These laws, policies, and plans establish that commercial visitor services may be authorized only if they are determined to be both *necessary* and *appropriate*. NPS 48 (Concessions Policies) defines these terms as follows –

- Necessary – Required to meet the needs of the visitor / public.
- Appropriate – Compatible with the park's natural, cultural, and/or recreational resources, recognizing the purpose of the established area.

The commercial visitor service analysis also looked at current private and commercial rock climbing and canyoneering use inside and outside park boundaries. The NPS determined there are 14 companies who provide commercial rock climbing and/or canyoneering services to the public on lands within 2 to 30 miles of the park. A key factor in determining whether to authorize a commercial service in a park is deciding whether it needs to be in the

park or whether it can be provided outside park boundaries (NPS Management Policies 2006, 10.2.2). In addition, the park's current Commercial Visitor Services Management Plan clearly states that authorization of a visitor service shall be based on demonstrated public need for the service and requests from entrepreneurs to create a market shall not constitute a public need. The NPS determined these commercial activities do not require a park setting and therefore Arches National Park management determined these activities will not be authorized as commercial visitor services. As a result, these commercial visitor services were dismissed as an element of Alternative B.

- Regulatory

This alternative was considered in the preliminary alternatives to be included in the range of management actions to be imposed on rock climbing and canyoneering. This alternative proposed to regulate group sizes, regulate canyon limits, prohibit new route establishment, prohibit fixed gear installations, develop, sign and maintain all access trails to routes, create a robust monitoring framework, prohibit bouldering, and prohibit climbing on any arch. In its entirety, it was eliminated from detailed study because it was technically and economically infeasible as presented. This alternative was very restrictive in controlling visitor use levels which will need to be enforced with additional staff, facilities and funding. This alternative was eliminated because of feasibility reasons and because the alternative will not meet the project's objectives.

- No Climbing or Canyoneering Allowed

This alternative was considered in the preliminary alternatives to be included in the range of management actions to be imposed on rock climbing and canyoneering. Rock climbing has been documented as an historic recreational activity within Arches National Park. Although canyoneering does not have that same historic basis, it has become an appropriate backcountry activity. This alternative was eliminated from detailed study because rock climbing or canyoneering have been found to be appropriate recreational activities in the park. Therefore there was no need to consider this alternative further.

Alternative Summaries

Table 1 summarizes the major components of the alternatives and compares their ability 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 B meets each of the objectives identified for this project, while Alternatives A and C do not address all of the objectives.

Table 1: Summary of Alternatives and How Each Alternative Meets Project Objectives¹

	Alternative A - No Action	Alternative B - Action	Alternative C - Minimum
Access Routes	<ul style="list-style-type: none"> No delineation of access routes 	<ul style="list-style-type: none"> Access routes will be delineated and maintained as necessary to minimize impacts on park resources and values. Rehabilitate and block social trails to discourage future use. 	<ul style="list-style-type: none"> No delineation or maintenance of access routes
Group Size Limits	<ul style="list-style-type: none"> No group size limits 	<ul style="list-style-type: none"> Group size limits will be established <p><i>Rock Climbing</i></p> <ul style="list-style-type: none"> 5 people per group. <p><i>Canyoneering</i></p> <ul style="list-style-type: none"> 10 people per group except in Fiery Furnace and Lost Spring Canyon where group sizes will be 6 people per group Large groups must split up to required group size and must use different routes or use same route different times of day. 	<ul style="list-style-type: none"> No group size limits
Permit Requirements	<ul style="list-style-type: none"> Permits will be required only for the Fiery Furnace. 	<ul style="list-style-type: none"> User registration system will be implemented <p><i>Rock Climbing</i></p> <ul style="list-style-type: none"> Climbers will be <i>encouraged</i> to self-register at the park VC. <p><i>Canyoneering</i></p> <ul style="list-style-type: none"> Canyoneers will be <i>required</i> to self-register at the park VC or at the Undercover/MMI canyoneering route trailhead prior to travel. 	<ul style="list-style-type: none"> Permits will be required only for the Fiery Furnace.

¹ Table does not include actions common to all alternatives

	Alternative A - No Action	Alternative B - Action	Alternative C - Minimum
New Route Establishment	<ul style="list-style-type: none"> Establishment of new routes will be prohibited. 	<ul style="list-style-type: none"> Establishment of new routes will be allowed. The park will establish guidelines for new routes to maximize visitor safety and minimize potential impacts on park resources and values. 	<ul style="list-style-type: none"> Establishment of new routes will be allowed. The park will establish guidelines for new routes to maximize visitor safety and minimize potential impacts on park resources and values.
Fixed Gear	<ul style="list-style-type: none"> Installation of new fixed gear will be prohibited. The installation of new pitons will be prohibited. The use of motorized power drills will be prohibited. The park will not replace existing fixed gear to reduce resource impacts. 	<ul style="list-style-type: none"> Installation of new fixed gear on new or existing routes will require park approval. The installation of new pitons will be prohibited. Use of motorized drills outside of wilderness boundaries will require park approval. Use of motorized drills within wilderness boundaries will be prohibited. The park will establish guidelines for new fixed gear installation to maximize visitor safety and minimize potential impacts on park resources and values. The park will work with climbing and canyoneering communities to place new fixed gear or to replace existing fixed gear to minimize resource impacts. 	<ul style="list-style-type: none"> Installation of new fixed gear outside of wilderness boundaries will be allowed without park approval. Installation of new fixed gear within wilderness boundaries will require park approval. Installation and removal of pitons will be allowed. The park will establish guidelines for fixed gear installation to maximize visitor safety and minimize potential impacts on park resources and values. Use of motorized drills will be prohibited.

Alternative A - No Action		Alternative B - Action		Alternative C - Minimum
Monitoring	<ul style="list-style-type: none"> There will be no systematic monitoring to evaluate and minimize potential impacts of climbing and canyoneering use on park resources and values. 	<ul style="list-style-type: none"> Indicators of visitor use will be based on data provided by the user registration system and trail counter data. Indicators of resource conditions could include raptor nest site occupancy; evidence of disturbance to other wildlife, sensitive soil, vegetation, water, cultural and geologic resources; and soundscape characteristics. A volunteer-based resource stewardship program could be developed in partnership with the canyoneering and climbing communities to enhance monitoring capacity and resource protection. 	<ul style="list-style-type: none"> A minimal amount of monitoring will be conducted to evaluate and minimize potential impacts of canyoneering and climbing use on park resources and values. Park efforts to minimize potential resource impacts attributable to canyoneering and climbing will focus on providing educational information to users. 	
Closures/ Regulations	<ul style="list-style-type: none"> The use of white chalk will be prohibited. Chalk or chalk substitutes used in the park will be required to be similar in color to the rock that is being climbed. 	<ul style="list-style-type: none"> Climbing on, scrambling on, or walking on, or rappelling off any arch (named or unnamed) that has an opening greater than 3 feet will be prohibited. The use of white chalk will be prohibited. Chalk or chalk substitutes used in the park will be required to be similar in color to the rock that is being climbed. 	<ul style="list-style-type: none"> The use of white chalk will be allowed. The park will establish guidelines for use of chalk substitutes and other techniques designed to minimize white chalk usage and associated impacts. 	
Project Objectives	Meets Project Objectives?	Meets Project Objectives?		Meets Project Objectives?
Identify management strategies which protect the park's resources and values while providing opportunities for climbing and canyoneering.	No. This alternative will just be business as usual and will not identify any new management strategies.	Yes. This alternative will establish group size limits, permit requirements, a permit process for establishing new routes with fixed gear, increase monitoring strategies to maintain desired conditions and increase the park's educational information regarding these two activities.		Yes and No. The only park resource that will be protected through a management strategy will be wilderness since permits will be required for new routes or fixed gear in wilderness areas. Otherwise group sizes will not be established and monitoring of park resources will be limited.
Monitor the status of	No. This alternative will just be	Yes. Monitoring data will be used to evaluate patterns in		No. Although this alternative will collect

Alternative A - No Action		Alternative B - Action	Alternative C - Minimum
natural resources, climbing and canyoneering routes and use patterns as a basis for future decision making for maintaining desired conditions.	business as usual and will not monitor visitor use activities and resources as a basis of future decision making.	usage and resource conditions over time, facilitate learning, and determine the need for future actions to improve and maintain desired conditions.	some visitor use data the data will be limited to just wilderness areas and will not fully monitor visitor use activities and resources sufficient enough to inform future decision making.
Establish appropriate levels of canyoneering and rock climbing use.	No. This alternative will not establish group sizes nor monitor if appropriate levels of use are warranted.	Yes. This alternative proposes to establish group size limits and a permit system to monitor appropriate size limits. Monitoring data will be used to evaluate patterns in usage and resource conditions over time, facilitate learning, and determine the need for future actions to improve management and protect resources.	No. This alternative will not establish group sizes nor monitor if appropriate levels of use are warranted.
Identify opportunities to provide educational venues and materials for rock climbing and canyoneering activities.	Yes. A climber/canyoneering education board will be established outside the park VC, the park website will provide specific route information for rock climbing and canyoneering routes, trail kiosks will contain necessary information in climbing and canyoneering areas and educational information will be provided through social media outlets as well.	Yes. A climber/canyoneering education board will be established outside the park VC, the park website will provide specific route information for rock climbing and canyoneering routes, trail kiosks will contain necessary information in climbing and canyoneering areas and educational information will be provided through social media outlets as well.	Yes. A climber/canyoneering education board will be established outside the park VC, the park website will provide specific route information for rock climbing and canyoneering routes, trail kiosks will contain necessary information in climbing and canyoneering areas and educational information will be provided through social media outlets as well.
Engage the climbing and canyoneering community and other stakeholders in cooperative stewardship of park resources, values, and visitor-experience opportunities	No. This alternative does not fully engage the climbing or canyoneering communities in cooperative stewardship of the park.	Yes. The park will work with the climbing and canyoneering community on monitoring routes. Ensuring that private groups register for routes enables the park to get valuable Leave No Trace (LNT) information, and specific park regulations to the user to ensure that cooperative stewardship of the park resources occurs.	Yes. This alternative allows for the climbing and canyoneering communities to self regulate by knowing the rules and regulations via educational information and not by imposing restrictions. Having fewer restrictions demonstrates to the public they have a responsibility to the park.

Table 2 summarizes the anticipated environmental impacts for each alternative. Only those impact topics that have been carried forward for further analysis are included in this table. Chapter 3 (*Affected Environment and Environmental Consequences*) provides a more detailed explanation of these impacts.

Table 2: Environmental Impact Summary by Alternative

Impact Topic	Alternative A: No Action	Alternative B: Action	Alternative C: Minimum
Geological Resources	With continuation of current management, new installations of fixed gear will be prohibited, few new routes will be established, and the park will not replace existing fixed gear. Impacts on geologic resources will be indirect and direct, adverse, negligible to minor, localized, and long-term.	Under the preferred alternative, new fixed gear could be installed if approved. The park will provide guidelines to minimize impacts on geologic resources, pitons will be prohibited, the park will replace and relocate existing fixed gear where necessary to mitigate impacts and the park will implement systematic monitoring to evaluate visitor-use patterns, changes in resource conditions, and the need for additional management actions to protect resources. Impacts on geologic resources will be indirect and direct, adverse, negligible to minor localized, and long-term. Impacts under this alternative are predicted to be less extensive and less intense overall than those under Alternative A.	Under Alternative C, new fixed gear could be installed in wilderness if approved in advance. Park will provide guidelines to minimize impacts on geologic resources. Pitons and white chalk will be allowed, new fixed gear could be installed outside of wilderness without park approval, and monitoring of visitor-use patterns and resource conditions will be minimal. Impacts on geologic resources will be indirect and direct, adverse, minor to moderate, parkwide, and long-term. Impacts on geologic resources under this alternative are predicted to be more extensive and more intense overall than those associated with Alternatives A and B.
Soil Resources	With continuation of current management, no access trails will be delineated, there will be no restrictions on group size, there will be continued spread of soil disturbance through the development and use of informal social trails, and there will be no systematic monitoring to evaluate visitor-use patterns, changes in resource conditions, and the need for actions to mitigate resource impacts. Impacts on soil resources will be indirect and direct, adverse, minor to moderate, localized, and	Under the preferred alternative, access trails will be delineated, existing social trails will be rehabilitated, group-size restrictions will be implemented, and monitoring will be conducted to evaluate visitor-use patterns and changes in resource conditions. Although new routes could be established, trail delineation and visitor-education efforts will mitigate additional impacts to soil resources. Impacts will be indirect and direct, adverse and beneficial, localized, minor to moderate, and long-term. Impacts under this alternative are predicted to be less extensive and less intense overall than those under Alternative A.	Under Alternative C, no access trails will be delineated, the park will not rehabilitate existing social trails, there will be no restrictions on group size, new routes could be established, and the park will conduct minimal monitoring to evaluate visitor-use patterns and changes in resource conditions. As a result, impacts on soil resources will be indirect and direct, adverse, moderate, parkwide, and long-term. Impacts associated with this alternative are predicted to be more extensive and more intense overall than those associated with Alternatives A and B.

Impact Topic	Alternative A: No Action	Alternative B: Action	Alternative C: Minimum
	long-term.		
Special Status Species	With continuation of current management, no access trails will be delineated, there will be no restrictions on group size, there will be continued development and use of informal social trails, and there will be no systematic monitoring to evaluate visitor-use patterns, changes in resource conditions (including raptor and bighorn sheep habitat occupancy), or the need for management actions to mitigate resource impacts. Impacts on special status species will be indirect and direct, adverse, minor to moderate, localized, and long-term.	Under the preferred alternative, access trails will be delineated, group-size restrictions will be implemented, and monitoring will be conducted to evaluate visitor-use patterns, changes in resource conditions, and the need for management actions to mitigate resource impacts. Although new routes could be established, trail delineation, visitor-education efforts, and systematic resource monitoring will mitigate additional impacts to special status species. Overall, the preferred alternative will result in impacts on special status species that are indirect and direct, adverse and beneficial, negligible to minor, localized, and long-term. Adverse impacts to special status species under this alternative are predicted to be less extensive and less intense than under Alternative A.	Under Alternative C, no access trails will be delineated, there will be no restrictions on group size, new routes could be established, and the park will conduct minimal monitoring to evaluate visitor-use patterns, changes in resource conditions, and the need for management actions to mitigate resource impacts. The result will be impacts on special status species that are indirect and direct, adverse, moderate, parkwide, and long-term. Impacts associated with this alternative are predicted to be more extensive and more intense overall than those associated with Alternatives A and B.
Archeological Resources	With continuation of current management, new installations of fixed gear will be prohibited which will continue to protect archeological resources. There will be continued development and use of informal social trails, and will be no systematic monitoring to evaluate visitor-use patterns or changes in resource conditions and the need for actions to mitigate impact to archeological resources. Impacts to archeological resources will be indirect and direct, adverse and beneficial, minor to moderate, local, and long-term.	<p>The preferred alternative will create an overall beneficial impact on archeological resources. Although new routes could be established, the requirement to comply with the National Historic Preservation Act for the installation of any new fixed gear on known and new climbing and canyoneering routes, as well as trail delineation and visitor-education efforts will mitigate additional impacts to archeological resources. Impacts to archeological resources will be direct and indirect, beneficial, minor to moderate, local and parkwide, and long-term.</p> <p><i>\$106 Summary:</i> After applying the Advisory Council on Historic Preservation's criteria of adverse effects (36 CFR Section 800.5, <i>Assessment of Adverse Effects</i>), the National Park Service concludes that implementation of the preferred alternative will have <i>no adverse effect</i> on archeological resources in Arches National Park.</p>	Under Alternative C, archeological resources will not be fully protected. Access trails will not be delineated, the park will not rehabilitate existing social trails, there will be no restrictions on group size, new routes could be established, and the park will conduct minimal monitoring to evaluate visitor-use patterns and changes in resource conditions. As a result, there will be no systematic approach to ensure that these new activities will not impact archeological resources. Impacts to archeological resources will be direct and indirect, adverse, minor to moderate, local and parkwide, and long-term. Impacts on archeological resources under this alternative are predicted to be more extensive and more intense overall than those associated with Alternatives A and B.

Impact Topic	Alternative A: No Action	Alternative B: Action	Alternative C: Minimum
Wilderness Character	With continuation of current management, no access trails will be delineated, there will be no restrictions on group size, and there will be no systematic monitoring to evaluate visitor-use patterns outside the Fiery Furnace, this current alternative will have an overall adverse impact on both the natural quality as well as the opportunity for solitude and unconfined recreation quality. The current restrictions will be a beneficial impact to the wilderness character in the park. Impacts will result in direct and indirect, adverse and beneficial, minor to moderate, parkwide, long-term impacts to wilderness character.	Under the preferred alternative, new fixed gear could be installed if approved. Pitons and white chalk will be prohibited and the park will replace and relocate existing fixed gear where necessary to mitigate resource impacts and the park will implement systematic monitoring to evaluate visitor-use patterns, changes in wilderness character, and the need for additional management actions to protect the natural quality of wilderness. A minimum requirement analysis will be prepared for any proposal to place new hardware in wilderness. By allowing the opportunity to establish new routes and explore the wilderness of the park under a permit process, the park can still provide a wilderness experience to visitors while ensuring park resources are protected. Impacts to wilderness character will be direct, adverse and beneficial, minor to moderate, local and parkwide, and long-term. Impacts under this alternative are predicted to be less extensive and less intense overall than those under Alternative A.	Under Alternative C, climbers and canyoneers will have an opportunity to explore and establish new routes in the wilderness without prior authorization. However, any new fixed gear in the wilderness will require park approval. Park will provide guidelines to minimize impacts on wilderness character. Pitons and white chalk will be allowed and new fixed gear could be installed outside of wilderness without park approval. This minimum management alternative will have a minor beneficial impact to wilderness users who are seeking wilderness opportunities in an unconfined way. The lack of management regarding access routes, group size limits, and hardware installation and monitoring will have a moderate adverse impact to the natural quality of wilderness character and will cause greater long-term impacts. Impacts to wilderness character will be indirect and direct, adverse and beneficial, minor to moderate, parkwide and long-term. Impacts under this alternative are predicted to be more extensive and more intense overall to wilderness character than those associated with Alternatives A and B.
Visitor Use and Experience	With continuation of current management, there will be no systematic monitoring to evaluate visitor-use patterns outside the Fiery Furnace to assist the park in enhancing visitor use and their experiences within the park. Impacts to visitor use and experience will be direct, both adverse and beneficial, negligible to moderate, local, parkwide, short and long-term.	Under the preferred alternative, new fixed gear could be installed if approved. The park will provide guidelines to minimize impacts on resources and will implement monitoring to evaluate visitor-use patterns. This alternative will provide an opportunity for climber and canyoneering groups to work with the park to offer a better visitor experience. The impacts will be direct, adverse and beneficial, minor to moderate, local and parkwide, and short to long-term. Impacts under this alternative are predicted to be more extensive and more intense overall than those under Alternative A.	Under Alternative C, new fixed gear could be installed in wilderness if approved in advance by park managers, and the park will provide guidelines to minimize impacts on other visitors in the area. But pitons and white chalk will be allowed, new fixed gear could be installed outside of wilderness without park approval, and monitoring of visitor-use patterns and resource conditions will be minimal. Impacts will be indirect and direct, adverse and beneficial, minor to moderate, parkwide and long-term if many

Impact Topic	Alternative A: No Action	Alternative B: Action	Alternative C: Minimum
			new routes are established. Impacts on visitor use and experience under this alternative are predicted to be less extensive and less intense overall than those associated with Alternatives A and B.
Park Operations	With continuation of current management, no access trails will be delineated, there will be no restrictions on group size, and there will be no systematic monitoring to evaluate visitor-use patterns outside the Fiery Furnace. Over the long-term, visitor use at Arches is expected to increase and current staffing levels will not be able to keep up with impacts of increased visitor use and will place a management burden on park operations. Impacts to park operations will be direct, adverse, negligible to moderate, local and parkwide and long-term.	Under the preferred alternative, access trails will be delineated, group-size restrictions will be implemented, new fixed gear could be installed if approved. The park will provide guidelines to minimize impacts on resources, the park will replace and relocate existing fixed gear where necessary to mitigate impacts and the park will implement monitoring to evaluate visitor-use patterns, changes in park resources, and the need for additional management actions and /or staff to protect resources. These additional responsibilities on park staff will result in a direct, adverse and beneficial, minor to moderate, parkwide long-term impact on park operations. Adverse impacts to park operations under this alternative are predicted to be more extensive and more intense than under Alternative A and C.	Under Alternative C, no access trails will be delineated, the park will not rehabilitate existing social trails, no restrictions on group size, new routes could be established, and the park will conduct minimal monitoring to evaluate visitor-use patterns and changes in resource conditions. However, over the long-term, visitor use at Arches is expected to increase and current staffing levels will not be able to keep up with impacts of increased visitor use on park resources and will place a management burden on park operations. Therefore, impacts to park operations will be direct, adverse, negligible to moderate, local and parkwide and long-term.

Environmentally Preferred Alternative

According to the CEQ regulations implementing NEPA (43 CFR 46.30), the environmentally preferable alternative is the alternative “that causes the least damage to the biological and physical environment and best protects, preserves, and enhances historical, cultural, and natural resources. The environmentally preferable alternative is identified upon consideration and weighing by the Responsible Official of long-term environmental impacts against short-term impacts in evaluating what is the best protection of these resources. In some situations, such as when different alternatives impact different resources to different degrees, there may be more than one environmentally preferable alternative.”

