

National Park Service  
U.S. Department of the Interior

Big Bend National Park  
Texas



## Construct New Multi-Use Trail at Panther Junction Environmental Assessment

August 2014



Panther Junction Visitor Center entrance and Route 13, looking northwest towards Lone Mountain.

# ENVIRONMENTAL ASSESSMENT

## Construct New Multi-Use Trail at Panther Junction Big Bend National Park, Texas

### SUMMARY

Big Bend National Park (Park) is considering constructing a 10-mile multi-use trail in non-wilderness backcountry 0.25 miles northwest of the Panther Junction Park Headquarters between Grapevine Hills Road and Route 11. The trail would allow for hiking and mountain biking.

The purpose of the proposed project is to provide Park visitors a trail-based recreational opportunity in an area of the Park where none currently exists. The proposed action is in keeping with a 2005 Memorandum of Agreement between the National Park Service (NPS) and the International Mountain Biking Association (IMBA) that encouraged identifying mountain biking opportunities in the national parks, including new trail construction in appropriate areas. Bicycles are currently allowed only on existing paved and unpaved roads within the Park according to requirements of 36 Code of Federal Regulations (CFR) 4.30. A new single-track trail would allow for mountain bike users to access the Park's backcountry.

This Environmental Assessment (EA) is a revision of an EA on the same topic that was released for public comment in March 2011. The original EA resulted in a Finding of No Significant Impact (FONSI) but that decision document was not published due to an unfortunate clerical oversight. In recognition of its error, the NPS is providing this revised EA for public review and comment. The revised EA provides additional details that may clarify some issues and corrects errata in the original EA.

This EA evaluates three alternatives: 1) Alternative A, the No Action Alternative; 2) Alternative B, to construct a new multi-use trail for mountain biking and hiking; and 3) Alternative C, to construct a new hiking trail only. Alternative A describes the current condition of the project area and the environmental impacts that may occur if there were no changes in the way the Park currently manages the area. Alternative B describes the construction of a new multi-use trail for mountain biking and hiking, trailheads, and construction of a new parking lot and picnic area. Alternative C describes the construction of a new hiking only trail with the same facilities proposed for Alternative B.

This EA examines the potential environmental impacts associated with the three alternatives and was prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code 4321 *et seq*), the Council on Environmental Quality (CEQ) regulations (40 CFR 1500 *et seq*) for implementing NEPA, and NPS Director's Order #12, *Conservation Planning, Environmental Impact Analysis, and Decision-making* (DO-12). Resources of concern that could be affected by the alternatives were identified by specialists at the Park and through public input during the scoping process. Impact topics analyzed in this document include soils, water resources, floodplains, vegetation, visitor use and experience/recreation, visitor safety, archeological resources, and socioeconomics. Other resource topics were dismissed from further analysis, because none of the alternatives would have measurable impacts to these

resources. None of the alternatives are anticipated to have any major impacts on Park resources or values. A summary and comparison of environmental impacts for each alternative is provided in Table 2 of this document.

## **PUBLIC COMMENT**

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

Superintendent  
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# TABLE OF CONTENTS

ENVIRONMENTAL ASSESSMENT .....	I
Summary .....	i
Public Comment .....	iii
TABLE OF CONTENTS .....	I
LIST OF FIGURES .....	V
LIST OF TABLES .....	V
PURPOSE AND NEED .....	1
Introduction .....	1
Background .....	1
Need for Action .....	2
Purpose and Park Objectives .....	3
Relationship to Other Plans and Policies .....	3
Precedence .....	4
Impairment .....	5
Unacceptable Impacts .....	6
Appropriate Use .....	6
Scoping .....	7
<b>Impact Topics Retained for Further Analysis</b> .....	8
Soils .....	9
Water Resources .....	9
Floodplains .....	9
Vegetation .....	9
Visitor Use and Experience/Recreation .....	10
Visitor Safety .....	10
Archeological Resources .....	10
Socioeconomics .....	10
<b>Impact Topics Dismissed From Further Analysis</b> .....	10
Geology .....	11
Paleontological Resources .....	11
Air Quality .....	12
Wildlife .....	12
Special Status Species .....	12
Biosphere Reserves .....	12
Wild and Scenic Rivers .....	13
Wilderness Values .....	13
Park Operations .....	16
Historic Structures .....	16
Ethnographic Resources .....	16
Cultural Landscapes .....	16
Indian Trust Resources .....	16
Museum Objects, Collections, and Archives .....	17
Environmental Justice .....	17
Prime and Unique Farmlands .....	17
Soundscape Management .....	17

Lightscape Management.....	18
<b>ALTERNATIVES CONSIDERED.....</b>	<b>19</b>
<b>Alternatives Analyzed .....</b>	<b>19</b>
Alternative A – The No Action Alternative .....	19
Alternative B – Construct a Multi-Use Trail .....	19
Alternative C – Construct a Hiking Trail Only.....	22
<b>Alternatives Considered But Dismissed.....</b>	<b>23</b>
Construct Multi-Use Trail in Alternate Location.....	23
Construct Bicycle Use Only Trail.....	23
Construct Separate Bicycle and Hiking Trails .....	23
Others.....	24
<b>Mitigation Measures .....</b>	<b>24</b>
<b>Alternative Summaries.....</b>	<b>27</b>
<b>Identification of the Environmentally Preferred Alternative.....</b>	<b>30</b>
<b>ENVIRONMENTAL CONSEQUENCES .....</b>	<b>31</b>
<b>Methodology .....</b>	<b>31</b>
<b>Cumulative Effects.....</b>	<b>31</b>
Past and Present Projects and Actions.....	32
Future Projects and Actions .....	33
<b>Soils.....</b>	<b>33</b>
Affected Environment .....	33
Intensity Level Definitions .....	34
Regulations and Policies.....	34
Impacts of Alternative A (No Action Alternative) .....	35
Cumulative Effects .....	35
Conclusion.....	35
Impacts of Alternative B (Multi-Use Trail) .....	35
Cumulative Effects .....	37
Conclusion.....	37
Impacts of Alternative C (Hiking Only Trail) .....	37
Cumulative Effects .....	37
Conclusion.....	38
<b>Water Resources.....</b>	<b>38</b>
Affected Environment .....	38
Intensity Level Definitions .....	38
Regulations and Policies.....	39
Impacts of Alternative A (No Action Alternative) .....	39
Cumulative Effects .....	39
Conclusion.....	40
Impacts of Alternative B (Multi-Use Trail) .....	40
Cumulative Effects .....	40
Conclusion.....	41
Impacts of Alternative C (Hiking Only Trail) .....	41
Cumulative Effects .....	41
Conclusion.....	41
<b>Floodplains.....</b>	<b>42</b>
Affected Environment .....	42
Intensity Level Definitions .....	42

Regulations and Policies.....	43
Impacts of Alternative A (No Action Alternative) .....	44
Cumulative Effects .....	44
Conclusion.....	44
Impacts of Alternative B (Multi-Use Trail) .....	44
Cumulative Effects .....	44
Conclusion.....	45
Impacts of Alternative C (Hiking Only Trail) .....	45
Cumulative Effects .....	45
Conclusion.....	45
<b>Vegetation .....</b>	<b>46</b>
Affected Environment .....	46
Intensity Level Definitions .....	47
Regulations and Policies.....	48
Impacts of Alternative A (No Action Alternative) .....	48
Cumulative Effects .....	48
Conclusion.....	48
Impacts of Alternative B (Multi-Use Trail) .....	49
Cumulative Effects .....	49
Conclusion.....	50
Impacts of Alternative C (Hiking Only Trail) .....	50
Cumulative Effects .....	50
Conclusion.....	50
<b>Visitor Use and Experience/Recreation.....</b>	<b>50</b>
Affected Environment .....	50
Intensity Level Definitions .....	51
Regulations and Policies.....	52
Impacts of Alternative A (No Action Alternative) .....	53
Cumulative Effects .....	53
Conclusion.....	53
Impacts of Alternative B (Multi-Use Trail) .....	53
Cumulative Effects .....	55
Conclusion.....	55
Impacts of Alternative C (Hiking Only Trail) .....	55
Cumulative Effects .....	56
Conclusion.....	56
<b>Visitor Safety .....</b>	<b>56</b>
Affected Environment .....	56
Intensity Level Definitions .....	57
Regulations and Policies.....	57
Impacts of Alternative A (No Action Alternative) .....	58
Cumulative Effects .....	58
Conclusion.....	58
Impacts of Alternative B (Multi-Use Trail) .....	58
Cumulative Effects .....	58
Conclusion.....	59
Impacts of Alternative C (Hiking Only Trail) .....	59
Cumulative Effects .....	59
Conclusion.....	60