Alternative B (Action) is the environmentally preferable alternative for several reasons: 1) it will result in long-term beneficial effects on soil resources, special status species, archeological resources, wilderness character, visitor use and experience, and park operations. 2) While there will be adverse impacts to geologic and soil resources, sensitive status species, wilderness character, visitor use and experience and park operations, using a management approach for monitoring of routes and resources will assist park management in making sound science-based decisions to reduce adverse impacts and improve the protection of these resources and improve visitor use and experience in the park. 3) Indicators and standards of resource conditions and visitor use will be implemented and monitored to determine whether adjustments in the management system are required to achieve the desired balance between resource protection and visitor experience. 4) This alternative will also continue to enhance climber education about the park’s resources and their values along with Leave No Trace ethics. 5) This alternative best meets this plan’s management objectives to identify management strategies which protect the park’s resources and values while providing opportunities for climbing and canyoneering. 6) Overall, this management alternative is predicted to reduce the extent and intensity of adverse impacts on natural and cultural resources as well as the human environment relative to Alternatives A and C.

By contrast, Alternative A (No Action) is not the environmentally preferred alternative because the no-action alternative will continue the existing management of rock climbing and canyoneering in the park. Access to climbing and canyoneering routes will remain un-delineated and damage to geologic and soil resources through the development and use of informal social trails will continue to occur. There will continue to be no systematic approach to long-term monitoring of visitor use patterns and resource conditions and how resource conditions actually or potentially are being affected by climbing and canyoneering activities. Without an opportunity to collect visitor use data, park managers will have inadequate information to evaluate relative levels of use among different routes, changes in use patterns over time, and implications of different or changing use patterns for impacts on resource conditions. In addition, a lack of permit requirements will limit opportunities for reducing resource impacts through visitor education provided during the permitting process.

Alternative C (Minimum) is also not the environmentally preferred alternative because impacts on natural and cultural resources such as geologic and soil resources, special status species, archeological resources, and wilderness character are predicted to be more extensive and more intense overall than those associated with both Alternatives A and B. Under this alternative the park will conduct minimal monitoring of visitor use patterns and resource conditions. As a consequence, park managers will have relatively little information for

determining where and when management strategies might be required to mitigate resource impacts. This alternative will place fewer restrictions on how visitors conduct climbing and canyoneering activities in the park and with minimal monitoring, park managers will not be able to fully protect park resources or visitors.

Preferred Alternative

No new information came forward from public scoping or consultation with other agencies to necessitate the development of any new alternatives, other than those described and evaluated in this document. Because it meets the purpose and need for the project, the project objectives, and is the environmentally preferred alternative, Alternative B is also recommended as the National Park Service preferred alternative. For the remainder of the document, Alternative B will be referred to as the *preferred alternative*.

CHAPTER 3 - AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter analyzes the affected environment (existing condition or baseline information) and potential environmental consequences, or impacts that will occur as a result of implementing the project's alternatives. Topics analyzed in this chapter include: geological resources, soil resources, special status species, archeological resources, wilderness character, visitor use and experience, and park operations. Direct, indirect, and cumulative effects are analyzed for each resource topic carried forward. Potential impacts are described in terms of context, and duration, type of impact, and intensity.

Methodology describes how the National Park Service bases impact analyses and conclusions on the review of existing literature and park studies, information provided by experts at the park and other agencies, professional judgments, and park staff insights.

Context is the setting within which an impact is analyzed such as local, parkwide, or regional. The Council on Environmental Quality requires that impact analyses include discussions of context. For this environmental assessment, local impacts will occur within the general vicinity of where the action takes place, while parkwide impacts will affect a greater portion of the park; regional impacts will extend outside the limits of the park.

Duration describes the length of time an effect will occur, either short-term or long-term. Because definitions of duration vary by resource topic, duration definitions are provided separately for each impact topic analyzed in this EA/AEF.

Type of Impact describes the classification of the impact as beneficial or adverse, direct or indirect:

- *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, and still reasonably foreseeable.
- *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.

Intensity is the degree to which a resource will be adversely affected. For this analysis, intensity has been categorized into negligible, minor, moderate, and major. The criteria that were used to rate the intensity of the impacts for each resource topic is presented for each topic (resource).

Cumulative Impact Scenario

The Council on Environmental Quality (CEQ) regulations, which implement the National Environmental Policy Act of 1969 (42 USC 4321 et seq.), require 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 are considered for all alternatives.

Cumulative impacts were determined by combining the impacts of the preferred alternative with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other ongoing or reasonably foreseeable future projects at Arches National Park and, if applicable, the surrounding region. The geographic scope for this analysis includes elements mostly within the park's boundaries but has the potential to be regional for certain impact topics. The temporal scope includes projects within a range of approximately ten years. Given this, the following projects were identified for the purpose of conducting the cumulative effects analysis, listed from past to future:

- **Agricultural Practices:** Grazing of livestock, farming and irrigation have occurred within park boundaries in the past. Today, these practices no longer take place in the park but still occur on neighboring lands. Resource impacts attributable to past livestock grazing and grazing-management activities persist in some areas of the park.
- **Oil, Gas, and Potash Exploration and Development:** Extensive lands managed by the Bureau of Land Management (BLM) and the State of Utah west and north of the park may be leased and permitted for future exploration and development of oil, gas, and/or potash resources.
- **Park Infrastructure:** To facilitate park management and visitation by the public, NPS has constructed buildings, parking lots, roads, trails, and other facilities. Collectively, these cover 232.76 acres which is .3% of the total area of the park.
- **Atlas Mine Tailings Site:** The US Department of Energy (DOE) is in the process of relocating contaminated uranium-ore surface material to a disposal site 30 miles north of Moab, UT via railroad line along HWY 191 just west of the park.
- **Williams Northwest Pipeline:** A buried natural gas pipeline that is owned and operated by Williams Northwest Pipeline Co. traverses the park from northeast to southwest. Recurring maintenance of the pipeline has been ongoing since the pipeline was installed in the 1950s, and these repeated maintenance activities have the potential to impact the park's natural and cultural resources.
- **Exotic Vegetation Management:** NPS manages an extensive program to control invasive exotic plants throughout the park primarily through the use of handsaws, chainsaws, and herbicide. Resulting piles of dead herbaceous and woody biomass often are burned under controlled conditions as a means of reducing hazardous fuel accumulations.
- **Recreation:** Recreation within the park occurs year-round and includes hiking, sightseeing, and backcountry camping. Over one million people visit Arches National Park a year. An average of 2.5 million people visit the Moab area to participate in various recreational opportunities that occur on public lands.
- **Transportation Planning Efforts:** Arches is currently implementing near-term strategies to alleviate traffic concerns and congestion issues that were outlined in the 2006 Transportation Implementation Plan and in a 2012 Alternative Transportation and Congestion Management Feasibility Study. Foreseeable actions that may occur within the next 5-10 years include expansion and/or reconfiguration of some existing parking lots and limited reconfiguration of some existing road segments.
- **Monitoring and Research Projects:** NPS manages an extensive program to monitor the condition of springs and hanging gardens, upland vegetation communities, riparian systems, and other park resources. Many monitoring activities require installation of measurement devices and markers to facilitate relocation of monitoring sites. In addition, numerous

research activities are permitted by NPS and conducted in the park by external scientists every year.

- **Fiery Furnace Site Strategy:** The Fiery Furnace is a year-round permitted day use area where both park and commercially led hikes are provided. Private groups may also obtain permits to access the Fiery Furnace. Issues related to visitor numbers, such as conflicts between users and resource impacts have prompted park management to start reevaluating how this area is currently managed.
- **Soundscape Management:** Arches is currently undergoing a Soundscape Management planning process. Standards / desired conditions for soundscape may have implications for future canyon limits or group size limits for day use and backcountry use.

Impacts to Cultural Resources and §106 of the National Historic Preservation Act

In this EA/AEF, impacts to archeological resources are described in terms of type, context, duration, and intensity, which is consistent with the regulations of the Council on Environmental Quality (CEQ) that implements the National Environmental Policy Act (NEPA). In accordance with the Advisory Council on Historic Preservation's regulations implementing §106 of the National Historic Preservation Act (36 CFR §800, *Protection of Historic Properties*), impacts to historic structures were identified and evaluated by (1) determining the area of potential effects; (2) identifying cultural resources present in the area of potential effects that were either listed in or eligible to be listed in the National Register of Historic Places; (3) applying the criteria of adverse effect to affected cultural resources either listed in or eligible to be listed in the National Register; and (4) considering ways to avoid, minimize or mitigate adverse effects.

Under the Advisory Council's regulations a determination of either adverse effect or no adverse effect must also be made for affected National Register eligible cultural resources. An adverse effect occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion on the National Register (e.g., diminishing the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association). Adverse effects also include reasonably foreseeable effects caused by the preferred alternative that will occur later in time, be farther removed in distance or be cumulative (36 CFR §800.5, *Assessment of Adverse Effects*). A determination of no adverse effect means there is an effect, but the effect will not diminish in any way the characteristics of the cultural resource that qualify it for inclusion on the National Register.

CEQ regulations and the National Park Service's *Conservation Planning, Environmental Impact Analysis and Decision-making* (Director's Order 12) also call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation will be in reducing the intensity of a potential impact, i.e., reducing the intensity of an impact from major to moderate or minor. Any resultant reduction in intensity of impact due to mitigation, however, is an estimate of the effectiveness of mitigation under NEPA only. It does not suggest that the level of effect as defined by §106 is similarly reduced. Although adverse effects under §106 may be mitigated, the effects remain adverse.

A §106 summary is included in the impact analysis sections under the preferred alternative. The §106 summary is intended to meet the requirements of §106 and is an assessment of the effect of the undertaking (implementation of the alternative) on cultural resources, based upon the criterion of effect and criteria of adverse effect found in the Advisory Council's regulations.

Geological Resources

Affected Environment

Arches National Park was established to protect extraordinary examples of geologic features including arches, natural bridges, windows, spires, balanced rocks, and other features of geologic, historic, and scientific interest. Geologic features and natural geologic processes together are considered by NPS to be geologic resources. NPS policy is to preserve and protect geologic resources as integral components of park natural systems (NPS 2006).

At least 19 distinct geologic units are exposed at the surface in the park (Doelling 2010), excluding unconsolidated aeolian and alluvial deposits that are considered as soil resources in this document. The majority of the arches and other prominent geologic features for which the park is known are formed in three units. In ascending stratigraphic order, these are the Dewey Bridge Member of the Carmel Formation, the Slick Rock Member of the Entrada Sandstone, and the Moab Member of the Curtis Formation (Doelling 2010). These and Navajo Sandstone (located stratigraphically beneath the Dewey Bridge Member) are the rock units that are traversed by canyoneering and climbing routes in the park. For the 10 canyoneering routes combined, approximately 44 percent of the total route length occurs on the Slick Rock Member, 15 percent occurs on Navajo Sandstone, 12 percent occurs on the Dewey Bridge Member, and 11 percent occurs on the Moab Member. The remaining 18 percent occurs on unconsolidated deposits discussed below as soil resources. (Percentages are estimated from GIS analysis.) As with the canyoneering routes, the majority of climbing routes are associated with the Slick Rock Member.

Climbing and canyoneering activities can affect geologic resources in a number of ways. Installation of fixed gear (including bolts and anchor systems) and the use of hammer driven pitons involve creating or expanding holes in rocks. All existing canyoneering routes and all climbing routes in the park have one or more installations of fixed gear, resulting in permanent alterations of geologic features. Crack systems along many climbing routes also have been permanently altered due to repeated insertion and removal of pitons used as climbing aids. Repeated abrasion of rock surfaces by ropes, shoes and clothing, and other gear can accelerate geologic processes of weathering, rock disintegration, and erosion. Other forms of rock alteration include chipping, removal, and displacement of rocks to facilitate access or traversal of a route. Unlike harder types of rock like granite, all of the rock units traversed by canyoneering and climbing routes in the park are relatively friable and thus highly susceptible to alteration and damage by human activities.

Environmental Consequences

Methodology

Information on geologic features and stratigraphy was compiled from published literature and map products (Doelling 2001, 2010). Predictions concerning short- and long-term impacts to geologic resources were based on field observations (see Appendix D) of existing impacts and on park staff's knowledge of park resources and techniques and gear used for canyoneering and climbing. Levels of intensity for impacts to geologic resources are defined below.

Intensity Level Definitions

Negligible: Activities will not cause discernible alteration to geologic resources. Impacts will not be measurable or of any perceptible consequence.

- Minor: Changes to character of geological features and processes are detectable but small, site-specific and of little consequence. Activities will cause site-specific or limited alteration to geological resources. Any mitigation needed to offset adverse effects will be standard, uncomplicated, and effective.
- Moderate: Changes may be evident over a large portion of geological features and processes. Activities will cause alterations to geological resources. Mitigation measures, if needed to offset adverse effects, could be extensive but will likely be successful.
- Major: Impacts to geological resources could be substantial and over a wide area. Alterations to geological resources will have a lasting effect and reclamation could not successfully be achieved. Extensive mitigation measures will be needed to offset any adverse effects, and their success could not be guaranteed.
- Duration: Short-term refers to a transitory effect, one that largely disappears over a period of days, months, or up to five years. Long-term refers to a period greater than five years.

Impacts of Alternative A – No Action

Access Routes

With the continuation of current management, access trails to, through, and/or from canyoneering and climbing routes will not be delineated. Where access routes traverse exposed bedrock, the lack of delineated trails will have the potential to result in rock abrasion from foot traffic that is more extensive than will otherwise occur. Adverse impacts will occur. However, since bedrock is highly resistant to impacts from foot traffic impacts will be negligible to minor.

Group Size Limits

Visitors will continue to travel in groups of various sizes when engaging in climbing and canyoneering activities. Particularly without delineated access trails, foot traffic attributable to large groups could result in a higher degree of rock abrasion than will occur with smaller groups.

Permit Requirements

With the continuation of current management, permits will be required only for the Fiery Furnace, and park management will lack data that document levels of canyoneering and/or climbing use in other areas of the park. Lacking these data, park managers will have inadequate information to evaluate relative levels of use among different routes, changes in use patterns over time, and implications of different or changing use patterns for impacts on resource conditions. In addition, a lack of permit requirements will limit opportunities for reducing resource impacts through visitor education provided during the permitting process. For geologic resources, lack of visitor-use information and educational opportunities derived from a permit system could result in adverse impacts.

New Route Establishment

Establishment of new routes will be allowed, but only without installation of fixed gear. With a prohibition of fixed-gear installations, it is likely that few new routes will be established and impacts on geologic resources will be those attributable to rock abrasion other than rope pulling.

Fixed Gear

Along many canyoneering routes in the park, repeated abrasion caused by pulling ropes to retrieve them from rappel stations has caused grooving of rock surfaces. At some rappel stations, repeated rope pulling has created multiple rope grooves that are up to several centimeters deep, permanently altering rock surfaces. Establishment of anchor systems by wrapping rope or webbing around geologic features such as small arches or boulders places stress on the feature, potentially

resulting in destabilization and accelerated movement and toppling of the feature. Installation of new fixed gear will be prohibited, thereby preventing additional adverse impacts on geologic resources attributable to gear installation. But the park also will not take action to replace existing fixed gear where such replacement could reduce future impacts on geologic resources (i.e., by relocating rappel stations to reduce the occurrence of rock abrasion and grooving from rope pulling).

Monitoring

Under this alternative, there will continue to be no systematic approach to long-term monitoring of visitor-use patterns and resource conditions and how resource conditions actually or potentially are being affected by climbing and canyoneering activities. As a consequence, park managers will lack current information necessary for determining where and when management actions might be required to mitigate resource impacts. Impacts will be indirect and minor.

Closures / Regulations

The use of white chalk to facilitate climbing alters the visual appearance of rock surfaces and associated geologic features. Use of white chalk will continue to be prohibited under this alternative, thereby minimizing adverse impacts of white chalk usage on geologic resources.

Cumulative Effects: Past agricultural practices; construction and continued maintenance of the Williams gas pipeline; park recreational uses other than climbing and canyoneering; development and maintenance of park infrastructure including roads, trails, and facilities; the conduct of resource monitoring and research activities; and foreseeable future actions related to park transportation management have affected the park's resources. This alternative when combined with other past, present, and foreseeable future actions, will result in a negligible to minor increase in cumulative adverse impacts to geologic resources in the park.

Conclusion: With continuation of current management, new installations of fixed gear will be prohibited, few new routes will be established, and the park will not replace existing fixed gear as a means of minimizing future impacts on geologic resources. Impacts on geologic resources will be indirect and direct, adverse, negligible to minor localized, and long-term overall.

Impacts of Alternative B – Action (Preferred Alternative)

Access Routes

Relative to Alternative A, delineation of access trails under the preferred alternative, likely will reduce the extent and intensity of adverse impacts on geologic resources. Since bedrock is resistant to abrasion impacts from foot traffic impacts will be negligible.

Group Size Limits

Group-size restrictions under this alternative could reduce the extent and intensity of abrasion impacts attributable to foot traffic relative to Alternative A. Currently, the greatest abrasion impacts are attributable to rope pulling at rappel stations. In this case, implementation of group-size limits could increase the degree of adverse impacts if splitting of large groups into multiple small groups causes an increase in the number of rope pulls for the same total number of canyoneers. Group-size limits could indirectly affect geologic resources, but impacts will remain negligible to minor.

Permit Requirements

The permit system established under this alternative likely will provide opportunities for visitor education and generate information on visitor use patterns that will have the potential to reduce the extent and intensity of adverse impacts on geologic resources relative to Alternative A.

New Route Establishment

Under the preferred alternative, establishment of new routes will be allowed, and the park will provide guidelines for minimizing resource impacts attributable to new routes. These guidelines could reduce the extent and intensity of adverse impacts on geologic resources relative to Alternative A.

Fixed Gear

Along many canyoneering routes in the park, repeated abrasion caused by pulling ropes to retrieve them from rappel stations has caused grooving of rock surfaces. At some rappel stations, repeated rope pulling has created multiple rope grooves that are up to several centimeters deep, permanently altering rock surfaces. Under this alternative, new fixed gear could be installed on new or existing routes if approved in advance by park managers. Although the park will provide guidelines for minimizing associated resource impacts, allowance of new fixed gear installations could increase the extent and intensity of impacts on geologic resources relative to Alternative A. These increases could be offset by park managers through replacement and relocation of existing fixed gear where such actions have the potential to reduce future impacts attributable to rope pulling. Overall, net effects could be to increase or to reduce the extent and intensity of adverse impacts on geologic resources relative to Alternative A.

Monitoring

Establishment of monitoring under the preferred alternative will have the potential to indirectly reduce the intensity and extent of impacts on geologic resources relative to Alternative A. Monitoring of rappel stations, visitor use patterns and resource conditions will provide park managers with information necessary for determining where and when management actions might be needed to mitigate resource impacts.

Closures / Regulations

The use of white chalk to facilitate climbing alters the visual appearance of rock surfaces and associated geologic features. Use of white chalk will continue to be prohibited under the preferred alternative, thereby minimizing adverse impacts of white chalk usage on geologic resources.

Establishment of anchor systems by wrapping rope or webbing around geologic features such as small arches or boulders places stress on the feature, potentially resulting in destabilization and accelerated movement and toppling of the feature. Under this alternative, rappelling from or climbing, scrambling, walking on any arch with an opening greater than three feet will be prohibited.

Both of these prohibitions have the potential to reduce the intensity and extent of impacts on geologic resources relative to Alternative A.

Cumulative Effects: Past agricultural practices; construction and continued maintenance of the Williams gas pipeline; park recreational uses other than climbing and canyoneering; development and maintenance of park infrastructure including roads, trails, and facilities; the conduct of resource monitoring and research activities; and foreseeable future actions related to park transportation management have affected the park's resources. This alternative when combined with other past, present, and foreseeable future actions, will result in a negligible to minor increase in cumulative adverse impacts to geologic resources in the park.

Conclusion: Under the preferred alternative, new fixed gear could be installed if approved in advance by park managers. The park will provide guidelines to minimize impacts on geologic resources, pitons will be prohibited; the park will work with local climbing or canyoneering groups to replace and relocate existing fixed gear where necessary to mitigate impacts attributable to rope pulling; the park will implement monitoring to evaluate visitor-use patterns, changes in resource conditions, and the need for additional management actions to protect resources. Impacts on geologic resources will be indirect and direct, adverse, negligible to minor, localized, and long-term.

Impacts under this alternative are predicted to be less extensive and less intense overall than those under Alternative A.

Impacts of Alternative C – Minimum

Access Routes

Like Alternative A, access trails to, through, and/or from canyoneering and climbing routes will not be delineated under Alternative C. Where access routes traverse exposed bedrock, the lack of delineated trails will have the potential to result in rock abrasion from foot traffic that is more extensive than will otherwise occur. Adverse impacts on geologic resources will be direct, potentially widespread if many new routes are established, and long-term, but they will be negligible to minor overall since bedrock is highly resistant to impacts from foot traffic.

Group Size Limits

Visitors will continue to travel in groups of various sizes when engaging in climbing and canyoneering activities. Particularly without delineated access trails, foot traffic attributable to large groups could result in a higher degree of rock abrasion than will occur with smaller groups. Adverse impacts on geologic resources will be direct, potentially widespread if many new routes are established, and long-term, but they will be negligible to minor.

Permits Requirements

As with Alternative A, permits will be required only for the Fiery Furnace and park management will lack data that document levels of canyoneering and/or climbing use in other areas of the park. Lacking these data, park managers will have inadequate information to evaluate relative levels of use among different routes, changes in use patterns over time, and implications of different or changing use patterns for impacts on resource conditions. In addition, a lack of permit requirements will limit opportunities for reducing resource impacts through visitor education provided during the permitting process. For geologic resources, lack of visitor use information and educational opportunities derived from a permit system could result in adverse impacts that are indirect, potentially widespread if many new routes are established.

New Route Establishment

As with the preferred alternative, establishment of new routes will be allowed, and the park will provide guidelines for minimizing resource impacts attributable to new routes. Although these guidelines could mitigate impacts on geologic resources, adverse impacts of new route establishment will be direct and potentially moderate if many new routes are established.

Fixed Gear

Under Alternative C, new fixed gear could be installed on new or existing routes outside wilderness boundaries without park approval and within wilderness boundaries if approved in advance by park managers. In addition, use of pitons will be allowed. Although the park will provide guidelines for minimizing associated resource impacts, allowance of new fixed gear installations could increase the extent and intensity of impacts on geologic resources relative to Alternative A. Allowing the use of pitons likely will increase the extent and intensity of impacts relative to Alternatives A and B. Unlike the preferred alternative, these increases will not be offset through replacement and relocation of existing fixed gear where such actions could reduce impacts attributable to rope pulling. Net effects will be to increase the extent and intensity of adverse impacts on geologic resources relative to Alternatives A and B. Adverse impacts will be direct, and long-term since the extent of impacts could increase and become widespread rather than localized if many new routes are established.

Monitoring

Under Alternative C, the park will conduct minimal monitoring of visitor-use patterns and resource conditions. As a consequence, park managers will have relatively little information for determining where and when management actions might be required for mitigating resource impacts. Potential impacts on geologic resources will be adverse, indirect, long-term, and minor to moderate since the extent of impacts could increase and become widespread rather than localized.

Closures / Regulations

Unlike Alternatives A and B, use of white chalk will be allowed under this alternative. Although the park will provide guidelines for minimizing impacts attributable to chalk usage, the extent and intensity of impacts will be greater for this alternative than for Alternatives A and B. In addition, this alternative will not prohibit rappelling from or climbing, scrambling, and/or walking on any arch with an opening greater than three feet. This will have the potential to increase the extent and intensity of impacts on geologic resources relative to the preferred alternative. Overall, adverse impacts of this alternative on geologic resources will be direct and will have the potential to become widespread if many new routes are established. Impacts could be long-term and minor to moderate.

Cumulative Effects: Past agricultural practices; construction and continued maintenance of the Williams gas pipeline; park recreational uses other than climbing and canyoneering; development and maintenance of park infrastructure including roads, trails, and facilities; the conduct of resource monitoring and research activities; and foreseeable future actions related to park transportation management and have affected the park's resources. This alternative when combined with other past, present, and foreseeable future actions, will result in a minor increase in cumulative adverse impacts to geologic resources in the park.

Conclusion: Under Alternative C, new fixed gear could be installed in wilderness if approved in advance by park managers, and the park will provide guidelines to minimize impacts on geologic resources. But pitons and white chalk will be allowed, new fixed gear could be installed outside of wilderness without park approval, and monitoring of visitor-use patterns and resource conditions will be minimal. As a result, impacts on geologic resources will be indirect and direct, adverse, minor to moderate, potentially widespread if many new routes are established, and long-term. Impacts on geologic resources under this alternative are predicted to be more extensive and more intense overall than those associated with Alternatives A and B.

Soil Resources

Affected Environment

For the purposes of this document, soil is defined as a surficial deposit of fine, unconsolidated material composed primarily of minerals weathered from rock, but also including organic matter and soil organisms. The concept of soil resources includes these components as well as mineral nutrients, soil moisture, associated natural processes such as nutrient cycling and water infiltration, and the soil properties necessary for sustaining these processes. NPS policy is to strive to understand and preserve soil resources of parks, and to prevent or minimize accelerated erosion or other impacts that degrade soil functions and contributions to park natural systems (NPS 2006).

A recent inventory documented the occurrence of 23 distinct types of soil in the park (Scott 2009). These soils differ from one another in numerous properties that affect soil functioning, soil capacity to support different types and amounts of vegetation, and soil responses to surface disturbance and management. Some of these properties include depth, mineral composition, and texture (particle size). Soils in the park can be grouped into three broad categories: aeolian (derived from wind-blown sediment), alluvial (derived from water-borne sediment), and residual (weathered in

place; Scott 2009). All three categories are found in association with climbing and canyoneering routes in the park. Aeolian soils often occur as dune features that range in depth from very shallow (Arches soil series) to very deep (Mido soil series). Residual soils are shallow or very shallow deposits on bedrock (Rizno soil series). Alluvial soils typically are associated with drainage ways and are very deep (Bowington soil series). Aeolian and residual soils are most commonly associated with climbing and canyoneering routes in the park, although significant sections of some canyoneering routes such as Bighorn, Dragonfly, and Lost-and-Found occur on alluvial soils.

Important aspects of many soils in the park are the presence, composition, and structure of biological soil crust (biological crust hereafter). Biological crusts are soil-surface assemblages of cyanobacteria, mosses, and lichens that are functionally significant for soil stabilization (Warren 2003), nutrient cycling (Evans and Lange 2003), hydrologic processes (Warren 2003), and mediation of vascular plant establishment (Belnap et al. 2003). Well-developed biological crusts characterized by a high degree of surface roughness and high cyanobacterial biomass confer greater soil stability than weakly developed biological crusts with less surface roughness and biomass (Belnap et al. 2008). Degree of development increases with duration of surface stability and also is affected by soil properties and site conditions. The functional significance of biological crust is countered by its high vulnerability to damage from surface disturbances that can result in long-term reductions of crust structure and functionality (Belnap and Eldridge 2003). In sparsely vegetated landscapes such as those found in the park, disturbance-induced declines in biological crust often are accompanied by accelerated soil erosion and persistent, long-term reductions in surface roughness and associated functions (Miller et al. 2011). Where well-developed biological crusts are lacking due to surface disturbance or other factors, soils may be stabilized by weakly developed biological crusts or by physical crusts.

Impacts to soil resources from visitor use activities are attributable primarily to trampling. Trampling of soil surfaces that are stabilized by physical or biological crusts destabilizes those surfaces and facilitates erosion by wind and water. Repeated trampling can cause soil compaction that may impede soil processes such as infiltration of water and growth of plant roots (Brady and Weil 1996). Where trampling causes compaction and/or damages the integrity of well-developed biological crusts, impacts to associated functions can be long-term (Belnap and Eldridge 2003). Secondary effects of soil disturbance and destabilization can occur due to transport of destabilized soil by wind and water. Wind-blown sand has the potential to abrade and damage undisturbed soil surfaces, biological crust components, and plant tissues; and to cause detachment and erosion of soil particles far downwind from the location of the original surface disturbance (Blanco and Lal 2008). Where destabilized soils are deposited by wind or water on top of intact biological crusts, long-term burial can result in death of photosynthetic components such as cyanobacteria and mosses (Belnap 2003).

Resource assessments conducted by NPS indicate that many of these impacts are evident in association with canyoneering and climbing routes in the park. Most impacts have occurred along access routes to and from the bedrock sections of canyoneering and climbing routes. But impacts also have occurred along bedrock sections where canyoneering routes traverse interspersed soil deposits. Increasing popularity of canyoneering in the park, the lack of delineated access trails, and increasing use of GPS (global positioning system) units by visitors for point-to-point cross-country navigation likely have contributed to the spread of informal trail networks (i.e., "social trails") and related soil-resource impacts in association with several canyoneering routes in the park.

Environmental Consequences

Methodology

Information on soil resources was compiled from published literature and map products (e.g., Brady and Weil 1996, Belnap and Lange 2003, Blanco and Lal 2008, Scott 2009). Predictions concerning short- and long-term impacts to soil resources were based on published literature, field observations (see Appendix D) of existing impacts, and on park staff's professional experience and knowledge of soil resources. Levels of intensity for impacts to soil resources are defined below.

Intensity Level Definitions

- Negligible:** Any effects to soils (loss of soil surface roughness, increase in compaction or erosion) will be below or at the lower levels of detection. Any effects to soils will be slight and short term. Impacted area will be very small (e.g., footprints), site-specific, and no mitigation measures will be necessary.
- Minor:** The effects to soils (loss of soil surface roughness, increase in compaction or erosion) will be detectable. Effects will be slight (e.g., the impact of one pass of a vehicle), the area affected will be small (e.g., 20' of vehicle tracks), and the damage site-specific. Impacts will be short-term. If mitigation were needed to offset adverse impacts, it will be simple to implement and likely successful.
- Moderate:** The effects to soils (loss of soil surface roughness, increase in compaction or erosion) will be readily apparent and detectable, likely long-term, and will result in a change to the soil character over a relatively localized area (up to 0.5 acre). Mitigation measures will probably be necessary to offset adverse impacts and will likely succeed.
- Major:** The effects to soils (loss of soil surface roughness, increase in compaction or erosion) will be readily apparent and detectable, long-term, and will substantially change the character of the soil surface over a large area (>0.5 acre). Mitigation measures to offset adverse impacts will be needed, extensive, and their success could not be guaranteed.
- Duration:** Short-term refers to a transitory effect, one that largely disappears over a period of days, months, or up to five years. Long-term refers to a period greater than five years.

Impacts of Alternative A – No Action

Access Routes

With the continuation of current management, access trails to, through, and/or from canyoneering and climbing routes will not be delineated. The continued lack of delineated access trails will result in the continued spread and use of informal social trails, and associated soil-resource impacts (loss of surface roughness, damage to biological crusts, soil destabilization and erosion, and compaction) will be moderate, localized and long-term than will otherwise occur.

Group Size Limits

Visitors will continue to travel in groups of various sizes when engaging in climbing and canyoneering activities. Without delineated access trails, foot traffic attributable to large groups could result in a higher degree of social trailing, surface disturbance, and associated soil-resource impacts than will occur with smaller groups. Adverse impacts on soil resources will be direct and moderate.

Permits Requirements

With the continuation of current management, permits will be required only for the Fiery Furnace, and park management will lack data that document levels of canyoneering and/or climbing use in

other areas of the park. Lacking these data, park managers will have inadequate information to evaluate relative levels of use among different routes, changes in use patterns over time, and implications of different or changing use patterns for impacts on resource conditions. In addition, a lack of permit requirements will limit opportunities for reducing resource impacts through visitor education provided during the permitting process. Although a lack of permit requirements will have no direct impacts on soil resources, the lack of visitor-use information and educational opportunities could contribute indirectly to adverse impacts.

New Route Establishment

Establishment of new routes will be allowed, but only without installation of fixed gear. With a prohibition of fixed-gear installations, it is likely that few new routes will be established. Based on this assumption, trampling and surface disturbances associated with new routes will have impacts on soil resources that are adverse but minor overall.

Fixed Gear

The continued prohibition of new fixed gear installations will have no impacts on soil resources.

Monitoring

Under this alternative, there will continue to be no systematic approach to long-term monitoring of visitor-use patterns and resource conditions and how resource conditions actually or potentially are being affected by climbing and canyoneering activities. As a consequence, park managers will lack current information necessary for determining where and when actions might be required to mitigate resource impacts. Indirect impacts on soil resources will be adverse and moderate.

Closures / Regulations

The prohibition on use of white chalk will have no impacts on soil resources.

Cumulative Effects: Past agricultural practices; construction and continued maintenance of the Williams gas pipeline; park recreational uses other than climbing and canyoneering; development and maintenance of park infrastructure including roads, trails, and facilities; the conduct of resource monitoring and research activities; and foreseeable future actions related to park transportation management have affected park's resources. This alternative when combined with other past, present, and foreseeable future actions, will result in a minor increase in cumulative adverse impacts to soil resources in the park.

Conclusion: With continuation of current management, no access trails will be delineated, there will be no restrictions on group size, there will be continued spread of soil disturbance through the development and use of informal social trails, and there will be no systematic monitoring to evaluate visitor-use patterns, changes in resource conditions, and the need for actions to mitigate resource impacts. Impacts on soil resources will be indirect and direct, adverse, minor to moderate, localized, and long-term.

Impacts of Alternative B – Action (Preferred Alternative)

Access Routes

Relative to Alternative A, delineation of access trails and blocking of existing social trails under the preferred alternative will reduce the extent and intensity of adverse impacts of trampling and social trailing on soil resources. Blocking and rehabilitation of existing social trails also will facilitate stabilization and recovery of disturbed soils, thereby resulting in beneficial impacts to soil resources that will be direct but minor. Overall impacts will be both adverse and beneficial and localized.

Group Size Limits

Group size restrictions under this alternative could reduce the extent and intensity of adverse impacts of trampling and social trailing on soil resources relative to Alternative A.

Permits

The permit system established under this alternative will provide opportunities for visitor education and generate information on visitor-use patterns that could indirectly reduce the extent and intensity of adverse impacts on soil resources relative to Alternative A.

New Route Establishment

Under the preferred alternative, establishment of new routes will be allowed and the park will provide guidelines for minimizing resource impacts attributable to new routes. Although the guidelines will be likely to minimize the impacts of individual routes, there could be greater potential for establishing new routes under the preferred alternative than under Alternative A since new fixed gear could be installed under the preferred alternative if approved in advance by the park. This could result in a net increase in soil-resource impacts attributable to new route establishment relative to Alternative A. Adverse impacts of new route establishment on soil resources will be direct and minor to moderate.

Fixed Gear

Under this alternative, new fixed gear could be installed on new or existing routes if approved in advance by park managers. This will have no direct impacts on soil resources, but could result in indirect impacts, as noted above.

Monitoring

Relative to Alternative A, establishment of monitoring under Alternative B will have the potential to indirectly reduce the intensity and extent of adverse impacts on soil resources and also to indirectly result in beneficial impacts on soil resources. Monitoring of visitor-use patterns and resource conditions will provide park managers with information necessary for determining where and when actions might be required to mitigate resource impacts. For soil resources, such actions could include blocking and rehabilitation of social trails, delineation of new trail segments, and implementation of erosion-control measures. Indirect impacts of monitoring on soil resources will be both beneficial and adverse.

Closures / Regulations

Prohibitions included under the preferred alternative will have no impacts on soil resources.

Cumulative Effects: Past agricultural practices; construction and continued maintenance of the Williams gas pipeline; park recreational uses other than climbing and canyoneering; development and maintenance of park infrastructure including roads, trails, and facilities; the conduct of resource monitoring and research activities; and foreseeable future actions related to park transportation management have affected the park's resources. This alternative when combined with other past, present, and foreseeable future actions, will result in a negligible to minor increase in cumulative adverse impacts to soil resources in the park.

Conclusion: Under the preferred alternative, access trails will be delineated, existing social trails will be rehabilitated, group-size restrictions will be implemented, and monitoring will be conducted to evaluate visitor-use patterns and changes in resource conditions. Although new routes could be established, trail delineation and visitor-education efforts will mitigate additional impacts to soil resources. Impacts will be indirect and direct, adverse and beneficial, minor to moderate, localized, and long-term. Impacts under this alternative are predicted to be less extensive and less intense overall than those under Alternative A.

Impacts of Alternative C – Minimum

Access Routes

Like Alternative A, access trails to, through, and/or from canyoneering and climbing routes will not be delineated under Alternative C. The continued lack of delineated access trails will result in the

continued spread and use of informal social trails, and associated soil-resource impacts (loss of surface roughness, damage to biological crusts, soil destabilization and erosion, and compaction) will be more extensive and intense than will otherwise occur. Adverse impacts on soil resources will be direct, potentially widespread and moderate if many new routes are established.

Group Size Limits

Visitors will continue to travel in groups of various sizes when engaging in climbing and canyoneering activities. Without delineated access trails, foot traffic attributable to large groups could result in a higher degree of surface disturbance and associated soil-resource impacts than will occur with smaller groups. Adverse impacts on soil resources will be direct and moderate if many new routes are established.

Permit Requirements

As with Alternative A, permits will be required only for the Fiery Furnace and park management will lack data that document levels of canyoneering and/or climbing use in other areas of the park. Lacking these data, park managers will have inadequate information to evaluate relative levels of use among different routes, changes in use patterns over time, and implications of different or changing use patterns for impacts on resource conditions. In addition, a lack of permit requirements will limit opportunities for reducing resource impacts through visitor education provided during the permitting process. Although a lack of permit requirements will have no direct impacts on soil resources, the lack of visitor-use information and educational opportunities could contribute indirectly to adverse impacts that are potentially widespread if many new routes are established.

New Route Establishment

As with the preferred alternative, establishment of new routes will be allowed, and the park will provide guidelines for minimizing resource impacts attributable to new routes. Although these guidelines could mitigate impacts of individual routes, there could be greater potential for establishing new routes under Alternative C than under Alternatives A and B since pitons will be allowed and new fixed gear could be installed outside of wilderness without approval and inside wilderness if approved in advance by the park. This could result in a net increase in soil-resource impacts attributable to new route establishment relative to Alternative A. Adverse impacts of new route establishment on soil resources will be direct, potentially widespread and moderate.

Fixed Gear

Allowance of fixed gear installations will have no direct impacts on soil resources, but could result in indirect impacts, as noted above.

Monitoring

Under Alternative C, the park will conduct minimal monitoring of visitor-use patterns and resource conditions. As a consequence, park managers will have relatively little information for determining where and when management actions might be required to mitigate resource impacts. Adverse impacts on soil resources will be indirect, potentially widespread and moderate if many new routes are established.

Closures / Regulations

Allowing the use of white chalk under Alternative C will have no impacts on soil resources.

Cumulative Effects: Past agricultural practices; construction and continued maintenance of the Williams gas pipeline; park recreational uses other than climbing and canyoneering; development and maintenance of park infrastructure including roads, trails, and facilities; the conduct of resource monitoring and research activities; and foreseeable future actions related to park transportation management affects the park's resources. This alternative when combined with

other past, present, and foreseeable future actions, will result in a minor increase in cumulative adverse impacts to soil resources in the park.

Conclusion: Under Alternative C, no access trails will be delineated, the park will not rehabilitate existing social trails, there will be no restrictions on group size, new routes could be established, and the park will conduct minimal monitoring to evaluate visitor-use patterns and changes in resource conditions. As a result, impacts on soil resources will be indirect and direct, adverse, moderate, potentially widespread if many new routes are established, and long-term. Impacts associated with this alternative are predicted to be more extensive and more intense overall than those associated with Alternatives A and B.

Special Status Species

Affected Environment

Special status species are those that are listed or are candidates for listing under the federal Endangered Species Act, species identified on the State of Utah's sensitive species list, and other species that are of special management concern in the park due to uniqueness, rarity, declining population trends, and/or particular sensitivity to human impacts. NPS policy is to protect and strive to recover all federally listed species that are native to the park, to manage state-listed species similarly to federally listed species to the extent possible, and to manage other species of management concern to maintain their natural distribution and abundance (NPS 2006).

Fourteen state-sensitive species and one species that is a candidate for federal listing have been documented as present or probably present in the park (Table 3). Potential habitat for the federally listed Mexican spotted owl (*Strix occidentalis*) occurs in canyon habitats traversed by canyoneering routes in the Lost Spring Canyon area of the park, but surveys conducted by the park wildlife technician in 2011 and 2012 detected no owls in the area and a concurrence was made with the US Fish and Wildlife Service that canyoneering activities “may affect by not adversely affect” Mexican spotted owls (Appendix H). Nesting raptors as a group are considered species of management concern because of their high degree of sensitivity to disturbance from human activities. Raptor species nesting in the park include American kestrel (*Falco sparverius*), burrowing owl (*Athene cunicularia*), Cooper's hawk (*Accipiter cooperii*), golden eagle (*Aquila chrysaetos*), great horned owl (*Bubo virginianus*), long-eared owl (*Asio otus*), northern harrier (*Circus cyaneus*), peregrine falcon (*Falco peregrinus*), prairie falcon (*F. mexicanus*), and red-tailed hawk (*Buteo jamaicensis*). Desert bighorn sheep (*Ovis canadensis nelsoni*) also is of management concern in the park because of its value as an iconic species that is uncommon and sensitive to disturbance from human activities (Papouchis, et al. 2001).

Of the special status vertebrates identified above, nesting raptors and breeding and lambing desert bighorn sheep have the greatest potential to be impacted by climbing and canyoneering activities. Cooper's hawk, great horned owl, golden eagle, peregrine falcon, prairie falcon, and red-tailed hawk all are known to nest in proximity to existing climbing or canyoneering routes. Repeated disturbance and flushing of raptors during the breeding season have the potential to adversely impact reproductive success of nesting pairs and eventually to cause long-term declines in local populations (Romin and Muck 2002). Several climbing routes also occur in the midst of bighorn sheep breeding and lambing habitat in the park. Repeated disturbance of sheep during these key periods of their annual life cycle has the potential to displace animals from areas of preferred habitat and to adversely impact the energetics, condition, and reproductive success of individual animals (Papouchis, et al. 2001).

Three canyoneering routes (Elephant Butte, Lomatium, and Krill) traverse habitats that support populations of Canyonlands lomatium (*Lomatium latilobum*), a plant species that is of management concern because of its extreme rarity globally and in the State of Utah (UDWR 1998, Fertig 2009). Canyonlands lomatium is a perennial, herbaceous member of the parsley family (Apiaceae) that only is known to occur in Grand and San Juan Counties in Utah and in adjacent Mesa County in Colorado. Visitor use activities in the park have the potential to adversely impact the species primarily by trampling that directly damages the condition, survival, and potential reproductive success of individual plants, and by trampling of soils that may impact the species indirectly through effects on soil stability, erosion, compaction, and water infiltration.