<b>Archeological Resources</b> .....	<b>60</b>
Affected Environment .....	60
Intensity Level Definitions .....	61
Regulations and Policies.....	62
Impacts of Alternative A (No Action Alternative) .....	62
Cumulative Effects .....	62
Conclusion.....	63
Impacts of Alternative B (Multi-Use Trail) .....	63
Cumulative Effects .....	63
Conclusion.....	64
Impacts of Alternative C (Hiking Only Trail) .....	64
Cumulative Effects .....	64
Conclusion.....	65
<b>Socioeconomics</b> .....	<b>65</b>
Affected Environment .....	65
Intensity Level Definitions .....	67
Regulations and Policies.....	67
Impacts of Alternative A (No Action Alternative) .....	68
Cumulative Effects .....	68
Conclusion.....	68
Impacts of Alternative B (Multi-Use Trail) .....	68
Cumulative Effects .....	69
Conclusion.....	69
Impacts of Alternative C (Hiking Only Trail) .....	69
Cumulative Effects .....	69
Conclusion.....	70
<b>UNACCEPTABLE IMPACTS AND IMPAIRMENT ANALYSIS</b> .....	<b>71</b>
<b>CONSULTATION AND COORDINATION</b> .....	<b>73</b>
<b>External Scoping</b> .....	<b>73</b>
<b>Internal Scoping</b> .....	<b>74</b>
<b>Environmental Assessment Review Period</b> .....	<b>74</b>
<b>Regulatory Compliance</b> .....	<b>74</b>
<b>LIST OF PREPARERS</b> .....	<b>76</b>
Contributors (provided information and guidance): .....	76
Reviewers (provided guidance and recommendations on content): .....	76
<b>REFERENCES</b> .....	<b>78</b>
<b>APPENDIX A: PUBLIC MEETING NOTICE</b> .....	<b>81</b>

## LIST OF FIGURES

Figure 1	Project Location within the Park.....	2
Figure 2	Wilderness Classification near the Project Area .....	15
Figure 3	Proposed Trail Location and Alignment .....	20
Figure 4	Parking and Picnic Area .....	22

## LIST OF TABLES

Table 1	Alternatives Summary and Extent to which Each Alternative Meets Project Objectives .....	27
Table 2	Environmental Impact Summary and Comparison of Impacts.....	27
Table 3	Estimated Permanent Ground Disturbance for Trail Construction.....	36
Table 4	Estimated Increase in Ground Disturbance After One Year of Use .....	36
Table 5	Species of Concern Found within the Lone Mountain Plant Survey Area, September 2006 .....	46

# PURPOSE AND NEED

## INTRODUCTION

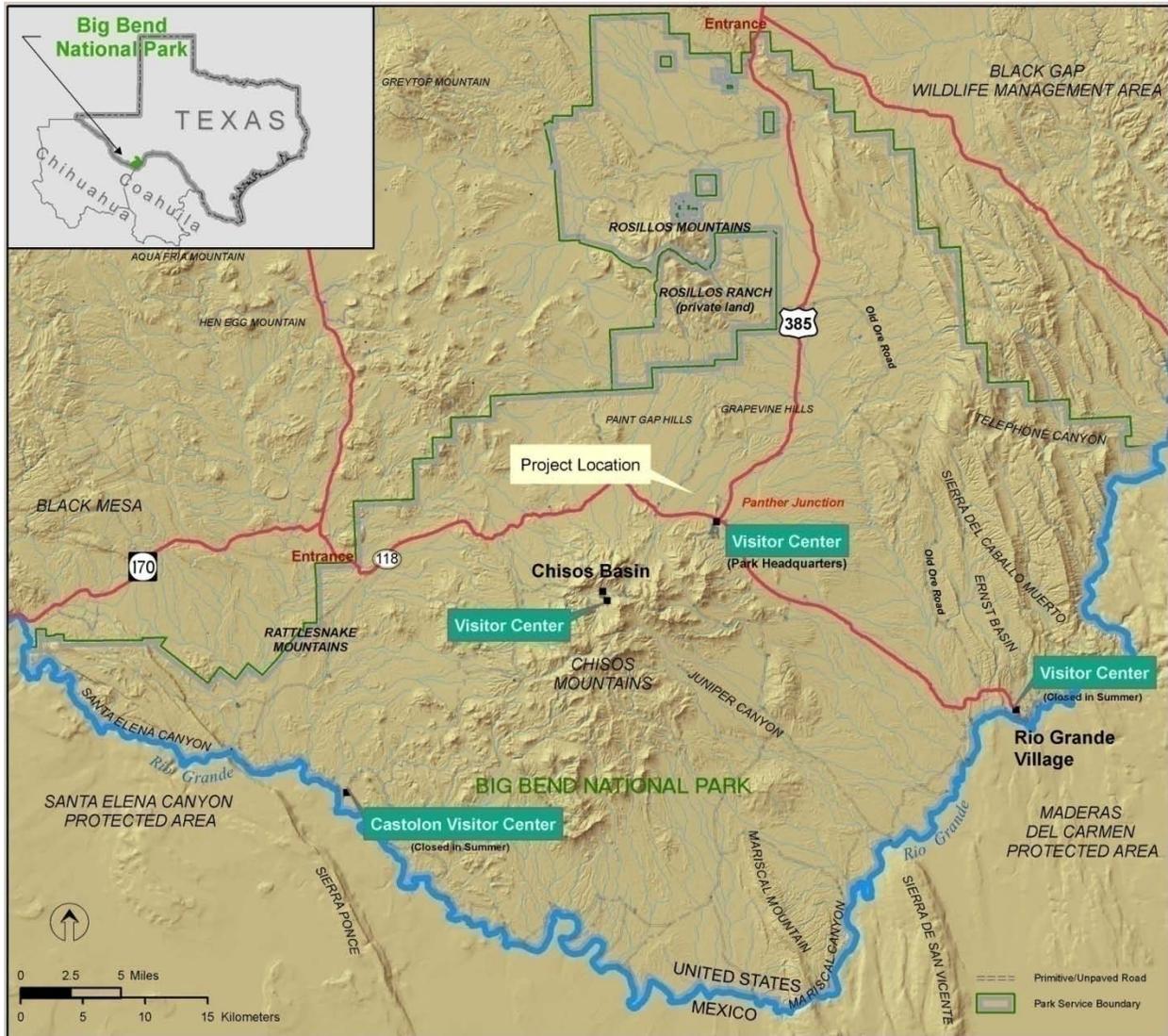
Big Bend National Park (Park) was established on June 20, 1935 by an act of Congress. The Park encompasses more than 801,000 acres in south Brewster County in southwest Texas (Figure 1). The “big bend” of the Rio Grande forms the Park’s southern international boundary with Mexico. The Park has national significance as the largest protected area of Chihuahuan Desert topography and ecology in the United States (NPS 2004) and has international significance as a designated biosphere reserve (UNESCO 1976). The Park’s river, desert, and mountain environments support an extraordinary richness of biological diversity and provide unparalleled recreational opportunities.

## BACKGROUND

In 2002, the NPS and IMBA signed a MOA with the goal of providing high quality mountain biking opportunities for visitors to enjoy the national park system in appropriate areas consistent with NPS stewardship responsibilities. Highlights of this agreement encourage the NPS to work in cooperation with IMBA and affiliate organizations to identify mutually beneficial projects or activities. These may include trail construction and maintenance projects, trail patrols, gathering and sharing information regarding mountain biking on NPS lands, safety training, and other educational efforts.

In 2005, the NPS began working with IMBA and the local mountain biking community to look into the possibility of expanding mountain biking opportunities in the Park. In 2006, the NPS began initial project scoping to identify potential opportunities. Since then, a new multi-use trail, to include mountain biking, has been proposed in undeveloped backcountry northwest of the Panther Junction Park Headquarters between Grapevine Hills and Park Route 11 (Figure 1). The proposed trail is within a non-wilderness area of Big Bend backcountry. Recommended Wilderness areas of Big Bend National Park remain off-limits to mountain bikes.

Figure 1. Project location within the Park.



## NEED FOR ACTION

Action is needed to provide a trail-based recreational opportunity near Panther Junction. As the location of the primary park visitor center and headquarters, Panther Junction is a focal point for congregation of park visitors, and no trail-based recreational opportunities are currently available in the vicinity. Additionally, the proposed project provides the opportunity to consider alternatives related to the 2005 MOA between NPS and IMBA that was established for the purpose of identifying mountain biking opportunities in the national parks. IMBA and the NPS have been working together over the past several years to identify potential opportunities in the Park, excluding wilderness management areas. Bicycles are currently allowed only on existing paved and unpaved roads within the Park according to requirements of 36 Code of Federal Regulations (CFR) 4.30. A new single-track trail would allow for hikers and mountain bike users to access the Park's backcountry at Panther Junction.

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## PURPOSE AND PARK OBJECTIVES

The purpose of the proposed project is to provide Park visitors a trail-based recreational opportunity in an area of the Park where none currently exists. The proposed action considers providing that opportunity to both hikers and bicyclists, and an alternative considers providing it to hikers only. The proposed action is in keeping with a 2005 Memorandum of Agreement between NPS and the International Mountain Biking Association (IMBA) that encouraged identifying mountain biking opportunities in the national parks, including new trail construction in appropriate areas. The primary objectives of the proposal are as follows:

- Create new recreational opportunities for Park visitors.
- Provide a trail-based recreational opportunity in the vicinity of Panther Junction.

This Environmental Assessment (EA) examines the potential environmental impacts associated with three alternatives – Alternative A, the no-action alternative; Alternative B, construct a multi-use trail; and Alternative C, construct a hiking trail only. This EA was prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code 4321 *et seq*), the Council on Environmental Quality (CEQ) regulations (40 CFR 1500 *et seq*) for implementing NEPA, and NPS Director’s Order #12, *Conservation Planning, Environmental Impact Analysis, and Decision-making* (DO-12).

## RELATIONSHIP TO OTHER PLANS AND POLICIES

Construction of a multi-use trail in the Panther Junction area meets the mandates of the Park’s enabling legislation, which states that the Park was set aside “for recreational park purposes. . . [and]. . .for the benefit and enjoyment of the people.” The proposed trail would provide new recreational opportunities to Park visitors for the enjoyment of the Park’s backcountry. One of the three purposes of the Park cited in the Park’s 2004 General Management Plan (GMP) is to “provide recreational opportunities for diverse groups that are compatible with the protection and appreciation of park resources” (NPS 2004). A new trail that allows the use of mountain bikes would diversify the recreational users in the Park while maintaining the appropriate use of the Park’s resources. NPS *Management Policies 2006* (NPS 2006) state that trails “will be planned and developed as integral parts of each park’s transportation system. . . All trails and walks will be carefully situated, designed, and managed to: reduce conflicts with automobiles and incompatible uses; allow for a satisfying park experience; allow accessibility by the greatest number of people; and protect park resources.” The proposed trail would be designed to meet these objectives.

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## PRECEDENCE

### Introduction

The purpose of this section is to provide an understanding of bicycle use in the national park system for comparison to the Proposed Action.

### Service-wide Bicycle Use Information

No central or comprehensive NPS database is maintained for the purpose of documenting or tracking service-wide bicycle use. Thus, Big Bend National Park staff conducted a review using a variety of sources, including direct telephone contact with staff at numerous parks and central offices, official park web sites, commercial and non-governmental recreation web sites, and other literature. It should be recognized that the lack of readily available, comprehensive and up-to-date statistics suggests additional relevant activities could exist. This review includes only parks and bike routes that have engaged the NEPA compliance process and rulemaking.

Chatahoochee River National Recreation Area, Georgia, completed a General Management Plan (GMP), EIS, and Record of Decision (ROD) in 2009. The GMP described off-road bicycling on trails as an appropriate use. In 2010 the park concluded the Chatahoochee River Trail Connection Plan and associated EA and Finding of No Significant Impact (FONSI), including 0.1 mile of new trail to connect existing routes in the Johnson Ferry South unit, and new trail segments to create a 6.7 mile loop in the Cochran Shoals unit. Rulemaking was completed in 2013.

Delaware Water Gap National Recreation Area, Pennsylvania, completed a Trails Plan GMP Amendment /EIS in 1999 and ROD (2000) that includes allowing up to 95 miles of the park's planned 223-mile trail system to accommodate bicycle use. Rulemaking is underway.

Lake Meredith National Recreation Area, Texas, concluded an EA and FONSI in 2012 for a new 22-mile multi-use trail through developed and undeveloped areas of the unit. The proposed trail would include new construction and incorporate administrative roads and utility corridors. Rulemaking was completed in early 2014.

Mammoth Cave National Park, Kentucky, completed a Bikeway Plan and EA / FONSI in 2004. The park completed a Comprehensive Trail Management Plan, EA, and FONSI in 2008. The plan calls for construction of a new, 6-mile long, single-track loop trail named the Big Hollow Trail, for bicyclists and hikers. Rulemaking was completed in 2012.

New River Gorge National River, West Virginia, completed a GMP and ROD in 2011, proposing bicycle use on new and existing trails and administrative roads. The park completed an EA and FONSI in 2011 on a plan for construction of new trails and designation of new and existing park trails as routes for bicycle use. In addition to new trail development on abandoned roads, railroad grades, and existing informal routes, the Craig Branch and Garden Ground Stacked Loop Trail Systems will include 36 miles of new trail where no routes currently exist. Rulemaking was completed in 2012.

Saguaro National Park, Arizona, completed a Comprehensive Trails Plan, EA and FONSI in 2009. The plan incorporated the Cactus Forest Trail, 2 miles of old road and ½ mile of single-

track, that had been in bicycle use since 2003, when rulemaking on the trail was completed. The 2012 Trails Plan proposed an additional route, the Hope Camp Trail (2.8 miles), a former, pre-park ranch road. Trails Plan Rulemaking was completed in 2012.

Sleeping Bear Dunes National Lakeshore, Michigan, included the concept for a multi-use trail to include bicycle use in the park's 2008 GMP, EIS and ROD. In 2009 the park published the Trailway Plan. The EA and FONSI were completed the same year. The 27-mile long Sleeping Bear Heritage Trail will generally parallel a paved park entrance road and provide a sustainable alternative to motor vehicle access from nearby communities. Rulemaking was completed in 2012.

## CONCLUSION

Six NPS units have completed all requirements to allow bicycle use on newly constructed trails and/or old (closed) roads outside of development areas, and one additional unit has completed NEPA analysis, with the goal of completing rulemaking

## IMPAIRMENT

NPS *Management Policies 2006* and DO-12 require analysis of potential effects to determine whether or not actions would impair a park's natural and cultural resources. The fundamental purpose of the National Park System, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid or minimize to the greatest degree practicable adverse impacts on park resources and values. However, the laws give NPS management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values.

Although Congress has given NPS management discretion to allow certain impacts within parks, that discretion is limited by statutory requirement that the NPS must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values. An impact to any park's natural or cultural resources or values may, but does not necessarily, constitute an impairment. An impact would be more likely to constitute an impairment to the extent it affects a resource or value whose conservation is:

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

An impact that may, but would not necessarily lead to impairment may result from visitor activities; NPS administrative activities; or activities undertaken by concessionaires, contractors, and others operating in the Park. Impairment may also result from sources or activities outside

the Park. A determination on impairment is made in the natural and cultural resources' conclusion statements for each alternative in the Environmental Consequences section.

## UNACCEPTABLE IMPACTS

The impact threshold at which impairment occurs is not always readily apparent. Therefore, the NPS will apply a standard that offers greater assurance that impairment will not occur. The NPS will do this by avoiding impacts that it determines to be unacceptable. These are impacts that fall short of impairment, but are still not acceptable within a particular park's environment. Park managers must not allow uses that would cause unacceptable impacts; they must evaluate existing or proposed uses and determine whether the associated impacts on park resources and values are acceptable.

Virtually every form of human activity that takes place within a park has some degree of effect on park resources or values, but that does not mean the impact is unacceptable or that a particular use must be disallowed. Therefore, for the purposes of these policies, unacceptable impacts are impacts that, individually or cumulatively, would:

- be inconsistent with a park's purposes or values, or
- impede the attainment of a park's desired future conditions for natural and cultural resources as identified through the park's planning process, or
- create an unsafe or unhealthful environment for visitors or employees, or
- diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values, or
- unreasonably interfere with park programs or activities, or an appropriate use, or
- impact the atmosphere of peace and tranquility, or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the park.
- NPS concessioner or contractor operations or services.

In accordance with NPS *Management Policies 2006*, park managers must not allow uses that would cause unacceptable impacts to park resources. To determine if unacceptable impacts could occur to the resources and values at the Park, the impacts of proposed actions in this EA were evaluated based on the above criteria. A determination on unacceptable impacts is made in the Conclusion section for each of the impact topics carried forward in the Environmental Consequences chapter of this document.

## APPROPRIATE USE

An "appropriate use" is a use that is suitable, proper, or fitting for a particular park, or to a particular location within a park. Not all uses are appropriate or allowable in units of the national park system, and what is appropriate may vary from one park to another and from one location to another within a park.