Table 3: State Sensitive Species and Federal Candidate Species in Arches National Park²

Group	Common Name	Scientific Name	Park Status	Abundance	Residency	Conservation Status
Mammals	Allen's big-eared bat	<i>Idionycteris phyllotis</i>	Probably Present	No information available	No information available	State sensitive
	Big free-tailed bat	<i>Nyctinomops macrotis</i>	Present in Park	Uncommon	Breeder	State sensitive
	Fringed myotis	<i>Myotis thysanodes</i>	Probably Present	No information available	No information available	State sensitive
	Spotted bat	<i>Euderma maculatum</i>	Probably Present	No information available	No information available	State sensitive
	Townsend's big-eared bat	<i>Corynorhinus townsendii</i>	Probably Present	No information available	No information available	State sensitive
	Kit fox	<i>Vulpes macrotis</i>	Present in Park	Unknown	Breeder	State sensitive
	White-tailed prairie dog	<i>Cynomys leucurus</i>	Present in Park	Uncommon	Breeder	State sensitive
Birds	Bald eagle	<i>Haliaeetus leucocephalus</i>	Present in Park	Uncommon	Resident	State sensitive
	Burrowing owl	<i>Athene cunicularia</i>	Present in Park	Occasional	Breeder	State sensitive
	Ferruginous hawk	<i>Buteo regalis</i>	Probably Present	No information available	No information available	State sensitive
	Lewis' woodpecker	<i>Melanerpes lewis</i>	Present in Park	Occasional	Migratory	State sensitive
	Northern goshawk	<i>Accipiter gentilis</i>	Present in Park	Rare	Migratory	State sensitive
Fishes	Yellow-billed cuckoo	<i>Coccyzus americanus</i>	Present in Park	Occasional	Migratory	Federal candidate
	Bluehead sucker	<i>Catostomus discobolus</i>	Present in Park	Uncommon	Resident	State sensitive
	Flannelmouth sucker	<i>Catostomus latipinnis</i>	Present in Park	Uncommon	Resident	State sensitive

² NPS. 2012. Species Lists. Northern Colorado Plateau Network, Inventory and Monitoring Program, National Park Service. <http://science.nature.nps.gov/im/units/ncpn/SpeciesSelect.cfm> (accessed November 19, 2012)

Environmental Consequences

Methodology

Information on the known distribution of nesting raptors, desert bighorn sheep habitat, and lomatium populations was compiled from NPS sources. Predictions concerning short- and long-term impacts to these special status species were based on field observations of existing conditions (see Appendix D) and on park staff's knowledge of park resources and climbing and canyoneering activities. Levels of intensity for impacts to special status species are defined below.

Intensity Level Definitions

- Negligible:** No special status species will be affected, or the alternative will affect an individual of a species or its critical habitat, but the change will be so small that it will not be of any measurable or perceptible consequence to the protected individual or its population.
- Minor:** The alternative will affect an individual(s) of a special status species or its critical habitat, but the change will be small. The impact will be site-specific and short-term. Mitigation measures, if needed to offset adverse impacts, will be simple and successful.
- Moderate:** An individual or population of a special status species or its critical habitat will be noticeably affected. The effect could have some long-term consequence to the individual, population, or habitat. The impact could be site-specific or local in context. Mitigation measures will probably be necessary to offset adverse effects and will likely be successful.
- Major:** An individual or population of a special status species or its critical habitat will be noticeably affected with a long-term, vital consequence to the individual, population, or habitat. The impact will be local or regional in context. Extensive mitigation measures will be needed to offset adverse effects, and their success will not be guaranteed.
- Duration:** Short-term refers to a transitory effect, one that largely disappears over a period of days, months, or up to five years. Long-term refers to a period greater than five years.

Impacts of Alternative A – No Action

Access Routes

With the continuation of current management, access trails to, through, and/or from canyoneering and climbing routes will not be delineated. The continued lack of delineated access trails is unlikely to affect raptors or bighorn sheep, but could result in more extensive and intense impacts on lomatium plants and populations than will otherwise occur and will be a minor to moderate impact. Adverse trampling impacts on lomatium plants and populations will be direct and indirect and localized.

Group Size Limits

Visitors will continue to travel in groups of various sizes when engaging in climbing and canyoneering activities. Without delineated access trails, foot traffic attributable to large groups could result in a minor to moderate direct and indirect trampling impact on lomatium plants than will occur with smaller groups. Likewise, disturbance of nesting raptors and breeding

and/or lambing sheep could be greater with large groups than with small groups. These impacts will be adverse and localized.

Permit Requirements

With the continuation of current management, permits will be required only for the Fiery Furnace and park management will lack data that document levels of canyoneering and/or climbing use in other areas of the park. Lacking these data, park managers will have inadequate information to evaluate relative levels of use among different routes, changes in use patterns over time, and implications of different or changing use patterns for impacts on resource conditions. In addition, a lack of permit requirements will limit opportunities for reducing resource impacts through visitor education provided during the permitting process. Although a lack of permit requirements will have no direct impacts on special status species, the lack of visitor use information and educational opportunities could contribute indirectly to adverse impacts.

New Route Establishment

Establishment of new routes will be allowed, but only without installation of fixed gear. With a prohibition of fixed-gear installations, it is likely that few new routes will be established. Based on this assumption, additional adverse trampling impacts on lomatium plants and populations will be localized, potentially long-term, but negligible to minor overall. Likewise, additional adverse disturbance impacts on raptors and bighorn sheep will be adverse and localized.

Fixed Gear

The continued prohibition of new fixed gear installations will have no impacts on special status species.

Monitoring

Under this alternative, there will continue to be no systematic approach to long-term monitoring of visitor-use patterns and resource conditions (including habitat occupancy by raptors and sheep) and how resource conditions actually or potentially are being affected by climbing and canyoneering activities. As a consequence, park managers will lack current information necessary for determining where and when management actions might be required to mitigate resource impacts. Impacts will be indirect on lomatium populations, nesting raptors, and bighorn sheep and minor to moderate.

Closures / Regulations

The prohibition on use of white chalk will have no impacts on special status species.

Cumulative Effects: Past agricultural practices; construction and continued maintenance of the Williams gas pipeline; park recreational uses other than climbing and canyoneering; development and maintenance of park infrastructure including roads, trails, and facilities; the conduct of resource monitoring and research activities, and changes in native plant communities have affected the park's special status species. Oil, gas and potash activities outside park boundaries and traffic such as overflights, scenic airplane tours or vehicles degrade habitats for special status species both from sight and sound. This alternative when combined with other past, present, and foreseeable future actions, will result in a minor increase in cumulative adverse impacts to special status species in the park.

Conclusion: With continuation of current management, no access trails will be delineated, there will be no restrictions on group size, there will be continued development and use of informal social trails, and there will be no systematic monitoring to evaluate visitor-use patterns, changes in resource conditions (including raptor and bighorn sheep habitat occupancy), or the need for management actions to mitigate resource impacts. Impacts on special status species will be indirect and direct, adverse, minor to moderate, localized, and long-term.

Impacts of Alternative B – Action (Preferred Alternative)

Access Routes

Relative to Alternative A, delineation of access trails under the preferred alternative could reduce the extent and intensity of adverse trampling impacts on lomatium plants and populations. Adverse impacts will be both direct and indirect, localized, potentially long-term, but negligible to minor overall. Delineation and rehabilitation of access trails will be unlikely to affect raptors or bighorn sheep.

Group Size Limits

Group size restrictions under this alternative could reduce the extent and intensity of adverse trampling and disturbance impacts on lomatium populations, nesting raptors, and breeding and/or lambing bighorn sheep relative to Alternative A.

Permit Requirements

The permit system established under this alternative will provide opportunities for visitor education and generate information on visitor-use patterns that could indirectly reduce the extent and intensity of adverse impacts on special status species relative to Alternative A.

New Route Establishment

Under the preferred alternative, establishment of new routes will be allowed, and the park will provide guidelines for minimizing resource impacts attributable to new routes. Although the guidelines will be likely to minimize the impacts of individual routes, there could be greater potential for establishing new routes under the preferred alternative than under Alternative A since new fixed gear could be installed under the preferred alternative if approved in advance by the park. Without mitigation measures, this could result in a net increase in adverse impacts on special status species attributable to new route establishment relative to Alternative A.

Fixed Gear

Under this alternative, new fixed gear could be installed on new or existing routes if approved in advance by park managers. The pre-identification of proposed locations where this activity might occur will allow the park to survey these areas prior to gear placement, and identify and protect lomatium populations, nesting raptors, and breeding and/or lambing bighorn sheep. This will have a direct beneficial impact on special status species.

Monitoring

Establishment of systematic monitoring under the preferred alternative will have the potential to indirectly reduce the intensity and extent of impacts on special status species relative to Alternative A. Monitoring of visitor-use patterns and resource conditions (including habitat occupancy by raptors and sheep) will provide park managers with information necessary for determining where and when actions might be required to mitigate resource impacts. For raptors and bighorn sheep, such actions could include seasonal closures of routes through or near occupied habitat. For lomatium, actions also could include route closures or reroutes.

Closures / Regulations

Prohibitions included under the preferred alternative will have no impacts on special status species.

Cumulative Effects: Past agricultural practices; construction and continued maintenance of the Williams gas pipeline; park recreational uses other than climbing and canyoneering; development and maintenance of park infrastructure including roads, trails, and facilities; the conduct of resource monitoring and research activities, and changes in native plant communities have affected the park's special status species. Oil, gas and potash activities outside park boundaries and traffic such as overflights, scenic airplane tours or vehicles degrade habitats for

special status species both from sight and sound. This alternative when combined with other past, present, and foreseeable future actions, will result in a negligible to minor increase in cumulative adverse impacts to special status species in the park.

Conclusion: Under the preferred alternative, access trails will be delineated, group-size restrictions will be implemented, and monitoring will be conducted to evaluate visitor-use patterns, changes in resource conditions, and the need for management actions to mitigate resource impacts. Although new routes could be established, trail delineation, visitor-education efforts, and systematic resource monitoring will mitigate additional impacts to special status species. Overall, the preferred alternative will result in impacts on special status species that are indirect and direct, adverse and beneficial, negligible to minor, localized, and long-term. Adverse impacts to special status species under this alternative are predicted to be less extensive and less intense than under Alternative A.

Impacts of Alternative C – Minimum

Access Routes

Like Alternative A, access trails to, through, and/or from canyoneering and climbing routes will not be delineated under Alternative C. The continued lack of delineated access trails is unlikely to affect raptors or bighorn sheep, but could result in more extensive and intense impacts on lomatium plants and populations than will otherwise occur. Adverse trampling impacts on lomatium plants and populations will be direct and indirect, potentially widespread if many new routes are established through lomatium populations, potentially long-term, and moderate.

Group Size Limits

Visitors will continue to travel in groups of various sizes when engaging in climbing and canyoneering activities. Without delineated access trails, foot traffic attributable to large groups could result in a higher degree of direct and indirect trampling impacts on lomatium plants than will occur with smaller groups. These impacts could be widespread if many new routes are established, potentially long-term, and moderate. Likewise, disturbance of nesting raptors and breeding and/or lambing sheep could be greater with large groups than with small groups. These adverse impacts could be widespread if many new routes are established.

Permit Requirements

As with Alternative A, permits will be required only for the Fiery Furnace and park management will lack data that document levels of canyoneering and/or climbing use in other areas of the park. Lacking these data, park managers will have inadequate information to evaluate relative levels of use among different routes, changes in use patterns over time, and implications of different or changing use patterns for impacts on resource conditions. In addition, a lack of permit requirements will limit opportunities for reducing resource impacts through visitor education provided during the permitting process. Although a lack of permit requirements will have no direct impacts on special status species, the lack of visitor-use information and educational opportunities could contribute indirectly to adverse impacts that could be widespread if many new routes are established.

New Route Establishment

As with the preferred alternative, establishment of new routes will be allowed, and the park will provide guidelines for minimizing resource impacts attributable to new routes. Although these guidelines could mitigate impacts of individual routes, there could be greater potential for establishing new routes under Alternative C than under Alternatives A and B since pitons will be allowed and new fixed gear could be installed outside of wilderness without approval and inside wilderness if approved in advance by the park. Without mitigation measures, this could result in a net increase in adverse impacts on special status species attributable to new route

establishment relative to Alternatives A and B. Adverse impacts of new route establishment on special status species could be direct and potentially widespread if many new routes are established.

Fixed Gear

Allowance of fixed gear installations will have no direct impacts on special status species, but could result in indirect impacts, as noted above.

Monitoring

Under Alternative C, the park will conduct minimal monitoring of visitor-use patterns and resource conditions. As a consequence, park managers will have relatively little information for determining where and when management actions might be required to mitigate resource impacts. Adverse impacts on special status species will be indirect, potentially long-term, potentially widespread if many new routes are established.

Closures / Regulations

Allowing the use of white chalk under Alternative C will have no impacts on special status species.

Cumulative Effects: Past agricultural practices; construction and continued maintenance of the Williams gas pipeline; park recreational uses other than climbing and canyoneering; development and maintenance of park infrastructure including roads, trails, and facilities; the conduct of resource monitoring and research activities, and changes in native plant communities have affected the park's special status species. Oil, gas and potash activities outside park boundaries and traffic such as overflights, scenic airplane tours or vehicles degrade habitats for special status species both from sight and sound. This alternative when combined with other past, present, and foreseeable future actions, will result in a moderate increase in cumulative adverse impacts to special status species in the park.

Conclusion: Under Alternative C, no access trails will be delineated, there will be no restrictions on group size, new routes could be established, and the park will conduct minimal monitoring to evaluate visitor-use patterns, changes in resource conditions, and the need for management actions to mitigate resource impacts. The result will be impacts on special status species that are indirect and direct, adverse, moderate, potentially widespread, and long-term. Impacts associated with this alternative are predicted to be more extensive and more intense overall than those associated with Alternatives A and B.

Archeological Resources

Affected Environment

The National Park Service (NPS), as a steward of many of America's most important cultural resources, is charged with preserving archeological resources for the enjoyment of present and future generations. Management decisions and activities throughout the National Park System must reflect awareness of the irreplaceable nature of these resources. The NPS will protect and manage archeological resources in its custody through effective research, planning, and stewardship, and in accordance with Section 106 and 110 of the National Historic Preservation Act (NHPA) as well as the policies and principles contained in the NPS *2006 Management Policies* (NPS 2006).

In addition to the NHPA and the NPS *2006 Management Policies*, the NPS's Director's Order 28A *Archeology* affirms a long-term commitment to the appropriate investigation, documentation, preservation, interpretation, and protection of archeological resources inside units of the

National Park System. As one of the principal stewards of America's heritage, the NPS is charged with the preservation of the commemorative, educational, scientific, and traditional cultural values of archeological resources for the benefit and enjoyment of present and future generations. Archeological resources are nonrenewable and irreplaceable, so it is important that all management decisions and activities throughout the National Park System reflect a commitment to the conservation of archeological resources as elements of our national heritage.

To date, 44 access routes to the most popular and heavily-used climbs, and 6 access routes to popular canyoneering routes, have been surveyed in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (PL 91-852), the National Environmental Policy Act of 1969 (PL 91-852), the Archaeological Resources Protection Act of 1979 (PL 96-95), and Executive Order 11593. The compliance work for this project included a literature search for existing sites and previous surveys, and a 15-meter pedestrian transect survey of each access route. These surveys were conducted between June of 2010 and October of 2011. A total of approximately 110 acres were surveyed for the project.

During the surveys, three new sites were located and documented and documentation for one previously recorded site was updated. All four of these sites were *Determined Eligible* for listing on the National Register of Historic Places by the Utah State Historic Preservation Officer on September 22, 2012. In addition, four isolated finds were also located and documented.

Based on the survey results, we are recommending a *No Historic Properties Affected* finding for 45 of the 50 access routes. For those access routes that had sites associated with them, none of these resources have the potential to be directly impacted by climbing or canyoneering activities, and therefore we are making a recommendation of *No Adverse Effect* for the resources associated with these five access routes.

Environmental Consequences

Methodology

In order to be eligible for listing on the National Register of Historic Places, an archeological resource must meet one or more of the following criteria of significance: A) associated with events that have made a significant contribution to the broad patterns of our history; B) associated with the lives of persons significant in our past; C) embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic value, or represent a significant and distinguishable entity whose components may lack individual distinction; D) have yielded, or may be likely to yield, information important in prehistory or history.

Intensity Level Definitions

For purposes of analyzing impacts to archeological resources either listed or eligible to be listed on the National Register, the thresholds of change for intensity of an impact are defined below:

- Negligible: Impacts to archeological resources either beneficial or adverse are at the lowest levels of detection, barely perceptible and not measurable. For purposes of §106, the determination of effect will be *no adverse effect*.
- Minor: *Adverse*: disturbance of an archeological resource results in little, if any, loss of significance or integrity and the National Register eligibility of the archeological resource is unaffected. For purposes of §106, the determination of effect will be *no adverse effect*.

- Beneficial:* maintenance or preservation of an archeological resource. For purposes of §106, the determination of effect will be *no adverse effect*.
- Moderate: *Adverse:* disturbance of an archeological resource that does not diminish the significance or integrity of the sites to the extent that its National Register eligibility is jeopardized. For purposes of §106, the determination of effect will be *no adverse effect*.
- Beneficial:* stabilization of the archeological resource. For purposes of §106, the determination of effect will be *no adverse effect*.
- Major: *Adverse:* disturbance of an archeological resource diminishes the significance and integrity of the resource to the extent that it is no longer eligible to be listed on the National Register. For purposes of §106, the determination of effect will be *adverse effect*.
- Beneficial:* stabilization of the archeological resource. For purposes of §106, the determination of effect will be *no adverse effect*.
- Duration: Short-term refers to a transitory effect, one that largely disappears over a period of days, months, or up to five years. Long-term refers to a period greater than five years.

Impacts of Alternative A – No Action

Access Routes

Under Alternative A, access routes to climbing or canyoneering locations will not be delineated or maintained. Visitors may trample unknowingly over areas of archeological deposits causing disturbance to a site local. Only the most popular, known access routes have been surveyed for archeological resources. Additional surveys will occur only if someone reports that there is an archeological resource present along an existing, but previously unsurveyed, route, or along an undelineated route. With no formal delineation of access routes, and only an informal process for notification about the potential presence of archeological resources, direct adverse impacts to archeological resources will occur along access routes.

Group Size Limits

Under Alternative A, group size is limited only when backcountry camping or accessing the Fiery Furnace. Large groups accessing climbing/canyoneering routes have the potential to stray off-trail or create completely new access trails. This behavior can disturb both known and previously unidentified archeological resources. Without control over group size, impacts to archeological resources will be long-term, adverse and moderate.

Permit Requirements

Under Alternative A, permits are required only for the Fiery Furnace. Without a requirement that climbers and canyoneers obtain a permit for activities in other areas of the park, visitor use data and other information on popular climbing and canyoneering locations cannot be collected and proactive protection of known archeological resources cannot be accomplished. The lack of visitor use information and educational opportunities derived from a permit system could result in indirect adverse impacts.

Fixed Gear

Under Alternative A, no new fixed gear can be installed. This will restrict the establishment of new climbing/canyoneering routes, and limit access routes to areas where archeological resources have already been identified and subjected to National Historic Preservation Act compliance. This restriction has a beneficial, localized impact to archeological resources.

New Route Establishment

Under Alternative A, new climbing/canyoneering routes can be established without fixed gear, however there are currently no comprehensive guidelines that educate visitors on safety and how to minimize potential impacts. Without an educational effort to help protect archeological resources, new route establishment will have an adverse impact to archeological resources.

Monitoring

Monitoring is limited under Alternative A and does not include monitoring of archeological resources. Without regular archeological monitoring, the park cannot evaluate potential impacts associated with any off-trail use, or proactively identify subsurface material should it become exposed along known climbing and/or canyoneering routes and impacts will be adverse but minor.

Closures/regulations

The use of white chalk over surfaces will adversely impact rock which may contain petroglyphs. Use of white chalk will continue to be prohibited under this alternative, thereby minimizing adverse impacts of white chalk usage on archeological resources. Also under Alternative A, any area in the park that contains archeological resources that will be adversely impacted by visitor use will be closed, or a buffer permanently established around the site. Closures and regulations will have a beneficial long-term impact on archeological resources.

Cumulative Effects: Past land practices (prior to park establishment) such as grazing, probably disturbed, damaged, or destroyed some archeological resources. Previous road/trail maintenance and construction has likely affected archeological resources adversely in the past, as has off-trail recreation. Long-term, major and adverse impacts occurred to archeological resources when the Williams pipeline was originally installed, destroying all or portions of an unknown number of sites. This alternative when combined with other past, present, and foreseeable future actions, will result in a minor increase in cumulative adverse impacts to archeological resources in the park.

Conclusion: The continuation of current park management will not necessarily protect all the park's archeological resources. The repeated abrasion of rock surfaces containing pictographs or petroglyphs by ropes, shoes and clothing, and other gear can accelerate the weathering of this ancient art. The alteration of rock from chipping, removal, and displacement of rocks to facilitate access or traversal of a route may contain archeological features. Without additional surveys to identify previously unknown archeological resources along access routes not yet delineated, potential impacts to these resources will be adverse. The development and use of informal social trails will continue, and will be no systematic monitoring in place to evaluate visitor-use patterns to better protect archeological resources. Prohibiting the installation of fixed gear will continue to protect archeological resources and will be a beneficial impact. Therefore, impacts to archeological resources will be indirect and direct, adverse and beneficial, minor to moderate, local, and long-term.

Impacts of Alternative B – Action (Preferred Alternative)

Access Routes

Under this preferred alternative, all current and potentially new access routes will be delineated and minimally maintained as necessary to minimize resource impacts. The formal identification of these routes will allow for additional surveys to be conducted for archeological resources, and some routes may be re-routed or further delineated to avoid sensitive archeological resources. This alternative will have a beneficial impact to archeological resources by preserving these sensitive resources.

Group Size Limits

Group sizes will be limited under the preferred alternative. Small group sizes are easier to control and will reduce the potential for straying off-trail or creating completely new social trails. By staying on delineated trails, disturbance to both known and previously unidentified archeological resources will be limited and impacts will be beneficial and long-term.

Permit Requirements

Under the preferred alternative, climbers will be *encouraged* to self-register and identify the locations of their activities while canyoneers will be *required* to self-register. This will assist the park in collecting visitor use data and information on popular climbing and canyoneering locations, and allow for proactive protection of known archeological resources. This alternative will have a direct, beneficial, long-term impact.

Fixed Gear

The preferred alternative will require climbers and canyoneers to obtain a permit to install new fixed gear. The pre-identification of proposed locations where this activity might occur will allow the park to survey these areas prior to gear placement, and identify and protect archeological resources through compliance with the National Historic Preservation Act. New gear placement will not be approved if archeological resources are present. This alternative will have a beneficial, localized, long-term impact on archeological resources.