The NPS must ensure that park uses that are allowed would not cause impairment of, or unacceptable impacts on, park resources and values. A new form of park use may be allowed within a park only after a determination has been made in the professional judgment of the

superintendent that it will not result in unacceptable impacts. To determine appropriate use, all proposals for park uses are evaluated for:

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

Superintendents must continually monitor and examine all park uses to ensure that unanticipated and unacceptable impacts do not occur. If, in monitoring a park use, unanticipated impacts become apparent, the superintendent must further manage or constrain the use to minimize the impacts, or discontinue the use if the impacts are unacceptable.

Trails are a common and integral part of most park units. Proper trail location, design, construction, and management would ensure that unacceptable impacts to park resources and values would not occur. The proposed construction of a new multi-use trail in the Panther Junction area is consistent with the Park's GMP and other NPS plans and policies described above. The NPS finds that the multi-use trail is an "appropriate use" at the Park.

## SCOPING

Scoping is a process intended to identify the resources that may be affected by a proposed action, and to explore possible alternative ways of achieving the objectives of a proposed action while minimizing adverse impacts. The NPS conducted both internal scoping with appropriate staff and external scoping with the public and other agencies.

The NPS' interdisciplinary staff of environmental resource, visitor use, and trail maintenance specialists conducted internal scoping. On October 9, 2005, the first formal internal scoping meeting was held between key Park staff and representatives of IMBA. During the same time as the first external public scoping period described below, the NPS held three "all-staff invited" internal scoping meetings on February 14, 16, and 24, 2006 at the Panther Junction auditorium. Approximately 15 to 20 people attended one of these meetings and 48 comments were received, none in support of the proposal.

The NPS commenced a 30-day public scoping period from January 26, 2006 to February 26, 2006. During this period, the NPS held two public scoping meetings to gather input from the general public, agencies, and organizations concerning the proposed multi-use trail. Twenty persons attended the first meeting and 24 persons attended the second. During the 2006 public scoping period, most public comments supported the possibility of mountain biking in the Park, some were opposed, and others expressed concern regarding the proposal.

During the next year, the NPS selected a proposed trail route and conducted natural resource surveys.

On July 30, 2008, interdisciplinary team members held a project kick-off meeting to discuss the project's purpose and need, various alternatives, and potential environmental impacts. After the

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project kick-off meeting, some interdisciplinary team members conducted a site visit to the proposed project area.

In 2008, the NPS revisited the proposal and opened another 30-day public scoping period from August 22 to September 20. During this period, the NPS held two public scoping meetings. Comments were received as written statements during the meetings, via letters and emails to the park, and via the NPS Planning, Environment and Public Comment (PEPC) website.

Comments were analyzed, and the vast majority fell into categories of whether the individual supported or opposed the proposal, suggested an alternative action for consideration, or expressed concern over trail design and trail user management.

Ten people attended the first meeting and 14 people attended the second. During the public scoping meetings, eight written comments were received, all supporting the proposed multi-use trail.

Most of the comments received via the PEPC website supported the proposed multi-use trail. It is also important to note that, of the PEPC comments supporting the proposal, approximately 60 percent were submitted as standard text. That is, each comment repeated the same discussions supporting the possibility of mountain biking in the Park. Further, of the 60 percent that were standard comments, approximately half of these were submitted by IMBA members. Additionally, many standard comments were submitted by members of other mountain biking associations.

A few agencies and organizations sent letters concerning the proposed trail, some supporting it, others opposing it.

Additional alternatives and actions included opening existing trails to bicycle use, establishing multi-use trails parallel to existing backcountry roads, creating new bike-only and hiker-only trails, using old abandoned roads for bicycle routes, allowing hikers or bicyclists sole use of the trail during specified but alternating time periods, creating a longer multi-use trail than proposed, and providing a shuttle vehicle to return cyclists to their vehicles.

Concerns were expressed regarding potential visitor-use conflicts and safety, increasing damage to natural resources over time, the quality of visitor experiences, expertise and experience of trail designers, and trail design specifics.

## **IMPACT TOPICS RETAINED FOR FURTHER ANALYSIS**

Issues and concerns affecting the proposed action were identified by specialists at the Park and through public input during the scoping process. Impact topics are the resources of concern that could be affected by the alternatives. The following impact topics were identified on the basis of Federal laws and regulations, NPS Director's Orders, NPS *Management Policies 2006*, and NPS knowledge of resources at the Park. A brief rationale is given for the selection of each impact topic for further analysis.

## Soils

NPS *Management Policies 2006* states that the NPS will strive to understand and preserve the soil resources of park units and to prevent, to the extent possible, the unnatural erosion, physical removal, or contamination of the soil, or its contamination of other resources. These policies further state that “management action will be taken by superintendents to prevent or at least minimize adverse, potentially irreversible impacts on soils.”

Trail and associated facility construction would permanently alter the soil surface. More specifically, trail construction would remove vegetation and the gravel and cobble veneer that protects the erodible soils beneath, thereby increasing the potential for erosion. Additionally, trail use would cause soil erosion and compaction. Therefore, soils are addressed as an impact topic in this EA.

## Water Resources

Surface waters of the U.S. are regulated by the Clean Water Act (CWA). The purpose of the CWA is to “restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.” The CWA is the primary authority under which the U.S. Environmental Protection Agency (EPA), U.S. Army Corps of Engineers, and Texas Commission on Environmental Quality regulate effects to surface waters in Texas, including the Rio Grande.

The proposed trail would cross Green Gulch and Avery Canyon washes, potentially concentrating storm water flows causing increased erosion in these areas. Therefore, water resources are addressed as an impact topic in this EA. There are no wetlands within the project area; thus, wetlands are not included in the water resources impacts analysis.

## Floodplains

The Panther Junction area is considered flash flood prone; therefore, floodplains are addressed as an impact topic in this EA.

## Vegetation

According to NPS *Management Policies 2006*, NPS strives to maintain all components and processes of naturally evolving park unit ecosystems, including the natural abundance, diversity, and ecological integrity of plants. It also contains management guidelines for avoiding the introduction of exotic plant species, and removal, when necessary, of exotic plant species from NPS units. Trail construction would require the removal of native vegetation; therefore, vegetation is addressed as an impact topic in this EA.

## **Visitor Use and Experience/Recreation**

Currently, the Panther Junction area has no trails for visitor use and recreation. A new trail would provide a new recreational opportunity for Park visitors; therefore visitor use and experience/recreation is addressed as an impact topic in this EA.

## **Visitor Safety**

Visitor use of a new trail may increase the potential for visitor accidents and injuries. A multi-use trail could lead to conflicts between hikers and mountain bikers. Therefore, visitor safety was addressed as an impact topic in this EA.

## **Archeological Resources**

Construction and maintenance of the proposed trail has the potential to impact four archeological sites. In addition, the new trail would introduce visitors to an area that is rarely accessed, exposing other sites to potential harm from off-trail use. Therefore, archeological resources are addressed as an impact topic in this EA.

## **Socioeconomics**

Because all three alternatives have the potential to affect the socioeconomic environment surrounding the project area, this topic has been retained for further analysis.

## **IMPACT TOPICS DISMISSED FROM FURTHER ANALYSIS**

NEPA regulations emphasize the importance of adjusting the scope of each EA to the particulars of the project and its setting, and focusing on the specific potential impacts of the project. There is no need, according to the regulations, to include information on resources that would not be affected by the project. Impact topics were dismissed from further analysis if it was determined that the project did not have the potential to cause substantial change to these resources and values.

Some impact topics have been dismissed from further consideration, as listed below. During internal scoping, the NPS' interdisciplinary team conducted a preliminary analysis of resources to determine the context, duration, and intensity of effects that the proposal may have on those resources. If the magnitude of effects was determined to be at the negligible or minor level, there is no potential for substantial impact and further impact analysis is unnecessary, therefore the resource is dismissed as an impact topic. If however, during internal scoping and further investigation, resource effects still remain unknown, or are at the minor to moderate level of intensity, and the potential for substantial impacts is likely, then the analysis of that resource as an impact topic is carried forward. For purposes of this section, an impact of negligible intensity is one that is "at the lowest levels of detection, barely perceptible, and not measurable". An

impact of minor intensity is one that is “measurable or perceptible, but is slight, localized, and would result in a limited alteration or a limited area”. The rationale for dismissing these specific topics is stated for each resource.

## Geology

NPS *Management Policies 2006* states that the NPS will preserve and protect geologic features and geologic processes as integral components of park natural systems. The geology of the project area is primarily characterized by the Late Cretaceous sedimentary Aguja Formation.

Trail and associated facility construction would have a negligible impact on geologic features and processes. Soils would be impacted and are analyzed in this EA. There would be no potential impacts from geohazards (e.g., landslides). Therefore, geology was dismissed as an impact topic in this EA.

## Paleontological Resources

NPS *Management Policies 2006* states that paleontological resources (fossils), including both organic and mineralized remains in body or trace form, will be protected, preserved, and managed for public education, interpretation, and scientific research. The Park is known to contain an abundance and diversity of paleontological resources representing an uninterrupted 35 million-year-long fossil record, which includes fossil remains of dinosaurs, crocodiles, turtles, plants, fish, amphibians, and early mammals.

In March 2006, Dr. Thomas Lehman, Professor of Geosciences at Texas Tech University, investigated the project area and found no vertebrate fossils. Several petrified logs were found exposed in the Aguja Formation near the base of Lone Mountain. The logs were sampled and found to be the most common conifer wood variety found in the Aguja Formation. This wood type has been well documented and there are many more and better preserved specimens found at sites elsewhere in the Park. Given the close proximity of the petrified logs, it is possible that trail users would discover them and thus, there is the potential for loss. However, because there are many more and better preserved specimens in other areas of the Park, the project’s impact on the logs would be minor.

The Park’s Division of Science and Resources Management, in coordination with the Trail Supervisor, has developed mitigation measures to ensure protection of paleontological resources. If previously unidentified paleontological resources should be found during ground disturbing activities associated with trail construction, work would stop in the area of the discovery and the NPS paleontologist would determine the appropriate treatment of those resources in accordance with NPS *Management Policies 2006*. Because known paleontological resources would be avoided and mitigation measures would be implemented by the NPS to manage any potential discovery of paleontological resources, it is anticipated that the action alternatives would have no effect; therefore, paleontological resources was dismissed as an impact topic in this EA.

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## Air Quality

Section 118 of the 1963 Clean Air Act (CAA) requires the NPS to meet all Federal, State, and local air pollution standards. Section 176(c) of the 1963 CAA requires all Federal activities and projects to conform to state air quality implementation plans to attain and maintain national ambient air quality standards. *NPS Management Policies 2006* addresses the need to analyze potential impacts to air quality during park planning.

The Park is classified as a Class I air quality area under the CAA, as amended, because it encompasses more than 6,000 acres. This most stringent air quality classification protects national parks and wilderness areas from air quality degradation. The CAA gives Federal land managers the responsibility for protecting air quality and related values including visibility, plants, animals, soils, water quality, cultural resources, and public health from adverse air pollution impacts.

Construction and use of the trail would have a negligible impact on air quality and would not affect the Park's Class I air quality and related values. Constructing the trail would include clearing vegetation, minor grading, and employing desert trail construction techniques. These construction activities, as well as dust generated by trail users, would have a negligible impact on air quality. Therefore, air quality was dismissed as an impact topic in this EA.

## Wildlife

*NPS Management Policies 2006* states that the NPS strives to maintain all components and processes of naturally evolving park unit ecosystems, including the natural abundance, diversity, and ecological integrity of animals. Construction of the trail would have no measurable impact on wildlife in the area. Therefore, wildlife was dismissed as an impact topic in this EA.

## Special Status Species

The Endangered Species Act of 1973, as amended, requires examination of impacts on all federally listed threatened or endangered species. The *NPS Management Policies 2006* and *DO-77 Natural Resource Management Guidelines* require the NPS to examine the impacts of federal candidate species, as well as state-listed threatened, endangered, candidate, rare, declining, and sensitive species. The NPS botanist and wildlife biologist have evaluated the project area and found that no federally or state-listed species or suitable habitat for these species exists in the project area. A May 2007 botanical survey final report found several Park-designated sensitive plant species in the project area. However, because these species have a sufficiently wide coverage area in the Park, the project is unlikely to affect regional or Park-wide populations. Therefore, special status species was dismissed as an impact topic in this EA.

## Biosphere Reserves

The Park is a designated biosphere reserve. Biosphere reserves are areas of terrestrial and coastal/marine ecosystems or a combination thereof, which are internationally recognized

within the framework of UNESCO's program on Man and the Biosphere. Biosphere reserves are established to promote and demonstrate a balanced relationship between humans and the biosphere. Construction of the trail would not impact the Park's biodiversity or other characteristics qualifying it as a biosphere, and would not conflict with the Park's biosphere management objectives. Therefore, biosphere reserves was dismissed as an impact topic in this EA.

## Wild and Scenic Rivers

The Wild and Scenic Rivers Act states that "certain selected rivers of the Nation which, with their immediate environments possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations." The segment of the Rio Grande that borders the Park is a designated Wild and Scenic River. The proposed project is not within the vicinity of the Rio Grande and would not impact the characteristics of the river that qualify it as wild and scenic. Therefore, wild and scenic rivers was dismissed as an impact topic in this EA.

## Wilderness Values

The Wilderness Act of 1964 (16 U.S.C. 1131 et seq.) authorized Congress to designate undeveloped, roadless areas of 5000 acres or more to be set aside as wilderness "for the use and enjoyment of the American People in such a manner as will leave them unimpaired for future use and enjoyment as wilderness." Wilderness areas are places "where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain."

At Big Bend, 538,000 acres were recommended to Congress for wilderness designation in 1978. Until congress acts upon the 1978 recommendation, in keeping with NPS Policies, the park manages recommended wilderness as though it were designated wilderness.

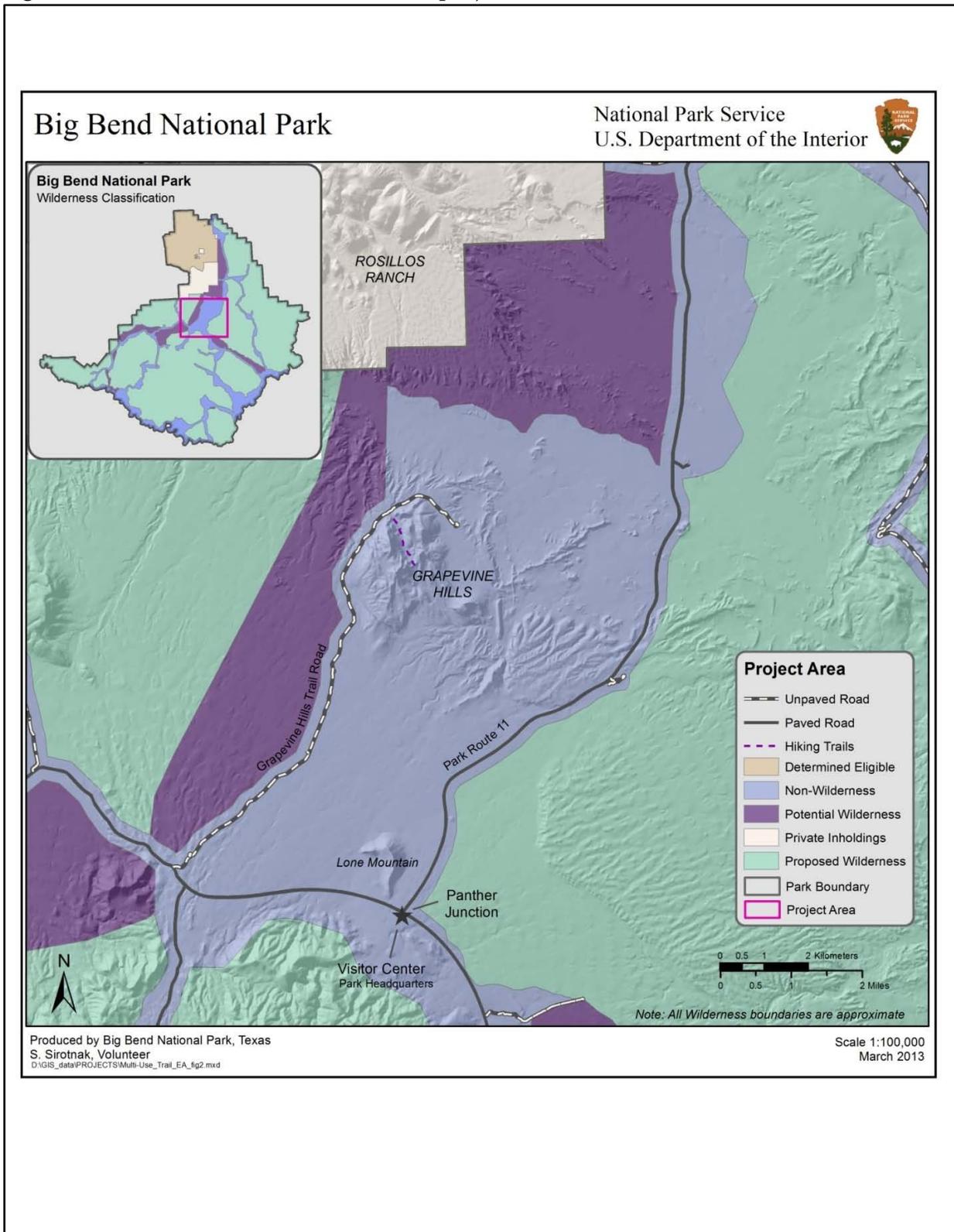
The project is in the southern portion of a tract of land between Park Route 11 and the Grapevine Hills Road, and south of upper Tornillo Creek that was not included in the 1978 Wilderness Recommendation (Figure 2). The tract is bounded on the eastern and southern sides by paved roads and on the western side by an unpaved road, along which the park's landfill is located. Immediately adjacent to the tract's southern side is Panther Junction, the park's main headquarters and employee housing area. Panther Junction contains the headquarters building, maintenance yard, office buildings, school, gas station, wastewater treatment plant, helibase, offices for park cooperators, and residences for park employees, Border Patrol agents, school teachers, and concession employees.