New Route Establishment

Under the preferred alternative, new climbing/canyoneering routes can be established; however there will be a concurrent emphasis on providing comprehensive guidelines that educate visitors on safety and how to minimize potential impacts. This educational effort will help to protect archeological resources, and will therefore have a beneficial impact on archeological resources.

Monitoring

The preferred alternative proposes a monitoring strategy that will be assisted through information gained through self-registration, as well as a special use permit process. Trends in climbing and canyoneering use, and their potential impacts, will be better understood. Any proposed new area for the installation of fixed climbing gear will undergo a review process to ensure archeological resources will not be impacted. Under this alternative, impacts to archeological resources will be beneficial and potentially widespread.

Closures/regulations

The use of white chalk over surfaces will adversely impact rock which may contain petroglyphs. Use of white chalk will continue to be prohibited under the preferred alternative, thereby minimizing adverse impacts of white chalk usage on archeological resources. Also under this alternative, areas in the park that contain archeological resources that will be adversely impacted by visitor use will be closed, or a buffer permanently established around the site. Closures and regulations will have a beneficial long-term impact on archeological resources.

Cumulative Impacts: Past land practices (prior to park establishment) such as grazing, probably disturbed, damaged, or destroyed some archeological resources. Previous road/trail maintenance and construction has likely affected archeological resources adversely in the past, as has off-trail recreation. Long-term, adverse impacts occurred to archeological resources when the Williams pipeline was originally installed, destroying all or portions of an unknown number of sites. This alternative when combined with other past, present, and foreseeable future actions, will result in a minor increase in cumulative adverse impacts to archeological resources in the park.

Conclusion: Overall, the implementation of the preferred alternative will create an overall beneficial impact on archeological resources. Through a systematic survey of all currently known access trails and routes, the requirement that climbers and canyoneers self-register prior to

conducting their activities, the production of educational materials in conjunction with the establishment of new climbing and canyoneering routes, and the requirement to comply with the National Historic Preservation Act for the installation of any new fixed gear on known and new climbing and canyoneering routes, archeological resources will be better protected under this alternative. Therefore, the preferred alternative will have a direct and indirect, beneficial, minor to moderate, local and parkwide, long-term impact on archeological resources. Impacts under this alternative are predicted to be beneficial overall than those under Alternative A.

§106 Summary:

After applying the Advisory Council on Historic Preservation's criteria of adverse effects (36 CFR Section 800.5, *Assessment of Adverse Effects*), the National Park Service concludes that implementation of the preferred alternative will have *no adverse effect* on archeological resources in Arches National Park.

Impacts of Alternative C – Minimum

Access Routes

Under Alternative C, access routes to climbing or canyoneering locations will not be delineated or maintained. Only the most popular, known access routes have been surveyed for archeological resources. Additional surveys will occur only if someone reports that there is an archeological resource present along an existing, but previously unsurveyed, route, or along an undelineated route. With no formal delineation of access routes, and only an informal process for notification about the potential presence of archeological resources, direct and adverse impacts to archeological resources will occur along access routes.

Group Size Limits

Under Alternative C, group size is limited only when backcountry camping or accessing the Fiery Furnace. Large groups accessing climbing/canyoneering routes have the potential to stray off-trail or create completely new access trails. This behavior can disturb both known and previously unidentified archeological resources. Without control over group size, impacts to archeological resources will be indirect and adverse.

Permit Requirements

Under Alternative C, permits are required only for the Fiery Furnace. Without a requirement that climbers and canyoneers obtain a permit for activities in other areas of the park, visitor use data and other information on popular climbing and canyoneering locations cannot be collected and proactive protection of known archeological resources cannot be accomplished. Therefore, impacts to archeological resources will be indirect and adverse.

Fixed Gear

Under Alternative C (Minimum), new fixed gear can be placed at the discretion of the climber or the canyoneer. Park management will have no way of knowing where new fixed gear is being placed, which could potentially impact archeological resources. This alternative leaves the protection of park resources up to the visitor and will have direct, adverse long-term impacts to archeological resources.

New Route Establishment

Under Alternative C, new climbing/canyoneering routes can be established; however there are currently no comprehensive guidelines that educate visitors on safety and how to minimize potential impacts. The repeated abrasion of rock surfaces containing pictographs or petroglyphs by ropes, shoes and clothing, and other gear can accelerate the weathering of this ancient art.

The alteration of rock from chipping, removal, and displacement of rocks to facilitate access or traversal of a route may contain archeological features. Without an educational effort to help protect archeological resources, new route establishment will have an adverse impact to archeological resources.

Monitoring

Monitoring is limited under Alternative C and does not include monitoring of archeological resources. Without regular archeological monitoring, the park cannot evaluate potential impacts associated with any off-trail use, or proactively identify subsurface material should it become exposed along known climbing and/or canyoneering routes. Therefore, impacts to archeological resources will be adverse and long-term.

Closures/regulations

Unlike Alternatives A and B, use of white chalk will be allowed under this alternative. The use of white chalk over surfaces will adversely impact rock which may contain petroglyphs. Although the park will provide guidelines for minimizing impacts attributable to chalk usage, the extent and intensity of impacts will be greater for this alternative than for Alternatives A and B. Overall, adverse impacts of this alternative on archeological resources will be direct and will have the potential to become widespread if many new routes are established.

Cumulative Effects: Past land practices (prior to park establishment) such as grazing, probably disturbed, damaged, or destroyed some archeological resources. Previous road/trail maintenance and construction has likely affected archeological resources adversely in the past, as has off-trail recreation. Long-term, major and adverse impacts occurred to archeological resources when the Williams pipeline was originally installed, destroying all or portions of an unknown number of sites. This alternative when combined with other past, present, and foreseeable future actions, will result in minor to moderate increase in cumulative adverse impacts to archeological resources in the park.

Conclusion: Under Alternative C, archeological resources will not be fully protected. Access trails will not be delineated, the park will not rehabilitate existing social trails, climbers and canyoneers will be able establish new routes with fixed gear without park involvement and the park will conduct minimal monitoring. As a result, there will be no systematic approach to ensure that these new activities will not impact archeological resources. The park will attempt to educate the public about safety and resource values but these efforts will not offset the adverse effects of this alternative on archeological resources. Impacts to archeological resources under this alternative will be direct and indirect, adverse, minor to moderate, local and parkwide, and long-term. Impacts on archeological resources under this alternative are predicted to be more extensive and more intense overall than those associated with Alternatives A and B.

Wilderness Character

Affected Environment

Wilderness area are 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 to provide for the protection of these areas and the preservation of their wilderness character (sec. 2(a) 1964 Wilderness Act).” Wording in the Wilderness Act is similar to the NPS Organic Act, but differs in specifying lands to be left unimpaired as wilderness, a higher standard of protection than backcountry. The Wilderness Act charges agencies managing wilderness, in this case the NPS, to preserve wilderness character. Wilderness character is described as four necessary and interrelated qualities: untrammeled, natural, undeveloped, and providing solitude or primitive

and unconfined recreation. Together, the four qualities comprise the integrated ecological and social system of wilderness.

The National Park Service also has policies and guidelines in which the NPS is guided in the management of wilderness resources. In January 2011 a draft Directors Order 41: *Wilderness Stewardship* was proposed. In Section 7.2 *Climbing* it states “the occasional placement of a fixed anchor for belay, rappel or protection purposes does not necessarily impair the future enjoyment of wilderness or violate the Wilderness Act. However, climbing practices with the least adverse impact on wilderness resources and character will always be the preferred choice.” The draft also states “fixed anchors or fixed equipment may be appropriate, but should be rare in wilderness and authorization will be required for the placement of new fixed anchors or fixed equipment.” The number of bolted routes in wilderness alone is less important than the cumulative levels of resource impact associated with continued unregulated installations of hardware. This climbing and canyoneering plan will adopt the policy that is outlined in the draft DO 41 for climbing and canyoneering within wilderness areas. Once a final DO 41 is approved, this plan will also follow the approved DO 41 wilderness policies.

An additional method designed to assist wilderness managers in making appropriate decisions for wilderness management is the minimum requirement concept. This concept is a documented process used to determine if administrative actions, projects, or programs undertaken by the NPS or its agents and affecting wilderness character, resources, or the visitor experience are necessary, and if so how to minimize and control impacts. The minimum requirement concept is applied as a two-step process that determines (1) whether the proposed management action is appropriate or necessary for administration of the area as wilderness and does not cause a significant impact to wilderness resources and character, in accordance with the Wilderness Act; and (2) the techniques and types of equipment needed to ensure that impacts on wilderness resources and character are minimized. A minimum requirement decision guide (MRDG) is the document used to analyze the minimum requirement concept of installing fixed gear, assessing trammerness in certain wilderness areas and deciding what kind of non-motorized equipment will be the minimum tool for installing fixed gear. An example of this document can be found in Appendix F.

Today, Arches National Park contains six units, totaling 70,008 acres (91% of the park) which have been recommended for designation as wilderness. Arches National Park does not have a range of zones for the backcountry or its recommended wilderness areas. Wilderness areas comprise nearly the entire park, except for the roads and the Visitor Center area where the wilderness boundary is defined as 300 feet from the centerline of paved park roads and 150 feet from the centerline of unpaved roads (NPS 1974). Park lands that are identified as recommended wilderness will be managed as designated wilderness in accordance within the wilderness preservation section of the NPS *2006 Management Policies* (NPS 2006).

Currently there are 120 rock climbing routes and more than 10 canyoneering routes that have been documented within recommended wilderness areas. Many of these established routes have had fixed gear such as bolts, pitons, slings, and anchors installed along them and the use of hammer-driven pitons has created and expanded holes in rocks. The wilderness has heavy day-use for hiking and occasional overnight backcountry camping. The park will likely remain at a high level of use. The interest in climbing and canyoneering will continue to increase primarily on established routes, but there will likely be interest in new routes and new technology.

Environmental Consequences

Methodology

Analyses of the potential intensity of impacts to wilderness character were derived from predictions concerning short- and long-term impacts to wilderness character and were based on published literature (Landres et al, 2008 and NPS 2012a), field observations of existing impacts, and on park staff's professional experience and knowledge and understanding of wilderness character as defined below.

Untrammelled Quality of Wilderness

Within the untrammelled quality, wilderness is essentially unhindered and free from human control or manipulation. Indicators of the untrammelled quality of wilderness include actions authorized by park management to manipulate the biophysical environment. This quality was considered and dismissed from further discussion in this EA because no alternatives, including the no action alternative, will result in manipulation of the biophysical environment or natural processes.

Natural Quality of Wilderness

This factor considers whether wilderness ecological systems are substantially free from the effects of modern civilization. The effects of an action are considered to be adverse when it increases the effects of modern humans on ecological systems. Effects are considered beneficial when they decrease such effects, either through natural recovery or intentional restoration. The plant and animal ecosystems will be discussed in the various natural resource sections of this chapter.

Undeveloped Quality of Wilderness

The Wilderness Act states that wilderness is "an area of undeveloped Federal land ... without permanent improvements" and "with the imprint of man's work substantially unnoticeable." This factor considers the amount and type of permanent improvements, structures, installations, and administrative use of motorized tools and mechanized transportation. Improvements in wilderness are generally judged by a number of criteria. Developments in wilderness are generally judged by both number and type. Actions that increase the number of developments or the visual obtrusiveness, permanence, or technological sophistication of the development are considered to be adverse; actions that result in fewer developments or that are less obvious, more temporary, or more primitive are considered beneficial.

Opportunities for Solitude or Primitive and Unconfined Recreation Quality of Wilderness

Wilderness provides opportunities for solitude or primitive and unconfined recreation. Indicators of this quality include remoteness from the sights and sounds of people inside the wilderness, remoteness from occupied and modified areas outside the wilderness, facilities that decrease self-reliant recreation, and management restrictions on visitor behavior. Actions that increase crowding are considered adverse while those that reduce crowding are considered beneficial.

NPS considers unconfined recreation as meaning to be free of the confinement of regulations, with the ability to access and travel about the wilderness freely. Regulating access into and within wilderness affects the unconfined quality of wilderness by reducing spontaneous choices about travel and trip itinerary.

Levels of intensity for impacts to wilderness character are defined below.

Intensity Level Definitions

Negligible: Effects to wilderness character or experience will be slight, and will be much localized in area and very short in duration (a day or less). The action will not cause a fundamental change in the character of wilderness.

- Minor:** Effects to wilderness character or experience will be relatively small, and will be localized in area (within the route) or short in duration. The action will not cause a fundamental change in the character of wilderness.
- Moderate:** Effects to wilderness character or experience, including the size of the area affected (several acres) and the duration will be intermediate. The action will not cause a fundamental change in the character of wilderness. Mitigation measures to offset adverse effects will probably be necessary and likely successful.
- Major:** Effects to wilderness character or experience, including the size of the area affected (hundreds of acres) and the duration will be substantial. The action will cause a fundamental change in the character of wilderness. Mitigation to offset adverse effects will be needed, but its success not assured.
- Duration:** Short-term refers to a transitory effect, one that largely disappears over a period of days, months, or up to five years. Long-term refers to a period greater than five years.

Impacts of Alternative A – No Action

Access Routes

While not establishing or marking trails speaks to the undeveloped quality and primitive unconfined recreational opportunity in a wilderness area, not marking some trails has led to increased social trailing as visitors access routes by the quickest, most direct line from where they park their vehicles. These informal trails used to access popular climbing routes are common and may be highly visible. Such trails are a sign of people in wilderness, potentially affecting the sense of solitude for other climbers/canyoneers and other wilderness users. The continued lack of delineated access trails in wilderness increases opportunities for self-reliant recreation; however, the development of many social web-like trails along some routes will be a direct, adverse impact to the natural quality (loss of surface roughness, damage to biological crusts, soil destabilization and erosion) of wilderness.

Group Size Limits

Under Alternative A, visitors will continue to travel in groups of various sizes to access climbing routes or travel through canyoneering routes in the wilderness. Foot traffic attributable to large groups could result in a higher degree of surface disturbance and associated resource impacts than will occur with smaller groups. Visual or noise intrusions from large groups may impact other visitors along the routes who are in search of privacy and solitude that a wilderness setting typically affords them. Unregulated group sizes will have minor to moderate adverse impact to the quality of solitude in wilderness.

Permit Requirements

With the continuation of current management, permits will be required only for the Fiery Furnace and park management will lack data that document levels of canyoneering and/or climbing use in other areas of the park. Permits impact a visitor's opportunity for unconfined recreation. Unrestricted opportunities encompass attributes such as self-discovery, exploration, and freedom from societal or managerial controls. Lacking these data, park managers will have inadequate information to evaluate relative levels of use among different routes, changes in use patterns over time, and implications of different or changing use patterns for impacts on resource conditions while also providing outstanding opportunities for primitive and unconfined recreation. Therefore, the lack of permits will have a beneficial impact on the unconfined recreational quality of wilderness character but will have an adverse impact on protecting the natural and primitive quality many visitors come to the wilderness to experience.

New Route Establishment

Under Alternative A, new routes are allowed to become established without installation of fixed gear. This opportunity provides an unconfined recreational experience to explore most of the park and is an essential quality of wilderness character. However, any new routes requiring fixed gear will not be allowed. This restriction will be beneficial in maintaining the naturalness and undeveloped qualities of wilderness by limiting installations. Park managers are mandated by the Organic Act to make decisions about the need for resource protection in sensitive areas while also providing outstanding opportunities for primitive and unconfined recreation. Under this current alternative there is no way for park managers to control visitor use in potentially sensitive climbing or canyoneering areas when new routes become established. On the other hand, for the wilderness user who enjoys exploring by climbing or canyoneering as their wilderness experience, this alternative will be beneficial to the user.

Fixed Gear

Since the decision to restrict bolting and use of a motorized drill, the park has seen less growth in new climbing routes. These restrictions have reduced the number of potential bolts which may be considered to some as installations and are considered to be prohibited within the wilderness as per the Wilderness Act. These restrictions have preserved the undeveloped quality of the wilderness but also have diminished the opportunity to experience the wilderness in an unrestricted way. Yet, some bolts may be appropriate in wilderness to ensure visitors are given an opportunity to conduct a rock climbing and canyoneering wilderness experience. The proper placement of bolts can be used as a resource protection tool to help preserve the natural quality of the wilderness but should be rare in a wilderness setting. The use of motorized drills will continue to be prohibited and will preserve the undeveloped quality of the wilderness. Overall the restrictions have been a beneficial impact to the preservation of wilderness character.

Monitoring

Under this alternative there will be no systematic approach to long-term monitoring to evaluate natural or cultural resource impacts along climbing and canyoneering routes and therefore will have an adverse impact on the natural quality of wilderness. The park will also have no data on the trends in visitor usage, outside the Fiery Furnace or staff observations, which will affect opportunities for solitude and primitive recreation. As a consequence, park managers will lack current information necessary for determining where and when actions might be required to mitigate resource impacts. Therefore, the lack of monitoring data to assist with management decisions in the wilderness will be long-term and directly adverse to wilderness character.

Closures/regulations

With the continuation of current management, the use of white chalk for climbing will continue to be prohibited. This prohibition will impact the unconfined quality of wilderness in the short-term but will protect the natural quality of wilderness over the long-term, as will the requirement that chalk or substitutes must be of a color that blends with the native rock. The park will also recommend that software that is left in place should match the rock surface in color as well as several other mitigations to reduce visual impacts and preserve the natural quality of wilderness. Overall, the limited closures and regulations will have a direct, beneficial impact to wilderness character.

Cumulative Effects: Past agricultural practices; construction and continued maintenance of the Williams gas pipeline; park recreational uses other than climbing and canyoneering; development and maintenance of park infrastructure including roads, trails, and facilities; the conduct of resource monitoring and research activities; barbed wire fragments; and changes in native plant communities within recommended and potential wilderness areas have affected its "pristine" and undeveloped quality. Oil, gas and potash activities outside park boundaries and

traffic such as overflights, scenic airplane tours or vehicles in areas adjacent to wilderness will degrade wilderness character, both from sight and sound impacting the natural quality. Other recreational user groups or research projects within the wilderness could adversely impact wilderness character by affecting the opportunities for solitude and primitive recreation. This alternative when considered with other past, present, and foreseeable future actions, this alternative will result in minor increase in cumulative adverse impacts to wilderness character and its qualities in the park.

Conclusion: With continuation of current management, no access trails will be delineated, there will be no restrictions on group size, and there will be no systematic monitoring to evaluate visitor-use patterns outside the Fiery Furnace, this current alternative will have an overall adverse impact on both the natural quality as well as the opportunity for solitude and unconfined recreation quality. The current restriction on fixed gear placement has enabled the wilderness to remain relatively pristine and undeveloped in terms of new established routes and have become a beneficial impact to the wilderness character in the park. Overall, impacts will result in direct and indirect, adverse and beneficial, minor to moderate, parkwide, long-term impacts to wilderness character.

Impacts of Alternative B – Action (Preferred Alternative)

Access Routes

Relative to Alternative A, delineation of access trails under the preferred alternative will reduce the extent and intensity of adverse impacts of trampling and social trailing to climbing areas and through canyons. The delineation of trails will be as minimal as possible to ensure the natural and undeveloped qualities of wilderness character will not be diminished. The park will continue to stress leave no trace ethics as well and restore the damage caused by social trails. Delineating trails with trail markers, such as rock cairns or signs will reduce the feeling of self-reliant recreation and decrease solitude and primitive quality in the wilderness. Overall, minimally, establishing some trails to alleviate resource damage or to provide a safer wilderness experience will have direct, beneficial, long-term impacts to the natural and undeveloped qualities of wilderness.

Group Size

By requiring group size restrictions, this preferred alternative proposes to reduce the impacts of large groups in the wilderness to preserve the opportunities for solitude and primitive recreation and to protect the natural quality of wilderness. Unfortunately by regulating group sizes, this alternative will adversely impact a visitor's opportunity for unconfined recreation. These adverse impacts are a necessary trade-off to protect the park's wilderness resources (solitude, natural soundscape, etc.) in numerous wilderness areas.

Permit Requirements

Under the preferred alternative, the permit system established under this alternative will provide opportunities for visitor education and generate information on visitor-use patterns that could indirectly reduce the extent and intensity of adverse impacts on wilderness character. This registration process will place a low burden on the visitor since no day use limits are proposed, outside the Fiery Furnace. In addition, climbers and canyoneers need not stand in line to fill out their registration form, nor speak with a park ranger. The forms will be available outside the Visitor Center or at the trailhead for the Lost Spring Canyon area. However, some wilderness users will be required to register and carry a copy of the registration and may be checked by a law enforcement ranger. All of this will represent a loss of spontaneity and will affect the unconfined quality of wilderness character.

The result of this permit process will provide a means to supply the visitor with additional information regarding off-trail travel as well as a collection of visitor use numbers for better park management. Wilderness travel on non-designated trails has greater impacts to park resources in a semi-arid environment due to the disturbance of sensitive soils and the potential for invasive plant dispersal.

The implementation of a permit system will create impacts to the wilderness character that will be directly beneficial and adverse. However, these impacts will be minor since these user groups are a small percentage of the visitors to Arches. If a fee-based system will be warranted, impacts to wilderness character will be direct beneficial, moderate, parkwide and long-term.

New Route Establishment

New routes for rock climbing may become established under the preferred alternative. However, any new or existing routes requiring fixed gear require park approval. The park will also determine if additional routes which require fixed anchors are justified. Most importantly, the proposal will be evaluated in terms of its potential to increase or reduce the cumulative impacts of climbing and canyoneering in the wilderness.

Impacts of new route establishment will be beneficial for visitors who come to the park to climb or canyoneer in the wilderness. However, the process to obtain park permission for routes requiring new fixed gear will have adverse impacts to a visitor who is trying to seek an unconfined recreational wilderness experience. Establishing new routes without gear will represent an opportunity of spontaneity and will not affect the unconfined quality of wilderness character.