According to the Final Environmental Statement, Proposed Wilderness Classification, (January 1975), the non-wilderness tract between Park Route 11 and Grapevine Hills Road is "a potential source of water for Panther Junction. Test wells ...have demonstrated this potential" and inclusion "would affect in an adverse manner the park's management objective to ameliorate the human impact in the Chisos Basin by construction of substitute facilities elsewhere." Additionally, the document notes "adverse factors involving this area include a network of utility lines (aerial telephone and power) which traverse it."

These references allude to consideration being given during the 1970's to moving development out of the Chisos Basin, and compensating by placing additional campgrounds, lodging, and other visitor developments at or near Panther Junction. Utility lines have now been removed from the area, and recent park management plans do not include moving significant development from the Basin. However, the park seeks to preserve the option of developing water wells in the area and to maintain infrastructure and monitoring equipment that is located there.

Since the project area is located in a non-wilderness area, wilderness values was dismissed as an impact topic in this EA.

Figure 2. Wilderness classification near the project area.



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## Park Operations

Parks must consider the potential effects of proposed actions on park operations. Currently, periodic road maintenance is the only park operation carried out in the general vicinity of the project area. Existing road maintenance operations would not be affected by any of the alternatives. Construction of a new trail in the project area would require trail maintenance, interpretation such as waysides, updated Park maps, and development of rules for trail use. A new trail would present additional waste management responsibilities for Park staff. However, overall, these additional park operations would be minor. Therefore, park operations was dismissed as an impact topic in this EA.

## Historic Structures

As defined in NPS-28, *Cultural Resource Management Guideline* (NPS 1998), historic structures are “a constructed work... consciously created to serve some human activity.” The project area does not contain any historic structures (Alex 2008). Therefore, historic structures was dismissed as an impact topic in this EA.

## Ethnographic Resources

As defined in NPS-28, ethnographic resources may be any “site, structure, object, landscape or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it.” The Park contacted the Apache, Comanche, Blackfeet, Kickapoo-Kiowa, and Mescalero tribes by mail in Texas, Oklahoma, and New Mexico during the scoping process to determine if ethnographic resources would be affected by the project. The tribes did not respond. Archaeological surveys conducted within the project area by Park archeologist Thomas C. Alex in July 2008 did not identify any ethnographic resources. Therefore, ethnographic resources were dismissed as an impact topic in this EA.

## Cultural Landscapes

NPS-28 states that a cultural landscape is “a reflection of human adaptation and use of natural resources and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation and the types of structures that are built. The character of a cultural landscape is defined both by physical materials, such as roads, buildings, walls and vegetation, and by use reflecting cultural values and traditions.” The project area is not within a cultural landscape; therefore, this impact topic was dismissed in this EA.

## Indian Trust Resources

Indian trust resources are assets held in trust by the U.S. for Native Americans. The U.S. Department of the Interior’s (DOI) Secretarial Order 3175, *Departmental Responsibilities for Indian Trust Resources*, requires that any anticipated impacts to Indian trust resources from a proposed project or action by DOI agencies be explicitly addressed in environmental documents. The Federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the U.S. to protect tribal lands, assets, resources, and treaty rights; and it

represents a duty to carry out the mandates of Federal law with respect to American Indian and Alaska Native tribes.

There are no Indian trust resources at Big Bend National Park. Because there are no lands, assets, resources, and treaty rights within the Park held in trust by the Secretary of the Interior for the benefit of Indians, this impact topic was dismissed in this EA.

## **Museum Objects, Collections, and Archives**

Museum objects are material things possessing functional, aesthetic, cultural, symbolic, and/or scientific value, and include prehistoric and historic objects, artifacts, art, archival documents, and natural history specimens that are part of the museum collections (NPS 1998). According to NPS Director's Order 24 (DO-24), *Museum Collections*, the NPS must consider the potential for impacts on museum collections and provides further policy guidance, standards, and requirements for preserving, protecting, documenting, and providing access to, and use of NPS museum collections. The NPS would collect any artifacts found during construction of the trail and house them in the Park's museum collections storage facility. The proposed trail would have only negligible effects on the Park's museum collections; therefore, this impact topic was dismissed in this EA.

## **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. No alternative would have health or environmental effects on minorities (including American Indian tribes) or low-income populations or communities as defined in the EPA's Environmental Justice Guidance (1998). Therefore, environmental justice has been dismissed as an impact topic in this EA.

## **Prime and Unique Farmlands**

In August 1980, the CEQ directed that Federal agencies must assess the effects of their actions on farmland soils classified as prime or unique by the Natural Resource Conservation Service (NRCS), U.S. Department of Agriculture. According to the NRCS, Texas State office, there are no prime or unique farmlands in the Park; therefore, the topic of prime and unique farmland has been dismissed as an impact topic in this EA.

## **Soundscape Management**

In accordance with NPS *Management Policies 2006* and DO-47 *Sound Preservation and Noise Management*, an important component of the NPS mission is the preservation of natural soundscapes associated with NPS units. Natural soundscapes exist in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all the natural sounds that occur in NPS units, together with the physical capacity for transmitting natural sounds. The frequencies, magnitudes, and durations of human-caused sound considered acceptable varies

among NPS units as well as potentially within each NPS unit, being generally greater in developed areas and less in undeveloped areas.

The project area is located adjacent to Panther Junction between Park Routes 11 and 13 where vehicle noise can be heard. Trail construction may generate short-term human-caused sound, and if the trail were constructed, it would potentially increase human sounds associated with trail use. However, because the area is already subject to vehicle noise from the nearby Park Routes and human sounds from visitor and residential use in Panther Junction, noise generated from trail construction and use would not substantially contribute to the aggregate of human-caused sounds in the area, and effects would be negligible. Therefore, soundscape management has been dismissed as an impact topic in this EA.

### **Lightscape Management**

In accordance with NPS *Management Policies 2006*, the NPS strives to preserve natural ambient landscapes, which are natural resources and values that exist in the absence of human-caused light. The NPS limits the use of artificial outdoor lighting to only that which is necessary for basic safety requirements. No lights would be installed as part of trail construction; therefore, this impact topic was dismissed from further analysis in this EA.

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## ALTERNATIVES CONSIDERED

CEQ regulations for implementing NEPA require that Federal agencies explore and objectively evaluate all reasonable alternatives to the Preferred Alternative, and to briefly discuss the rationale for eliminating any alternatives that were not considered in detail. On July 30, 2008, an interdisciplinary team of NPS staff met to discuss the project. This meeting resulted in the definition of the project objectives and a list of alternatives that could potentially meet these objectives. This chapter describes a range of reasonable alternatives, including the No Action alternative and Preferred Alternative, and those that were considered and eliminated from further analysis.

### ALTERNATIVES ANALYZED

#### Alternative A – The No Action Alternative

CEQ regulations (40 CFR 1502.14) require the assessment of the No Action alternative in NEPA documents. The No Action alternative provides a basis for comparing the management direction and environmental consequences of the proposed action and must be considered in every EA. Under the No Action alternative, the NPS would not construct a new trail and the project area would remain in its current condition.

#### Alternative B – Construct a Multi-Use Trail

Under this alternative, a new multi-use trail for hiking and mountain biking would be constructed to provide new recreational opportunities to Park visitors at Panther Junction. To avoid user conflicts, no horses would be permitted on the trail. Designation of a mountain biking trail would require new Federal rulemaking, including publication in the Federal Register and an associated public comment period, to allow for bicycle use other than on Park roads (36CFR, section 4.30).