By allowing new routes (without new fixed gear) to become established without park approval, park resources will become adversely impacted. Park managers have no way of knowing where visitors are going and whether a sensitive resource is becoming adversely impacted by this new route. This will affect the natural and undeveloped quality of wilderness. The park will work with climbing and canyoneering communities to place new fixed gear or to replace existing fixed gear to minimize resource impacts. The park will need to highly encourage climbers and canyoneers to work with park staff regarding resource concerns in new areas.

Fixed Gear

Under the preferred alternative, new fixed gear along new and established routes in wilderness may be authorized through a park approval process which will include a minimum requirement analysis (Appendix F) to ensure accountability of where new fixed gear is being placed. Authorization will not be required to replace or remove existing fixed anchors or fixed equipment if they seem unsafe although it will be strongly encouraged to contact the park regarding replacement hardware for inventory documentation. New hardware may be authorized to replace existing hardware to prevent resource damage such as rock grooving. New hardware may be placed to prevent or reduce impacts from sling or chain heavy locations that may be a visual intrusion in the wilderness.

The use of new pitons is prohibited. Although the insertion and removal of hammer-driven pitons have resulted in expanding holes that may allow the use of removable gear during subsequent climbs, permanent damage to crack systems along many climbing routes has occurred, impacting the natural quality of the wilderness.

Bolt-intensive face climbs, such as "sport climbs" are also considered incompatible with wilderness preservation and management due to the concentration of human activity which they support, and the level of impacts associated with the development of such routes. Sport climbs will be removed from the wilderness to preserve the undeveloped quality of wilderness.

The use of motorized drills will not be allowed within wilderness boundaries as this tool is not the minimum tool required for the placement of bolts. Hand drills will be allowed without park approval, however if installing new fixed gear, the park must approve the location for installation. The use of motorized drills outside of wilderness boundaries will require park approval as well to ensure the placement of new bolts is conducted in a manner that protects the natural qualities (i.e. geologic features, natural soundscape, and wildlife) of the adjacent wilderness character.

Monitoring

Establishment of systematic monitoring under the preferred alternative will have the potential to indirectly reduce the intensity and extent of impacts on wilderness character relative to Alternative A. Indicators of visitor use and resource conditions will be monitored to determine whether adjustments in the management system are required to achieve the desired balance between visitor experience and resource protection. Overall this management and monitoring will have an adverse and beneficial impact on wilderness character. Some wilderness users may not appreciate the additional park staff in wilderness areas to monitor resources or check for compliance with the permit system, as these management actions will impede on the solitude and unconfined recreation quality of wilderness. However, long-term systematic monitoring will assist park management in improving the natural and undeveloped qualities of wilderness and will be a beneficial impact.

Closures/regulations

Use of white chalk will continue to be prohibited under the preferred alternative, thereby minimizing adverse impacts of white chalk usage on wilderness character. Additional prohibitions on rappelling from or climbing, scrambling or walking on any arch with an opening greater than three feet, will have the potential to reduce the intensity and extent of impacts on wilderness character relative to Alternative A. These closures and regulations will ensure the natural quality of wilderness will be preserved for the long-term and will be a beneficial impact to wilderness character.

Cumulative Effects: Past agricultural practices; construction and continued maintenance of the Williams gas pipeline; park recreational uses other than climbing and canyoneering; development and maintenance of park infrastructure including roads, trails, and facilities; the conducting of resource monitoring and research activities; barbed wire fragments; and changes in native plant communities within recommended and potential wilderness areas have affected its "pristine" and undeveloped quality. Oil, gas and potash activities outside park boundaries and traffic such as overflights, scenic airplane tours or vehicles in areas adjacent to wilderness will degrade wilderness character, both from sight and sound impacting the natural quality. Other recreational user groups or research projects within the wilderness could adversely impact wilderness character by affecting the opportunities for solitude and primitive recreation. This alternative when combined with other past, present and foreseeable future actions will result in a negligible cumulative increase in adverse impacts to wilderness character and its qualities in the park.

Conclusion: Under the preferred alternative, new fixed gear could be installed if approved. Pitons and white chalk will be prohibited and the park will develop partnerships with local climbing and canyoneering groups to replace and relocate existing fixed gear where necessary to mitigate resource impacts and the park will implement systematic monitoring to evaluate visitor-use patterns, changes in wilderness character, and the need for additional management actions to protect the natural quality of wilderness. A minimum requirement analysis (Appendix F) will be prepared by park management for any proposal to place new hardware in wilderness. Most importantly, the proposal will be evaluated in terms of its potential to increase or reduce the

cumulative impacts of climbing and canyoneering in the wilderness. By allowing the opportunity to establish new routes and explore the wilderness of the park under a permit process, the park can still provide a wilderness experience to visitors while ensuring park resources are protected. Impacts to wilderness character will be direct, adverse and beneficial, minor to moderate, local and parkwide, and long-term. Impacts under this alternative are predicted to be less extensive and less intense overall than those under Alternative A.

Impacts of Alternative C – Minimum

Access Routes

Like Alternative A, access trails to, through, and/or from canyoneering and climbing routes will not be delineated under Alternative C. This alternative will not be proactive in establishing heavily used routes or delineating routes to reduce resource damage. Climbers and canyoneers will be expected to know park rules and to tread lightly and leave no trace in the wilderness. Unfortunately, there is already damage to park resources caused by social trails throughout the wilderness, and this alternative will not help prevent these impacts. Therefore, this alternative will have direct, adverse impact to the natural quality of wilderness character.

Group Size Limits

Like Alternative A, visitors will continue to travel in groups of various sizes to access climbing routes or travel through canyoneering routes in the wilderness under Alternative C. Foot traffic attributable to large groups could result in a higher degree of surface disturbance and associated resource impacts than will occur with smaller groups. Visual or noise intrusions from large groups may impact other visitors along the routes who are in search of the privacy and solitude that a wilderness setting typically affords them. Unregulated group sizes will have an adverse, direct impact to the quality of solitude in wilderness.

Permit Requirements

With the continuation of current management, permits will be required only for the Fiery Furnace and park management will lack data that document levels of canyoneering and/or climbing use in other areas of the park. Permits impact a visitor's opportunity for unconfined recreation. Unrestricted opportunities encompass attributes such as self-discovery, exploration, and freedom from societal or managerial controls. Lacking these data, park managers will have inadequate information to evaluate relative levels of use among different routes, changes in use patterns over time, and implications of different or changing use patterns for impacts on resource conditions while also providing outstanding opportunities for primitive and unconfined recreation. Therefore, the lack of permits will have a beneficial impact on the unconfined recreational quality of on wilderness character but will have an adverse impact on protecting the natural and primitive quality many visitors come to the wilderness to experience.

New Route Establishment

As with the preferred alternative, establishment of new routes will be allowed and the park will provide guidelines for minimizing resource impacts attributable to new routes. However, any new or existing routes requiring fixed gear requires park approval within wilderness areas. The park will also determine if additional routes which require fixed anchors were justified. Most importantly, the proposal will be evaluated in terms of its potential to increase or reduce the cumulative impacts of climbing and canyoneering in the wilderness.

Impacts of new route establishment will be beneficial for visitors who come to the park to climb or canyoneer in the wilderness. However, the process to obtain park permission for routes requiring new fixed gear will have adverse impacts to a visitor who is trying to seek an unconfined recreational wilderness experience. Establishing new routes without gear will represent an opportunity of spontaneity and will not affect the unconfined quality of wilderness

character. This alternative will allow new routes to be established and will have a direct, adverse and beneficial impact to wilderness character.

Fixed Gear

Under Alternative C, new fixed gear could be installed on new or existing routes outside wilderness boundaries without park approval and within wilderness boundaries if approved in advance by park managers. In addition, use of pitons will be allowed. Although the park will provide guidelines for minimizing associated resource impacts, allowance of new fixed gear installations could increase the extent and intensity of impacts on wilderness character relative to Alternative A. Allowing the use of pitons likely will increase the extent and intensity of impacts relative to Alternatives A and B. New hardware placement along new and established routes within wilderness must be authorized through a park approval process which will include a minimum requirement analysis to ensure accountability of where new fixed gear is being placed.

Motorized drills will continue to be prohibited. This restriction will be a beneficial impact to preserving the natural soundscape and undeveloped quality of wilderness as well as preserving traditional skills in conducting wilderness activities.

Adverse impacts will be direct, long-term, and minor to moderate since the extent of impacts could increase and become widespread rather than localized if many new routes are established. Overall, fixed gear under this alternative will have a direct, adverse impact to the natural quality and beneficial impact to the unconfined quality of wilderness character. Net effects will be to increase the extent and intensity of adverse impacts on wilderness character relative to Alternatives A and B.

Monitoring

Under Alternative C, the park will conduct minimal monitoring of visitor-use patterns and resource conditions. As a consequence, park managers will have relatively little information for determining where and when management actions might be required for mitigating resource impacts. The use of educational information, available on the park website and at the Visitor Center, will be the method to convey to climbers and canyoneers to be cognizant of their activities on park resources. This educational material will focus primarily on the impact of visitors on the park's natural and cultural resources and minimum impact techniques. Park law enforcement will still enforce applicable laws and regulations when necessary and appropriate. Without a standard monitoring protocol and data collection process, it will be extremely difficult to determine how much these visitor use activities have an impact on the natural quality of wilderness. Therefore, the lack of monitoring will have an indirect, adverse, moderate impact on the wilderness character.

Closures/regulations

Unlike Alternatives A and B, use of white chalk will be allowed under this alternative. Although the park will provide guidelines for minimizing impacts attributable to chalk usage, the extent and intensity of impacts will be greater for this alternative than for Alternatives A and B. However, use of white chalk has the potential to become a visual impact on the park's red rock features, and park management will need to organize chalk clean-up efforts to reduce this impact. From past chalk removal operations in the park, staff has learned the porous surface of sandstone allows the white chalk to be easily absorbed and becomes extremely difficult to remove. Several clean-up efforts throughout the year will be required to ensure that the white chalk remains unobtrusive. The use of white chalk will have a direct, adverse, long-term impact on the natural quality of the wilderness.

Cumulative Effects: Past agricultural practices; construction and continued maintenance of the Williams gas pipeline; park recreational uses other than climbing and canyoneering; development and maintenance of park infrastructure including roads, trails, and facilities; the conducting of resource monitoring and research activities; barbed wire fragments; and changes in native plant communities within recommended and potential wilderness areas have affected its “pristine” and undeveloped quality. Oil, gas and potash activities outside park boundaries and traffic such as overflights, scenic airplane tours or vehicles in areas adjacent to wilderness will degrade wilderness character, both from sight and sound impacting the natural quality. Other recreational user groups or research projects within the wilderness could adversely impact wilderness character by affecting the opportunities for solitude and primitive recreation. This alternative when considered with other past, present, and foreseeable future actions, this alternative will result in minor increase in cumulative adverse impacts to wilderness character and its qualities in the park.

Conclusion: Under Alternative C, climbers and canyoneers have an opportunity to explore and establish new routes in the wilderness without prior authorization. However, any new fixed gear in the wilderness does require park approval. Outside of wilderness boundaries, new fixed gear does not require approval. This minimum management alternative will have a minor beneficial impact to wilderness users who are seeking wilderness opportunities in an unconfined way. The lack of management regarding access routes, group size limits, and hardware installation and monitoring will have a moderate adverse impact to the natural quality of wilderness character and will cause greater long-term impacts to wilderness character than providing an unconfined recreational opportunity. As a result, impacts to wilderness character will be adverse, indirect and direct, minor to moderate, potentially widespread if many new routes are established, and long-term. Impacts under this alternative are predicted to be more extensive and more intense overall to wilderness character than those associated with Alternatives A and B.

Visitor Use and Experience

Affected Environment

According to NPS *2006 Management Policies* Section 8.2, the enjoyment of park resources and values by people is part of the fundamental purpose of all park units. NPS is committed to providing appropriate, high-quality opportunities for visitors to enjoy the parks, and will maintain within the parks 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. Section 8.2.2 in NPS *2006 Management Policies* also states *the Service will monitor new or changing patterns of use or trends in recreational activities and assess their potential impacts on park resources.*

Section 8.2.5.1 NPS *2006 Management Policies* states the National Park Service “*recognizes that the park resources it protects are not only visitor attractions, but they may also be potentially hazardous. In addition the recreational activities of some visitors may be of especially high-risk, high-adventure types, which pose a significant personal risk to participants and which the Service cannot totally control. Park visitors must assume a substantial degree of risk and responsibility for their own safety when visiting areas that are maintained as natural, cultural, or recreational.*”

Arches National Park averages over 800,000 visitors annually but in the last three years starting in 2010, the park received more than one million visitors. During the last ten years visitation has increased an average of 3% each year (NPS 2012b). While the majority of the visitors who enter the park never leave the roadways or frontcountry trails, there is a small percentage of visitors

who come to the park to experience the backcountry and wilderness that Arches has to offer. Rock climbing and canyoneering are two high risk, high-adventure experiences which occur in the park's frontcountry and backcountry areas. Unfortunately the park does not have any visitor use data on how many rock climbers come to Arches annually. The more popular climbing routes are found along the main park road, along the Park Avenue trail and the Courthouse Tower area. All these areas are highly visible to other visitors from the road or trails.

Canyoneering through the park's backcountry has developed in the last ten years as a popular activity for those visitors who seek a backcountry experience with some thrilling rappel opportunities over pour-overs, through slot canyons or down sheer cliff walls. Prior to the planning effort for the CCMP, the park did not have any visitor use data on how many canyoneers access canyoneering routes in the park.

Over the last three years, park rangers, while in the field, have attempted to note when and where they see canyoneering groups or climber groups in the park to help gather some visitor use numbers until the management plan was completed. According to park ranger observations from February 2010 to December 2012, a total of 992 visitors were observed canyoneering or accessing canyoneering routes with technical gear. During this same three-year period, park rangers observed 920 rock climbers on climbing routes or accessing climbing routes with climbing gear. These numbers were acquired from casual observations and do not in any way accurately capture every climber or canyoneer in the park over this time period. To better acquire use numbers trail counters were installed spring and summer 2011 along several climbing and canyoneering access and egress points to quantify current levels and seasonal patterns of route usage. Unfortunately, too many variables existed in the field that produced erroneous numbers. Variables included but were not limited to, animal occurrences and tampering, ambient temperatures versus body temperatures, diversity of terrain, and multiple access and egress trails. Numbers from these counters will not be incorporated into management until technical issues are resolved.

Fortunately, the park requires a permit for day use entry into the Fiery Furnace, which was an opportunity to collect visitor use data. Starting in 2011, visitors were asked when acquiring a private permit for the Fiery Furnace if they were using ropes. Staff kept monthly tallies on permits issued, size of group and whether ropes were used or not. According to permits issued for the Fiery Furnace in the last two years, a total of 1256 visitors entered the Fiery Furnace to canyoneer (Figure 5) and a total of 261 permits were issued to canyoneering groups (Figure 6). Data was also used to calculate the number of permits issued to canyoneers based on group size (Figure 7). Based on group size, 90% of the permits issued to canyoneers were given to group sizes of ten or less (Figure 8) while 78% of the permits issued to canyoneers were issued to group sizes of six or less (Figure 9).

The percent monthly error of undocumented canyoneers ranged from 5.9% over the two year period of total canyoneers in the Fiery Furnace. Therefore, the total numbers of canyoneers may potentially be underestimated. However, this Fiery Furnace permit data will be used to determine baseline group size numbers for canyoneering in the park since it is the best available management data.