The trail is proposed in non-wilderness backcountry northeast of the Panther Junction Park Headquarters between Grapevine Hills Road and Route 11 (Figure 3). The trail would be constructed in two phases (Figure 3). Phase 1 would consist of approximately five miles of single-track trail beginning at a trailhead and parking lot on the north side of Park Route 13 across from the gas station/store. The trail would loop around the base of Lone Mountain for three miles and continue two miles northwest to Grapevine Hills Road. Most of the Lone Mountain loop would be designed for one-way traffic. The extensions west of Lone Mountain would be designed for two-way traffic. Phase 2 would consist of approximately five miles of single-track trail that interconnects with the Phase 1 trail near its endpoint at Grapevine Hills Road and continues southwest for one mile to a four-mile loop. A trailhead would also be located at Grapevine Hills Road with a widened strip or turnout along the road to allow for parking. The total length of the trail (Phases 1 and 2) would be approximately 10 miles. It is important to note that construction of Phase 2 will not be considered until the level of bicycle use on the Phase 1 trail demonstrates 1) the need for additional biking trails, 2) the bike trail is proving sustainable from maintenance, resource preservation, and expense perspectives, and 3) no unacceptable impacts have resulted from Phase 1 bike use.

Figure 3. Proposed trail location and alignment.

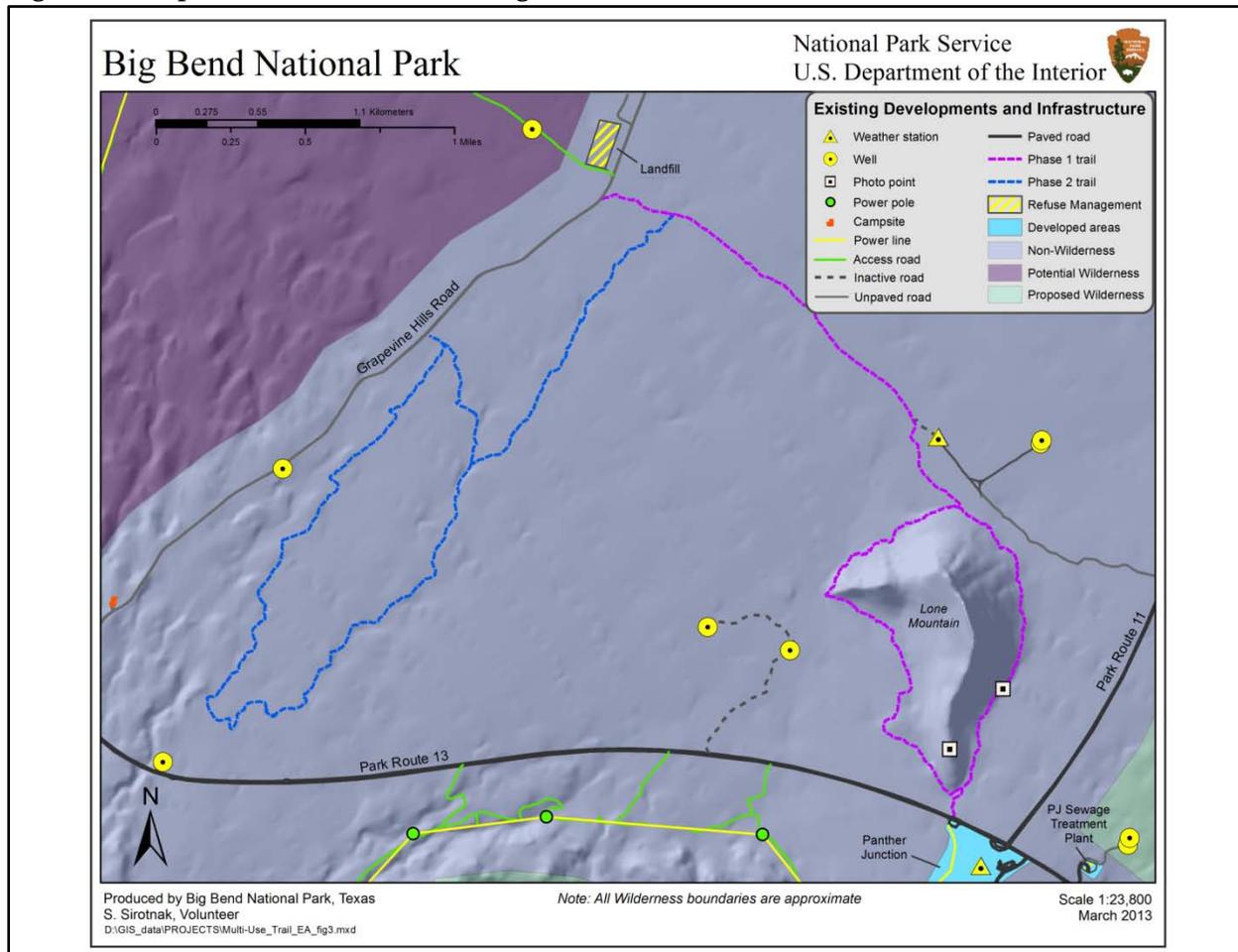


Figure 3 shows the approximate proposed alignment of the trail that was routed in the field by following natural contours of the landscape that would require minimal landscape alteration and disturbance. The trail would be unsurfaced and have an average width of 24 to 36 inches, with wider portions along curves in the route. Areas of trail constructed for two-way traffic would average 36 to 48 inches in width. Trail construction would require removal of vegetation by hand with hand tools, minor grading, and desert trail construction techniques. Charismatic flora such as yuccas would be avoided. Native materials including rock and soil would be used to control erosion. Trail construction would not require a construction staging area or material stockpile. Trail workers would require parking at the proposed trailheads for up to three NPS trucks during the day. Trail construction would occur over a one year period.

A paved parking lot allowing for 20 vehicles would be constructed at the trailhead on the north side of Park Route 13 (Figure 4). The parking lot would be about 7,500 square feet in size and have an entrance and exit at both ends to allow for recreational vehicle (RV) pull through. The parking lot would be set back 10 feet from the road. A vegetative buffer would separate the road

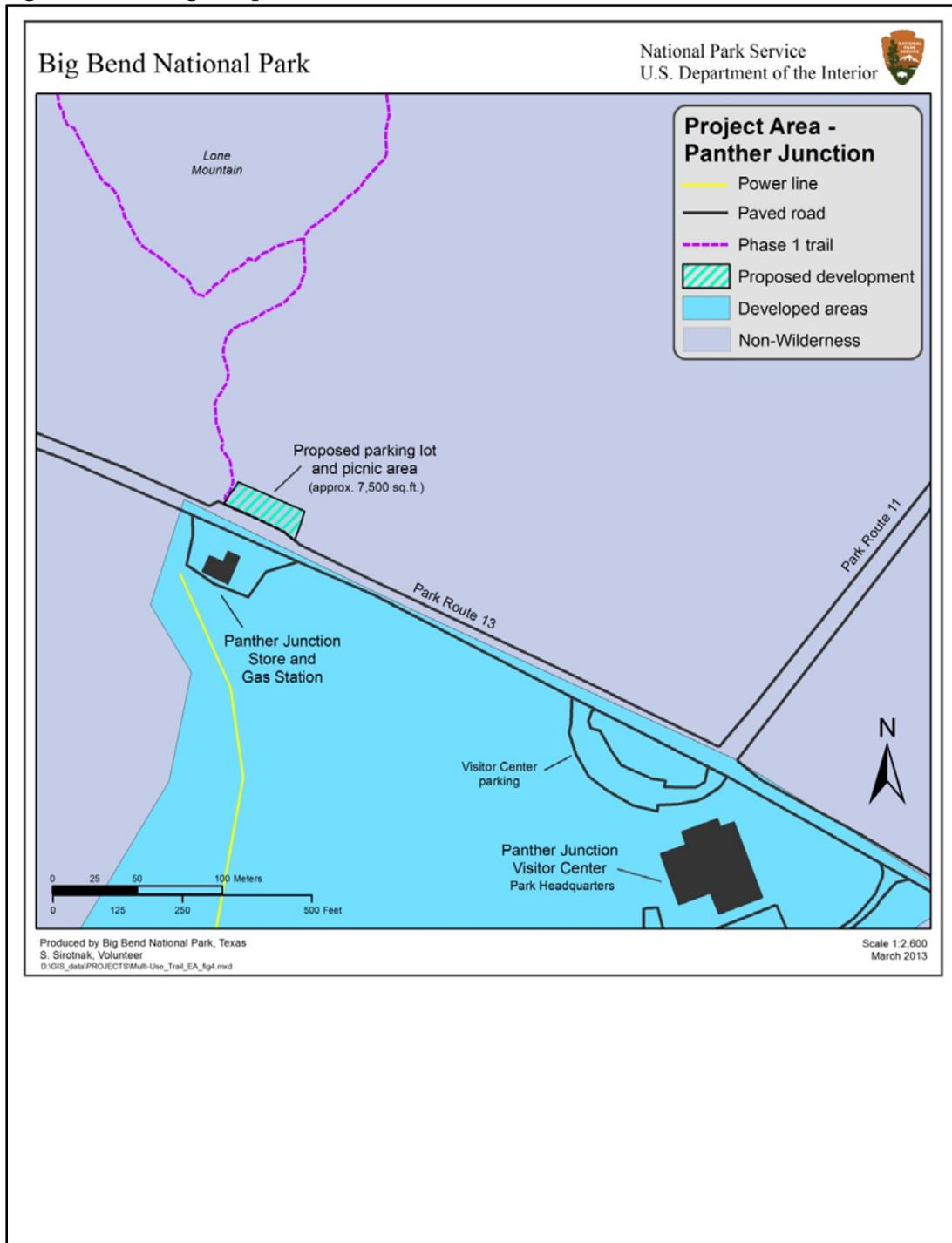
and the parking lot. Vegetation to screen the parking lot would most likely be supported on the down slope side of the parking lot. A small picnic area would be constructed at one end of the parking lot and NPS anticipates that a toilet may also be installed. The Park would consider using permeable parking lot surface treatments and implement the most feasible treatment option in light of expected longevity, maintenance, and cost considerations.