Figure 4: Total Number of Canyoneers in the Fiery Furnace

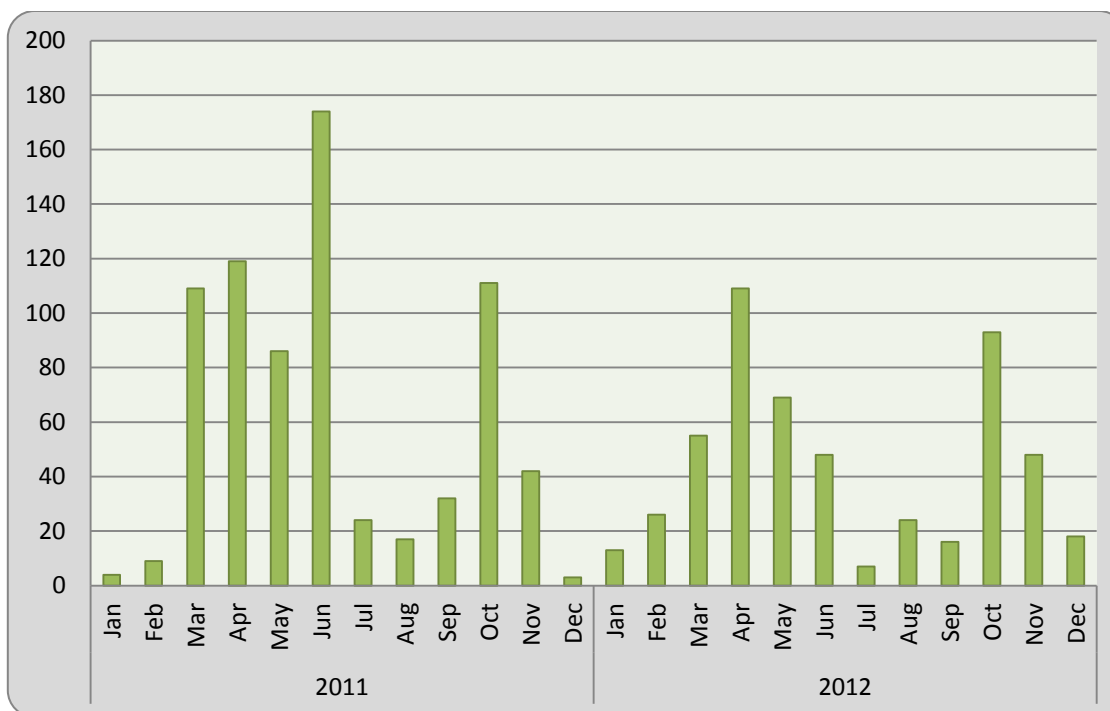


Figure 5: Total Number of Fiery Furnace Permits Issued to Canyoneers

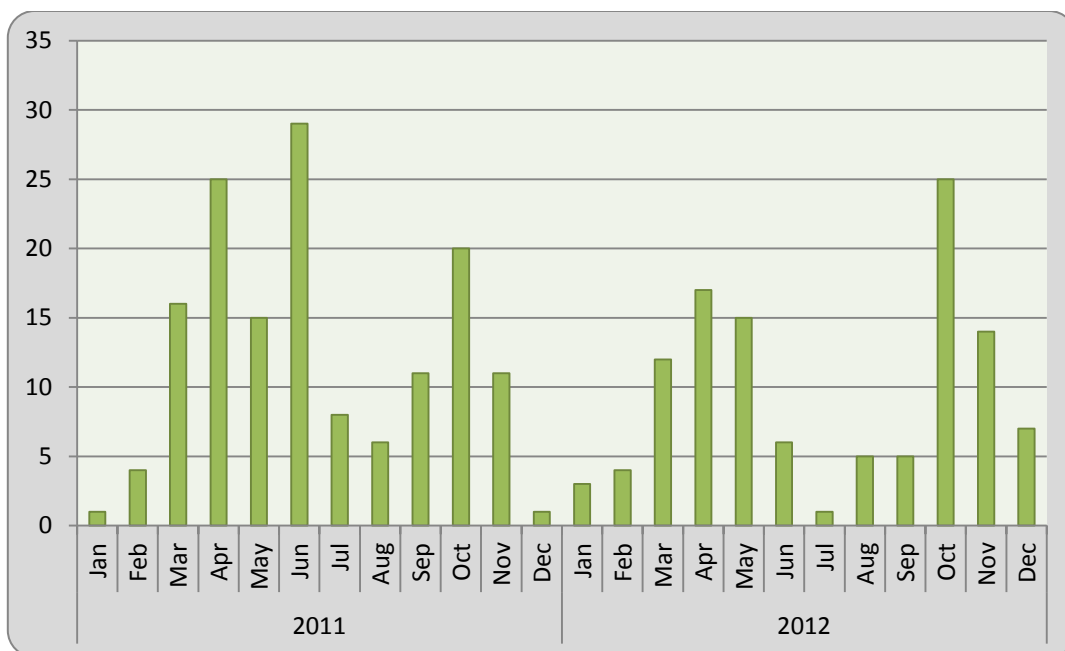


Figure 6: Fiery Furnace Permits Issued to Canyoneers Based on Group Size

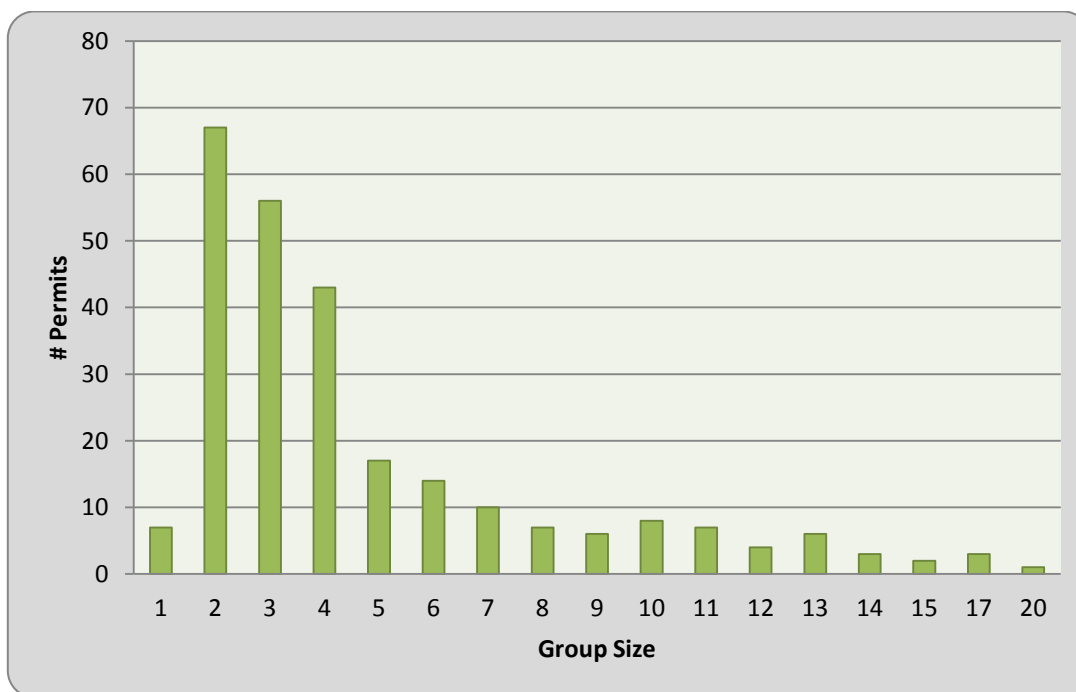


Figure 7: Percent of Permits Issued to Canyoneering Groups of 10 or More Persons

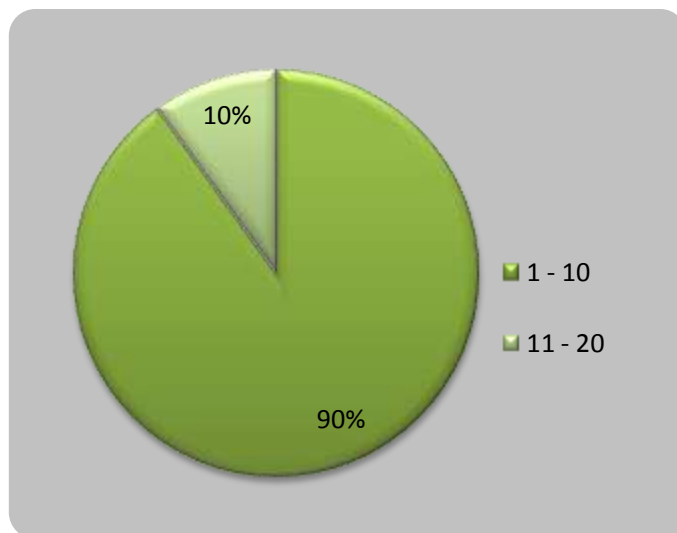
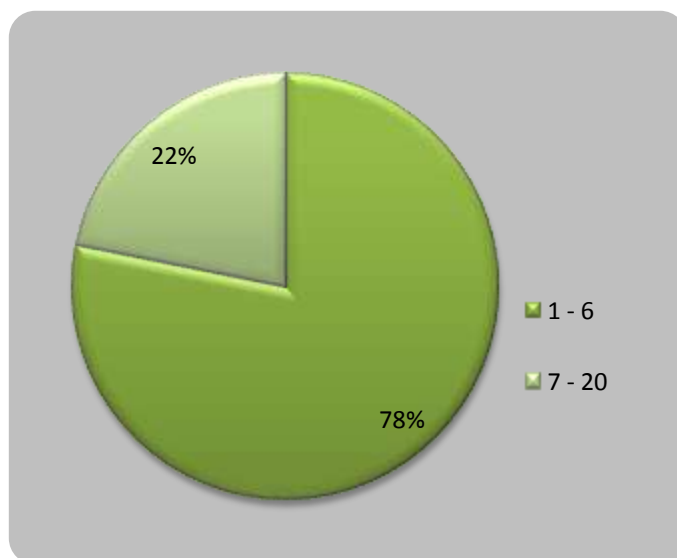


Figure 8: Percent of Permits Issued to Canyoneering Groups of 6 or More Persons



Environmental Consequences

Methodology

Predictions concerning short- and long-term impacts to visitor use and experience were based on day use visitor records collected over the last two years, staff observations of visitation patterns, public scoping comments, published literature (Watson et al. 2000) combined with staff's professional experience and knowledge of visitor use patterns. The impact on the ability of the visitor to experience a full range of park resources was analyzed by examining the resources impacted. Levels of intensity for impacts to visitor use and experience are defined below.

Intensity Level Definitions

- Negligible:** The visitor will not be affected or changes in visitor use and/or experience will be below or at the level of detection. The visitor will not likely be aware of the effects associated with the alternative.
- Minor:** Changes in visitor use and/or experience will be slight, but detectable. Changes will not appreciably alter critical characteristics of the visitor experience. Visitor satisfaction will generally remain unchanged.
- Moderate:** Many visitors to the backcountry/wilderness will be aware of the effects of associated changes, and the number of participants accessing the backcountry/wilderness could be affected. Visitor satisfaction will begin to change and visitors will likely be able to express an opinion about the changes.
- Major:** Changes in visitor use and/or experience will be apparent to many visitors to the parks, and/or the number of visitors to the backcountry/wilderness will be greatly reduced or increased. Visitors will be aware of the effects associated with the alternative, visitor satisfaction will markedly decline or increase and many will likely express strong opinions about the changes.
- Duration:** Short-term refers to a transitory effect, one that largely disappears over a period of days, months, or up to five years. Long-term refers to a period greater than five years.

Impacts of Alternative A – No Action

Access Routes

With the continuation of current management, access trails to, through, and/or from canyoneering and climbing routes will not be delineated. The continued lack of delineated access trails will result in the continued spread and use of informal social trails and will be more extensive and intense than will otherwise occur. Not marking some trails has led to increased social trailing as visitors access routes by the quickest, most direct line from where they park their vehicles. By not defining or maintaining some access routes, many visitors will have difficulty in finding the route and this will have a directly adverse impact to a visitor's experience.

Group Size Limits

Visitors will continue to travel in groups of various sizes when engaging in climbing and canyoneering activities. Without delineated access trails, foot traffic attributable to large groups could result in a higher degree of social trailing than will occur with smaller groups. Visual or noise intrusions from large groups will adversely impact other visitors along the routes who are in search of privacy and solitude. Large groups have a tendency to queue at rappel sites, which will impact smaller groups quickly moving through the route.

Permit Requirements

Under this alternative visitor's only need to acquire a permit to access the Fiery Furnace or for backcountry camping. Not requiring a permit to canyoneer outside the Fiery Furnace or to rock climb in the park will be a beneficial impact the visitor's use and experience.

New Route Establishment

Establishment of new routes will be allowed, but only without installation of fixed gear. With a prohibition of fixed-gear installations, it is likely that few new routes will be established. Some climbers and canyoneers feel that these restrictions prevent a visitor from truly exploring the backcountry/wilderness of Arches. However, under this current alternative there is no way for

park managers to protect sensitive park resources that are in or near climbing or canyoneering areas when new routes become established. Allowing a visitor to establish new routes, without fixed gear, will be a beneficial minor impact.

Fixed Gear

Since the decision in 2006 to restrict bolting, pitons and use of a motorized drill, the park has seen less growth in new climbing routes. However, some rock climbers feel that by not allowing the use of pitons, historic climbing routes are now unclimbable. The same goes for not allowing new bolts to be placed. Some climbers and canyoneers feel that these restrictions prevent a visitor from truly exploring the backcountry of Arches in an unconfined way. Therefore, these current fixed gear restrictions will have a directly adverse long-term impact to visitor's use and experience.

Monitoring

Under this alternative, there will continue to be no systematic approach to long-term monitoring of visitor-use patterns and resource conditions and how resource conditions actually or potentially are being affected by climbing and canyoneering activities. However, the lack of monitoring data to assist with management decisions regarding visitor use and experience will not impact a visitor and their experience in the park. Monitoring will have a negligible impact to a visitors use and experience in the park.

Closures/regulations

With the continuation of current management, the use of white chalk for climbing will continue to be prohibited. The park will require that chalk or substitutes must be of a color that blends with the native rock. The park recommends that this mitigation measure continues to protect one visual impact of climbing and canyoneering. Visitors will and do appreciate the required restriction to protect the park's stunning red rock scenery. These closures/ regulations may adversely impact some visitors, but these chalk restrictions will be short-term and beneficial for all visitors to the park.

Cumulative Effects: Oil, gas and potash activities outside park boundaries; traffic such as overflights, scenic airplane tours or vehicles in areas inside and adjacent to the backcountry/wilderness; construction and continued maintenance of the Williams gas pipeline; park recreational uses other than climbing and canyoneering; development and maintenance of park infrastructure including roads, trails, and facilities; and the conduct of resource monitoring and research activities, could degrade a visitor's experience, both from sight and sound. This alternative when combined with other past, present and foreseeable impacts will result in minor cumulative impact to visitor use and experience.

Conclusion: With continuation of current management, trends in visitor use or experience have not been continually monitored. This lack of visitor data prevents park management from making scientifically based decisions to protect resources and provide visitor opportunities. Although during public scoping many commenters were in favor of current management, this alternative is limited in assisting the park in enhancing visitor use and their experiences within the park. Opportunities to experience the backcountry/wilderness and challenging activities will be available and accessible; however, the increase in visitors conducting these activities may result in both short-term and long-term adverse effects on a visitor's experience. Overall, under current management, impacts to visitor use and experience will be direct, adverse and beneficial, negligible to moderate, localized and parkwide, short and long-term.

Impacts of Alternative B – Action (Preferred Alternative)

Access Routes

Relative to Alternative A, delineation of access trails under the preferred alternative will reduce the extent and intensity of adverse impacts of social trailing. Many visitors will appreciate the delineation of trails, especially to reduce the impacts of social trailing or protect other park resources. The delineation of trails will be as minimal as possible to ensure a visitor's experience will not be diminished. The park will continue to stress Leave No Trace ethics, as well, and restore the damage caused by social trails. Establishing some trails to alleviate resource damage or to provide a safer visitor experience will have direct and beneficial impact to visitor use and experience.

Group Size Limits

Under this alternative, group size restrictions will be established. Group size numbers for both user groups could be subject to future adjustment on the basis of monitoring data for resource conditions and use levels.

Rock climbing group size limits will be established at 5 people per group. This number was derived from visual observation data that rock climbers typically recreate in smaller groups; mostly 2-3 people and occasionally a couple more. In discussions with climbers, park staff has determined that this group size limit will not impact most climbing groups and will ensure the popular climbs will remain accessible to most climbing groups.

Canyoneering group size limits will be initially established at 10 people per group for most canyons. In analyzing the Fiery Furnace permits and sizes of groups who entered, 90% of canyoneering groups entered the Fiery Furnace with 10 or fewer people per group. The IDT determined that 10 people per group allowed for a large enough party without diminishing safety and visitor's experience in the backcountry (Figure 8).

The park currently allows groups of 12 in the backcountry for overnight use. However, during the scoping period many comments were received from members of the public who wanted to see group sizes reduced to fewer than 10 people per group for canyoneering. In the Fiery Furnace, due to the maze-like environment, sensitivity of the resource and the inability to delineate multiple routes, group size will be limited to 6 people per group. According to the Fiery Furnace data, 78% of permits were issued to canyoneers who were in groups of 6 or fewer (Figure 9).

For the Lost Spring canyoneering routes (MMI and Undercover Canyon) group size will also be limited to 6 persons per group. Lost Spring Canyon is a very remote and pristine area of the park and park management will like to ensure it remains this way. Natural resource assessments as well as routine staff observations have shown an increase in visitor use as well as resource damage in this area of the park along canyoneering routes.

Large groups (e.g., school groups, Boy Scout troops, church groups) must split up and use different routes or use the same route at different times of the day to avoid queuing at rappel sites and minimize impacts on resources and on other visitors.

By regulating group sizes, the impacts to visitor use and experience will be beneficial to some visitors but adverse to others.

Permit Requirements

The permit system established under this alternative will provide opportunities for visitor education and generate information on visitor use patterns. The permit system will assist the park in ensuring that climbers and canyoneers know about group size limits for each activity and route, provide a way to ensure educational information concerning resource protection, Leave No Trace (LNT) techniques, and safety information for the backcountry reaches these groups. By implementing a permit process, impacts to the visitor use and experience will be directly adverse

and long-term. By implementing a permit system, impacts to the visitor will be directly beneficial and adverse but minor since these user groups are a small percentage of the visitors to Arches. If a fee based system is warranted, impacts to wilderness character impacts will be direct beneficial, moderate, parkwide and long-term. The design of the registration system will be subject to future adjustment based on monitoring results for visitor use, group size and permit compliance, and resource conditions. Future adjustments could include the implementation of user fees if necessary to achieve management objectives.

New Route Establishment

New routes for rock climbing may become established under the preferred alternative. However, any new or existing routes requiring fixed gear require park approval. Most importantly, the proposal will be evaluated in terms of its potential to increase or reduce the cumulative impacts of climbing and canyoneering in the backcountry/wilderness. Impacts of new route establishment will be beneficial for visitors who come to the park to climb or canyoneer. The process to obtain permission for routes requiring new fixed gear will have adverse impacts to a visitor's experience.

Fixed Gear

Under this alternative, new fixed gear could be installed on new or existing routes if approved in advance by park managers. Authorization will not be required to replace or remove existing fixed anchors or fixed equipment if they are deemed unsafe. Pitons will be prohibited under this alternative as the installation and removal of pitons does permanent damage to the rock by causing unnatural holes along crack systems that grow in size with each installation and is visually intrusive in a backcountry/ wilderness setting. Locations of new hardware placement will be reviewed by park staff to ensure there will be minimal impact to the experience of other park visitors and park resources. Visitors who will not like to see new hardware placed on rock faces may be adversely impacted. However, most park visitors are typically not the ones conducting rock climbing or canyoneering activities. For climbers and canyoneers, the impacts of allowing new hardware to be placed will be a beneficial impact.

The use of motorized drills will not be allowed within wilderness boundaries as this tool is not the minimum tool required for the placement of bolts. Hand drills will be allowed without park approval; however, if installing new fixed gear, the park must approve the location for installation. The use of motorized drills outside of wilderness boundaries will require park approval as well to ensure the placement of new bolts is conducted in a manner that protects the geologic features, natural soundscape, wildlife and adjacent wilderness character. The park approval process for new fixed gear installations will have a long-term direct beneficial impact to wilderness character.

Monitoring

Establishment of systematic monitoring under the preferred alternative will have the potential to indirectly increase the intensity and extent of impacts on visitor use and experience relative to Alternative A. Monitoring of visitor-use patterns and resource conditions (including habitat occupancy by raptors and sheep) will provide park managers with information necessary for determining where and when actions might be required to mitigate resource impacts. This process may be augmented by trail counters and observations made during patrols. Some routes may be closed due to sensitive species present. Routes will not be closed year round on account of nesting and breeding animals. However, there will be long-term closures or reroutes if significant impacts to park resources occur. Also a volunteer-based resource stewardship program could be developed in partnership with the canyoneering and climbing communities to enhance monitoring capacity and resource protection. Impacts will be indirect, beneficial, and long-term impact on visitor use.

Closures/regulations

Use of white chalk will continue to be prohibited under the preferred alternative, and this regulation could potentially have a minor impact to visitors. Additional prohibitions on rappelling from or climbing, scrambling, walking on any arch with an opening greater than three feet will have the potential to adversely impact visitors as a minor long-term effect.

Cumulative Effects: Oil, gas and potash activities outside park boundaries; traffic such as overflights, scenic airplane tours or vehicles in areas inside and adjacent to the backcountry/wilderness; construction and continued maintenance of the Williams gas pipeline; park recreational uses other than climbing and canyoneering; development and maintenance of park infrastructure including roads, trails, and facilities; and the conduct of resource monitoring and research activities could degrade a visitor's experience, both from sight and sound. This alternative when combined with other past, present and foreseeable impacts will result in minor cumulative impact to visitor use and experience.

Conclusion: Under the preferred alternative, new fixed gear could be installed if approved in advance by park managers. The park will develop partnerships with local climbing and canyoneering groups to provide guidelines to minimize impacts on park resources, pitons will be prohibited, the park will replace and relocate existing fixed gear where necessary to mitigate impacts attributable to rope pulling, and the park will implement systematic monitoring to evaluate visitor-use patterns, changes in resource conditions, and the need for additional management actions to protect resources. However, this management approach will establish a process to ensure that other visitors will not be impacted by these new activities or installations and that park resources will not be significantly impacted. This alternative provides an opportunity for climber and canyoneering groups to work with the park to provide a better visitor experience. The impacts will be direct, adverse and beneficial, minor to moderate, local and parkwide, and short to long-term.

Impacts of Alternative C – Minimum

Access Routes

Like Alternative A, access trails to, through, and/or from canyoneering and climbing routes will not be delineated under Alternative C. The continued lack of delineated access trails will result in the continued spread and use of informal social trails and will be more extensive and intense than will otherwise occur. Not marking some trails has led to increased social trailing as visitors access routes by the quickest most direct line from where they park their vehicles. By not defining or maintaining some access routes, many visitors will have difficulty in finding the route and this will have a directly adverse impact to a visitor's experience.

Group Size Limits

Visitors will continue to travel in groups of various sizes when engaging in climbing and canyoneering activities. Without delineated access trails, foot traffic attributable to large groups could result in a higher degree of social trailing than will occur with smaller groups. Visual or noise intrusions from large groups will adversely impact other visitors along the routes who are in search of privacy and solitude. Large groups have a tendency to queue at rappel sites, which will impact smaller groups quickly moving through the route.

Permit Requirements

Under this alternative visitor's only need to acquire a permit to access the Fiery Furnace or for backcountry camping. Not requiring a permit to canyoneer outside the Fiery Furnace or to rock climb in the park will be a beneficial impact the visitor's use and experience.

New Route Establishment

As with the preferred alternative, establishment of new routes will be allowed and the park will provide guidelines for minimizing resource impacts attributable to new routes. These guidelines could mitigate impacts on visitor use and experience. If new routes are proposed for areas within wilderness boundaries, the park will determine if additional routes were justified within wilderness. Most importantly, the proposal will be evaluated in terms of its potential to increase or reduce the cumulative impacts, including impacts to other visitors in the backcountry/wilderness. Impacts of new route establishment with park guidelines will be directly beneficial to climbers and canyoneers.

Fixed Gear

Under Alternative C, new fixed gear could be installed on new or existing routes outside wilderness boundaries without park approval and within wilderness boundaries if approved in advance by park managers. In addition, use of pitons will be allowed. Although the park will provide guidelines for minimizing associated resource impacts, allowance of new fixed gear installations could increase the extent and intensity of impacts on visitor use and experience relative to Alternative A. The use of motorized drills will continue to be prohibited and will preserve the natural soundscape, wildlife and other visitors experience in the area. Overall, installing new fixed gear will have a direct, beneficial, impact to visitor use and experience.

Monitoring

Under Alternative C, the park will conduct minimal monitoring of visitor-use patterns and resource conditions. As a consequence, park managers will have relatively little information for determining where and when management actions might be required for mitigating resource impacts. The use of educational information, available on the park website and at the Visitor Center, will be the method to convey to climbers and canyoneers to be cognizant of their activities on park resources. This educational material will focus primarily on the impact of visitors on the park's natural and cultural resources and to utilize minimum impact techniques. Park law enforcement will still enforce applicable laws and regulations when necessary and appropriate. Therefore, the lack of resource monitoring will have a negligible impact to visitor use and experience.

Closures/regulations

Unlike Alternatives A and B, use of white chalk will be allowed under this alternative. Although the park will provide guidelines for minimizing impacts attributable to chalk usage, the extent and intensity of impacts will be greater for this alternative than for Alternatives A and B. Several clean-up efforts throughout the year will be required to ensure the white chalk remains unobtrusive. In addition, this alternative will not prohibit rappelling from or climbing, scrambling, and/or walking on any arch with an opening greater than three feet. The lack of closures and regulations will have adverse and beneficial, impact to visitors use and experience.

Cumulative Effects: Oil, gas and potash activities outside park boundaries; traffic such as overflights, scenic airplane tours or vehicles in areas inside and adjacent to the backcountry/wilderness; construction and continued maintenance of the Williams gas pipeline; park recreational uses other than climbing and canyoneering; development and maintenance of park infrastructure including roads, trails, and facilities; and the conduct of resource monitoring and research activities could degrade a visitor's experience, both from sight and sound. This alternative when combined with other past, present and foreseeable impacts will result in minor cumulative impact to visitor use and experience.

Conclusion: Under Alternative C, new fixed gear could be installed in wilderness if approved in advance by park managers, and the park will provide guidelines to minimize impacts on other visitors in the area. But pitons and white chalk will be allowed, new fixed gear could be installed

outside of wilderness without park approval, and monitoring of visitor-use patterns and resource conditions will be minimal. Overall, the opportunity for park visitors who climb and canyoneer to establish new routes and place new fixed gear will be a long-term beneficial impact for these users. However, by not regulating where visitors can place fixed gear and establish new routes, moderate adverse impacts will occur to park resources as new social trails are created and large groups of climbers and canyoneers will impact other smaller visitor groups who are out trying to experience the solitude and quiet in the backcountry/wilderness of the park. If these activities go unregulated in the park, impacts will be adverse and beneficial, indirect and direct, minor to moderate, parkwide and long-term if many new routes are established. Impacts on visitor use and experience under this alternative are predicted to be less extensive and less intense overall than those associated with Alternatives A and B.

Park Operations

Affected Environment

The Arches General Management Plan outlines park issues and goals to manage the protection of the park's resources and provide for visitor access. NPS operations perform a range of activities to manage the park's visitor access, safety and resource protection. The Superintendent is responsible for overall management, operation, and safety in the park and is supported by five operational divisions of responsibility. The following park divisions will be impacted with the management of rock climbing and canyoneering in the park: Resource Stewardship and Science, Resource and Visitor Protection, and Interpretation and Visitor Services.

The Resource Stewardship and Science Division (RSS) is responsible for the management and protection of natural and cultural resources. It is tasked with the responsibility to understand, maintain, restore, and protect the inherent integrity of the natural resources, processes, systems, and values of the park and to maintain the natural condition of resources that will occur in relation to human activities, climate, and landscape setting. The Resource Stewardship and Science Division is also responsible for cultural resources including archeological resources, cultural landscapes, ethnographic resources, historic and prehistoric structures, and museum collections. The cultural resource management program involves: research to identify, evaluate, document, register, and establish basic information about cultural resources and traditionally associated peoples; planning to ensure that management processes for making decisions and setting priorities integrate information about cultural resources and provide for consultation and collaboration with outside entities; and stewardship to ensure that cultural resources are preserved and protected, and are made available for public understanding and enjoyment. Creating additional workloads to monitor and manage climbing and canyoneering routes and activities will be a long-term adverse effect to RSS operations.

The Resource and Visitor Protection (RVP) Division is also responsible for protecting the natural and cultural resources of the park, as well as providing for the enjoyment and safety of park visitors. Programs managed include law enforcement, backcountry permit fee collection management, wildland fire activities, emergency medical services/search and rescue coordination, concessions, special use, commercial use management and continued efforts in resource education. Creating additional workloads to monitor and manage climbing and canyoneering routes and activities will be a long-term adverse effect to RVP operations.

The Interpretation Division and Visitor Services Division is responsible for staffing the front desk at the Visitor Center, issuing self-guided Fiery Furnace permits and backcountry permits; and presenting programs to the public which include guided walks, evening programs, roving interpretation, and the summer school lunch program. Although, the majority of the ticketing

and fee handling for the Fiery Furnace ranger-guided walks are done online through the reservation system, the interpretation division does some of the processing of these reservations at the front desk. Visitors still need to check in and obtain their reservation confirmation, and if there are any cancellations this division reissues these permits as well. The Interpretation and Visitor Services Division also explains the reservation system, aid with trouble shooting and assists visitors with problems pertaining to the reservation system. Creating additional workloads to monitor and manage climbing and canyoneering routes and activities will be a long-term adverse effect to interpretive operations.

Increased visitation is always accompanied with increased impacts to resources. Changes in the management of rock climbing and canyoneering activities have not kept pace with the popularity and increases in visitation to the park. During the scoping and preliminary alternatives review process, climbers and canyoneers commented that they like things the way they are, but agree that management changes will be needed in order to protect and preserve the unique resources that make the park special. Park management is constantly challenged in successfully managing user activities in order to decrease recreation-related impacts to sensitive resources.

In an effort to better understand visitor use levels for rock climbing and canyoneering and their impacts on park resources, the following park operations may be under the responsibility of these three divisions: installation, maintenance and data analysis of trail counters, collection and analysis of data from permits, monitoring of routes for resource impacts, mitigations of resource impacts, annual surveying for sensitive wildlife species, reviews and resource assessments of new route establishments and hardware installations, implementation of search and rescue efforts, enforcing regulations, issuing permits, educating visitors and updating educational materials such as brochures, maps, park website, and trailhead kiosks and working collaboratively with climbing and canyoneering communities on a stewardship program.

Environmental Consequences

Methodology

Park staff's knowledge regarding operational efficiency in managing park resources was used to determine the intensity levels of potential impacts. Analysis was based on predictions concerning whether there will be a loss, gain, or change in the efficiency of operations or infrastructure or a change in safety.

Intensity Level Definitions

- Negligible: The impact will result in little or no change in Arches NP operations.
- Minor: The impact could require a slight change in Arches NP operations, with few measurable consequences but the change will be addressed within current operations (staff, facilities, and funding).
- Moderate: The impact will result in readily apparent changes to Arches NP operations with measurable consequences that will require a need for additional staff, facilities, and/or funding sources.
- Major: The impact will result in a substantial change in Arches NP operations. These changes will require a need for additional staff, facilities, and/or funding that could not be obtained.

Duration: Short-term refers to a transitory effect, one that largely disappears over a period of days, months, or up to five years. Long-term refers to a period greater than five years.

Impacts of Alternative A – No Action

Access Routes

With the continuation of current management, access trails to, through, and/or from canyoneering and climbing routes will not be delineated. This has caused park staff to continually rehabilitate the overabundance of social trails along routes by raking out the trail and closing the area off with vegetative debris and/or rock necklaces which has become a time-consuming process for all park divisions. Impacts to park operation due to lack of marked routes will have direct adverse, long-term impacts.

Group Size Limits

Visitors will continue to travel in groups of various sizes when engaging in climbing and canyoneering activities. Under this alternative there will be negligible impacts to park operations from unrestricted group size limits.

Permit Requirements

The only permit required under this alternative is to access the Fiery Furnace. Currently the Interpretation Division issues these permits to private groups canyoneering on a first-come-first-serve basis online or at the Visitor Center's front desk all year round. Under this alternative, there will be no additional impact to park operations; therefore impacts are negligible.

New Route Establishment

Establishment of new routes will be allowed, but only without installation of fixed gear. With a prohibition of fixed-gear installations, it is likely that few new routes will be established. To ensure that visitors are complying with this restriction, backcountry patrols will need to increase to cover climbing and canyoneering areas. Impacts to park operations will be direct, adverse and minor.

Fixed Gear

With the continuation of current management, the prohibition of new fixed gear installations will continue. Fixed gear can only be replaced if deemed unsafe without park approval. To ensure that visitors are complying with this restriction, backcountry patrols will need to increase to cover climbing and canyoneering areas.

Monitoring

Under this alternative, there will continue to be no systematic approach to long-term monitoring of visitor-use patterns and resource conditions and how resource conditions actually or potentially are being affected by climbing and canyoneering activities. As a consequence, park managers will lack current information necessary for determining where and when actions might be required to mitigate resource impacts. Therefore, RSS staff will not need to make monitoring a priority. This limited monitoring will have negligible impacts to current park operations.

Closures/regulations

The prohibition on use of white chalk will have no impacts to park operations.

Cumulative Effects: The development of private lands near Arches; park recreational uses other than climbing and canyoneering; development and maintenance of park infrastructure including roads, trails, and facilities; the conduct of resource monitoring and research activities; and foreseeable future actions related to park transportation management and activities by other

federal, state, and local agencies with respect to water, wildlife, and soundscapes, all effect park operations due to additional staff time required for patrols and monitoring. This alternative when combined with other past, present and foreseeable impacts will result in a minor cumulative increase in adverse impacts to park operations.

Conclusion: With continuation of current management, no access trails will be delineated, there will be no restrictions on group size, and there will be no systematic monitoring to evaluate visitor-use patterns outside the Fiery Furnace. Over the long term, visitor use at Arches is expected to increase and current staffing levels will not be able to keep up with impacts of increased visitor use and will place a management burden on park operations. Impacts to park operations will be direct, adverse, negligible to moderate, local and parkwide and long-term.

Impacts of Alternative B – Action (Preferred Alternative)

Access Routes

Relative to Alternative A, delineation of access trails under the preferred alternative will reduce the extent and intensity of adverse impacts of trampling and social trailing. Blocking and rehabilitation of existing social trails will facilitate stabilization and recovery of disturbed soils, and also will contribute to limiting the occurrence of new social trails. By marking access routes, the social trails, ideally, will be fewer, and park staff will not have to continually rehabilitate a network of social trails. Currently Arches has fourteen miles of trails and the addition of a few new minimally delineated routes to climbing and canyoneering areas will have a minor, short-term impact. In the long-term, the delineation of access routes will result in a direct, beneficial, parkwide impact to park operations.

Group Size Limits

Under the preferred alternative, group sizes are proposed for both climber and canyoneering groups. Imposing group size limits will require additional informational material on the new regulations on the park website and at the Visitor Center. Visitor contacts at the Visitor Center may become more frequent because of the new regulations. The law enforcement staff will need to conduct more backcountry patrols to ensure groups are compliant with the new regulations. Imposing group size limits will have a directly adverse and moderate impact to park operations.

Permit Requirements

The permit system established under this alternative will provide opportunities for visitor education and generate information on visitor-use patterns that could indirectly reduce the extent and intensity of adverse impacts. These permits will be free for canyoneers and climbers and will be available outside the Visitor Center so impacts to the park visitor and staff will not be so overburdened. Visitor contacts at the Visitor Center may become more frequent because of the new regulations. The law enforcement staff will need to conduct more backcountry patrols to ensure groups are compliant with the new regulations while in the park. Overall, impacts to park operations regarding a permit process will be directly adverse and moderate.

New Route Establishment

Under the preferred alternative, establishment of new routes, without fixed gear, will be allowed without park approval, and the park will provide guidelines for minimizing resource impacts attributable to new routes. Although the guidelines will be likely to minimize the impacts of individual routes, there could be greater potential for establishing new routes under the preferred alternative than under Alternative A since new fixed gear could be installed under the preferred alternative but only if approved in advance by the park. The park will need to highly encourage climbers and canyoneers to work with park staff regarding resource concerns in new areas. By allowing new routes (without new fixed gear) to become established without park

approval, park resources will become adversely impacted and therefore park operations will suffer an adverse impact in trying to protect resources and manage visitor use activities.

Fixed Gear

Under this alternative, new fixed gear could be installed on new or existing routes if approved in advance by park managers. Although the park will provide guidelines for minimizing associated resource impacts, allowance of new fixed gear installations could increase the extent and intensity of impacts on park operation relative to Alternative A. The park will also work with climbing and canyoneering communities to place new fixed gear or to replace existing fixed gear to minimize resource impacts. Park staff will review proposals to ensure the park's natural and cultural resources will not be impacted. Environmental compliance will need to be initiated and site surveys conducted. For hardware being placed in a wilderness setting, a minimum requirement analysis (Appendix F) will need to be completed. An interdisciplinary team will review each proposal prior to approval. This additional approval process will have direct moderate impact to park operations.

Monitoring

Establishment of systematic monitoring under the preferred alternative will have the potential to indirectly reduce the intensity and extent of impacts on special status species relative to Alternative A. Monitoring of visitor-use patterns and resource conditions (including habitat occupancy by raptors and sheep) will provide park managers with information necessary for determining where and when actions might be required to mitigate resource impacts. For raptors and bighorn sheep, such actions could include seasonal closures of routes through or near occupied habitat. For lomatium, actions also could include route closures.

A long-term monitoring program of the park's natural resources will impact the park's RSS program by competing with other long-term monitoring programs. Developing a volunteer-based stewardship program will have short-term adverse impacts to park operations in getting the program off the ground; however, the long-term assistance in monitoring with additional resources will be an overall benefit to park operations.

Closures/regulations

Use of white chalk will continue to be prohibited. The action of rappelling from or climbing on, scrambling on, or walking on any arch with an opening greater than three feet will be prohibited as well. It will be the responsibility of the RVP staff to ensure that these regulations are enforced. These closures and regulations will have a direct, adverse and beneficial, moderate impact to park operations.

Cumulative Effects: The development of private lands near Arches; park recreational uses other than climbing and canyoneering; development and maintenance of park infrastructure including roads, trails, and facilities; the conduct of resource monitoring and research activities; and foreseeable future actions related to park transportation management and activities by other federal, state, and local agencies with respect to water, wildlife, and soundscapes, all effect park operations due to additional staff time required for patrols and monitoring. This alternative when combined with other past, present and foreseeable impacts will result in a minor cumulative increase in adverse impacts to park operations.

Conclusion: Under the preferred alternative, access trails will be delineated, group-size restrictions will be implemented, new fixed gear could be installed if approved. The park will provide guidelines to minimize impacts on resources, the park will replace and relocate existing fixed gear where necessary to mitigate impacts and the park will implement systematic monitoring to evaluate visitor-use patterns, changes in park resources, and the need for additional management actions and /or staff to protect resources. These additional

responsibilities on park staff will result in a direct, adverse and beneficial, minor to moderate, parkwide long-term impact on park operations. Adverse impacts to park operations under this alternative are predicted to be more extensive and more intense than under Alternative A and C.

Impacts of Alternative C– Minimum

Access Routes

Like Alternative A, access trails to, through, and/or from canyoneering and climbing routes will not be delineated under Alternative C. This has caused park staff to continually rehabilitate the overabundance of social trails along routes by raking out the trail and closing the area off with vegetative debris and/or rock necklaces which has become a time consuming process for all park divisions. Impacts to park operation due to lack of marked routes will have direct adverse, long - term impacts.

Group Size Limits

Visitors will continue to travel in groups of various sizes when engaging in climbing and canyoneering activities. Under this alternative there will be negligible impacts to park operations from unrestricted group size limits.

Permit Requirements

The only permit required under this alternative is to access the Fiery Furnace. Currently the Interpretation Division issues these permits to private groups canyoneering on a first-come-first-serve basis online or at the Visitor Center's front desk all year round. Under this alternative, there will be no additional impact to park operations; therefore impacts are negligible.

New Route Establishment

As with the preferred alternative, establishment of new routes will be allowed, and the park will provide guidelines for minimizing resource impacts attributable to new routes. Although these guidelines could mitigate impacts of individual routes, there could be greater potential for establishing new routes under Alternative C than under Alternatives A and B since pitons will be allowed and new fixed gear could be installed outside of wilderness without approval and inside wilderness if approved in advance by the park. Unfortunately, the public does not know if nesting raptors or other sensitive species are present along the route. Working with park staff will aid in these issues. Park staff will need to constantly conduct backcountry patrols and monitor blog sites to document where new routes may be. This alternative will place a heavy burden on RSS staff and RVP staff. Impacts to park operations will be direct, adverse and moderate.

Fixed Gear

Under Alternative C, new fixed gear could be installed on new or existing routes outside wilderness boundaries without park approval and within wilderness boundaries if approved in advance by park managers. In addition, use of pitons will be allowed. Although the park will provide guidelines for minimizing associated resource impacts, allowance of new fixed gear installations could increase the extent and intensity of impacts on geologic resources relative to Alternative A. Without an approval process to document where and what kind of gear is being placed outside of wilderness areas, the park is leaving the protection of the park up to the visitors. Park staff will need to constantly conduct backcountry patrols and monitor blog sites to document where fixed gear is placed. Impacts to park operations will be direct, adverse and moderate. Adverse impacts to park operations under this alternative are predicted to be more extensive and more intense than under Alternatives A and B.

Monitoring

Under Alternative C, the park will conduct minimal monitoring of visitor-use patterns and resource conditions. As a consequence, park managers will have relatively little information for determining where and when management actions might be required for mitigating resource impacts. Educational material will be used to convey to climbers and canyoneers to be cognizant of their impacts on park resources. This educational material will focus primarily on the impact of visitors on the park's natural and cultural resources and Leave No Trace ethics. Park law enforcement will still enforce applicable laws and regulations when necessary and appropriate. Impacts to park operations will be direct, adverse, and minor.

Closures/regulations

Unlike Alternatives A and B, use of white chalk will be allowed under this alternative. Although the park will provide guidelines for minimizing impacts attributable to chalk usage, the extent and intensity of impacts will be greater for this alternative than for Alternatives A and B. Several clean-up efforts throughout the year will be required to ensure the white chalk remains unobtrusive. In addition, this alternative will not prohibit rappelling from or climbing, scrambling, and/or walking on any arch with an opening greater than three feet. This will have the potential to increase the extent and intensity of impacts on park operations relative to the preferred alternative.

Cumulative Effects: The development of private lands near Arches; park recreational uses other than climbing and canyoneering; development and maintenance of park infrastructure including roads, trails, and facilities; the conduct of resource monitoring and research activities; and foreseeable future actions related to park transportation management and activities by other federal, state, and local agencies with respect to water, wildlife, and soundscapes, all effect park operations due to additional staff time required for patrols and monitoring. This alternative when combined with other past, present and foreseeable impacts will result in minor cumulative increase of adverse impacts to park operations.

Conclusion: Under Alternative C, no access trails will be delineated, the park will not rehabilitate existing social trails, no restrictions on group size, new routes could be established, and the park will conduct minimal monitoring to evaluate visitor-use patterns and changes in resource conditions. However, over the long term, visitor use at Arches is expected to increase and current staffing levels will not be able to keep up with impacts of increased visitor use on park resources and will place a management burden on park operations. Therefore, impacts to park operations will be direct, adverse, negligible to moderate, local and parkwide and long-term.

CHAPTER 4 - CONSULTATION AND COORDINATION

External Scoping

External scoping was conducted to inform the public about the proposal to develop a climbing and canyoneering management plan and to generate input on the preparation of this EA/AEF. Over 200 scoping brochures dated July 12, 2010 were mailed or emailed to interested parties in Moab, Salt Lake City, Grand Junction, and to various federal and state agencies, affiliated Native American tribes, local governments and local and state newspapers. Scoping brochures were also mailed to those individuals who had commented during the scoping period for the initial climbing management plan effort in 2007. Scoping information was also posted on the park's website and on the NPS planning website: *Planning, Environment and Public Comment* (PEPC). The NPS conducted an open house in August 2010 to gather additional input for the plan. The public who attended were primarily from the climbing community and local climbing and canyoneering guide services.

During the 30-day scoping period, 343 public responses were received. Three hundred eight responses were received from the 2007 scoping period. These responses were also included in this planning effort. The majority of the responses were in favor of some sort of regulation and/or education for both climbing and canyoneering to ensure the protection of park resources. Many were also in support of not allowing climbing on any of the park's arches. The remaining responses included some in favor of not allowing climbing or canyoneering activities to continue in the park, stating there are plenty of areas outside the park for these activities. Others wanted the park to allow placement of new fixed anchors primarily for safety reasons. Some groups wanted closer partnership with the park in assisting with this management process. However, a fair number of commentators were in favor of keeping current management policies just as they are.

A newsletter describing preliminary alternatives was posted on the PEPC website on February 11, 2011 for public comment. The public was also given a 30 day opportunity to comment on the preliminary alternatives. A total of 172 correspondences were received from the public through postings on PEPC website and letters. Out of the four possible alternatives, the majority of commenter's supported current management (Alternative A), management with a minimum of restrictions (formerly Alternative D, currently Alternative C) and management that is more active (Alternative B). The alternative in which the public was not in favor of was the regulatory management approach (formerly Alternative C). This alternative was examined by the interdisciplinary team and ultimately dismissed as not meeting the other objectives of the project, as well as being economically infeasible to manage (see *Impact Topics Dismissed from Further Analysis in Alternatives*).

Agency Consultation

In accordance with the Endangered Species Act, NPS contacted the U.S. Fish and Wildlife Service with regards to special status species, and in accordance with National Park Service policy. The results of these consultations are described in the *Special Status Species* section in Chapter 3 (*Affected Environment and Environmental Consequences*).

In accordance with §106 of the National Historic Preservation Act, the NPS will provide the Utah State Historic Preservation Officer (SHPO) an opportunity to comment on the effects of this project. An assessment of effect determination was developed in concurrence with this EA and will be submitted to SHPO during the 30 day public review process for their concurrence with the park's determination of "*No Adverse Effect*" to archeological resources under the preferred alternative.

Native American Consultation

Twenty-nine Native American tribes were contacted at the beginning of this project to determine if there were any ethnographic resources in the project area and if they wanted to be involved in the environmental compliance process, including:

Hopi Tribal Council
Jicarilla Apache Nation
Kaibab-Paiute Tribal Council
Navajo Nation
Paiute Indian Tribe
Pueblo of Acoma
Pueblo of Cochiti
Pueblo of Isleta
Pueblo of Jemez
Pueblo of Laguna
Pueblo of Nambe
Pueblo of Picuris
Pueblo of Pojoaque
Pueblo of San Clara
Pueblo of San Ildefonso
Pueblo of Santo Domingo
Pueblo of Taos
Pueblo of Tesuque
Pueblo of Zia
San Felipe Pueblo
San Juan Pueblo
Sandia Pueblo
Santa Ana Pueblo
Southern Ute Tribe
Ute Indian Tribe
Ute Mountain Tribe
White Mesa Ute
Ysleta Del Sur Pueblo
Zuni Tribal Council

Three Native American Tribes responded; the Pueblo of Laguna, Navajo Nation, and the Hopi Tribe. Both the Pueblo of Laguna and Navajo Nation responded and affirmed their affiliation with the project area and stated that they do not anticipate impacts to Native American sites or resources. They had no objection to the proposed project, and requested to be kept informed of the project's progress, including immediate notification if Native American materials are discovered. The Hopi Tribe responded and affirmed their affiliation with the project area but they "do not support activities which permanently damage or impact natural and cultural resources and recommend that any

and all such activities be prohibited". No other federal or state agencies responded during the scoping period.

Other Interested Parties

The following are local businesses, governments and interest groups as well as national associations and clubs who were contacted during the scoping phases of the plan.

Access Fund
Desert Highlights
Moab Cliffs and Canyons
Moab Desert Adventures
Utah High Adventure
Zion Canyoneering Coalition
The Wilderness Society
Southern Utah Wilderness Alliance
The Sierra Club
Utah Guides and Outfitters
Salt Lake Climbers Alliance
American Alpine Club
American Mountain Guides Association
Friends of Indian Creek
Patagonia, Inc.
Canyoneering USA
American Canyoneering Association
Grand County Council
Grand Canyon Trust
Utah State Trust Lands
Office of the Solicitor
The Nature Conservancy
Moab Area Chamber of Commerce
Red Rock Forests
Moab City Council

Environmental Assessment/Assessment of Effect Review and List of Recipients

The EA/AEF is subject to a 30-day public comment period. To inform the public of the availability of the EA/AEF, NPS will publish and distribute a letter to various agencies, tribes, and the park mailing list, as well as place an ad in the local newspaper. The document will be available for review on the PEPC website at <http://parkplanning.nps.gov/arch> and at the Arches Visitor Center and at the administration/headquarters office in Moab. Hardcopies or digital copies of the EA/AEF will be provided to interested individuals, upon request.

During the 30-day public review period, the public is encouraged to submit their written comments to NPS, as described in the instructions at the beginning of this document. Following the close of the comment period, all public comments will be reviewed and analyzed, prior to the release of a decision document. The NPS will issue responses to substantive comments received during the public comment period, and will make appropriate changes to the EA/AEF, as needed.

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