Parking lot construction would require a staging area and material stockpile that would be located on the proposed parking lot site and at the K-Bar construction staging site two miles east of Panther Junction. Parking lot construction would occur over a three month period.

In addition to the rules and recommendations listed below in Mitigation Measures, the NPS would implement the following administrative actions to protect Park resources and ensure visitor safety:

- The majority of the Lone Mountain loop (Phase 1) will be designated one-way, counter-clockwise, for bicycle use. However, the initial one-half mile, between the trailhead and the southwest side of Lone Mountain will be two-way. The flat desert section of the trail, between the northwest side of Lone Mountain and Grapevine Hills Road will be designated two-way for bicycle use. Future Phase 2 loops near Grapevine Hills Road may be designated for one- or two-way bicycle use;
- No directional restrictions for hikers are planned;
- Shaded information kiosk will be constructed at trailhead(s) to display rules, recommendations, map, and know-before-you-go information, which includes taking plenty of water, carrying first aid supplies, reporting accident information, and knowing where to find assistance, toilets, water, etc.;
- Primary signing will be displayed at the trailhead(s). Essential but minimal safety, resource, and directional signage will be posted along the trail where warranted;
- Group size limits will be imposed if warranted in the future;
- The NPS would install signs on paved Park Route 13 to alert motorists to bicyclists between the Grapevine Hills turnoff and the trailhead at Panther Junction;
- Law enforcement, interpretive, and volunteer patrols will occur;
- Trail layout and design will emphasize slow-speed bicycle use and mitigation of bicycle-related resource protection and visitor safety principles;
- The NPS will temporarily close the trail to bicycles and/or hikers when wet conditions create unacceptable rutting and erosion risk;
- Several rest/observation points with benches may be considered for installation along the trail (three along the Lone Mountain Loop – Phase 1);
- Bicycle racks will be installed at trailhead(s) and at the Panther Junction visitor center;
- A pedestrian crossing will be marked on paved Park Route 13, between the trailhead and the gas station/convenience store at Panther Junction.

Figure 4. Parking and picnic area.



### Alternative C – Construct a Hiking Trail Only

Under this alternative, a new trail would be constructed for hiking only to provide additional recreational opportunities in the Panther Junction area of the Park. Designation of a hiking trail would not require new Federal rulemaking.

The trail would have the same alignment and associated facilities as the multi-use trail described above. The only difference would be that the trail would be constructed with an average width of 18 to 24 inches. Under Alternative C, the parking lot would be the same size and configuration as for Alternative B (Figure 4).

## **ALTERNATIVES CONSIDERED BUT DISMISSED**

### **Construct Multi-Use Trail in Alternate Location**

The NPS considered constructing a single-track mountain bike trail parallel to the Old Ore Road; a 27-mile, backcountry dirt road that starts near the Rio Grande Village and travels north, winding along the western flank of the Dead Horse Mountains. The trail would have been located within a few hundred yards of the road in order to stay out of a wilderness management zone that generally parallels the road. The topography of the area would have required many road crossings along the length of the trail where the route shifted from one side of the road to the other. During initial scoping, IMBA indicated that the close proximity of the trail to the road and the numerous crossings that would subject the bicyclists to motor vehicles would present a less than desirable aesthetic experience and would not be a feasible route.

### **Construct Bicycle Use Only Trail**

During internal scoping, a recommendation was made to consider limiting activity on the proposed trail to bicycle users only. This would reduce concerns over user conflicts and safety. Non-mechanized transportation is established in the Code of Federal Regulations and NPS Policy as the fundamental off-road method of mobility in NPS backcountry. Thus Park managers wish not to exclude hiking, particularly since trail user rules and recommendations would alleviate potential visitor conflict and safety issues between the two user groups. Additionally, since restricting use of the trail to bicycles would not achieve creating a trail-based hiking opportunity near Panther Junction, one of the purposes of the project, this alternative is dismissed.

### **Construct Separate Bicycle and Hiking Trails**

Several commenters suggested separating hiking use and bicycle use, either by establishing certain days for each use, or building separate trails for each. Trail use statistics for the park and existing bicycle routes in the vicinity outside the park indicate use will not generally be intensive. Separate trails for each user group would be prohibitively expensive. The proposed trail would be professionally designed, with participation by experienced bicycle and hiking trail designers, to minimize user conflict, reduce speeds and provide adequate sight lines for all user groups. Trail etiquette rules and recommendations would be established under Alternative B to minimize user group incompatibility. Should intensity of use and concurrent user conflicts become substantial in the future, the NPS would examine the option of establishing a user schedule to separate uses on the trail. Because of expected modest use, trail design and use rules in the proposed action, and the potential to examine the option in the future if warranted, this alternative was considered but dismissed.

## Others

One commenter suggested the park create a longer bicycle route. The area proposed for the multi-use trail is constrained in that the surrounding areas are either in proposed wilderness, and thus off-limits to bicycle use; or contain higher potential for harm to sensitive resources. Should the proposal be implemented, park managers wish to evaluate long-term success of the project prior to considering similar projects in other non-wilderness zones of the park. Thus this alternative was considered but dismissed.

Several commenters suggested converting old, abandoned roads, or existing trails into bicycle routes, or creating bicycle routes parallel to existing trails. Because abandoned roads, and existing trails of any length are within designated suitable or proposed wilderness and off-limits to bicycle use, this alternative was considered but dismissed.

One commenter suggested providing a shuttle vehicle to return riders and their bicycles to their vehicles. The proposed trail route includes two trailheads, connected by public roads approximately six miles apart. This is not an excessive distance for riders to bicycle back to their vehicles, should they choose not to return via the trail, thus this alternative was considered and dismissed.

## MITIGATION MEASURES

The following mitigation measures were developed to minimize the degree and/or severity of adverse effects, and would be implemented during all activities associated with either of the action alternatives, as appropriate:

In accordance with *NPS Management Policies 2006*, the trail would be carefully situated, designed and managed to reduce conflicts with incompatible uses, allow for a satisfying park experience, allow accessibility by the greatest number of people, and protect Park resources. The NPS would implement the following Code of Federal Regulations (CFR) requirements to govern the proposed trail's use. The CFR reference is provided in parentheses:

- Trail users would adhere to one-way bicycle use designations as posted (Section 4.12);
- Bicycles may not shortcut switchbacks, and may not be used off the designated trail (Section 4.30 (a));
- Bicyclists yield to pedestrians (Section 4.20);
- No horses on designated multi-use trail (Section 1.5);
- Bicycles are allowed only on roads open to the public, and on this designated trail route (Section 4.30 (a));
- Only human-powered bicycles allowed. No motorized or power-assisted (i.e. electric) bicycles (Section 1.4 (a));
- Ride only in single file, not abreast (Section 4.30 (3));
- Use of headlight and tail reflector required when riding after dark (Section 4.30 (2)); and
- Ride at a speed and in a manner that does not endanger others (Section 4.22 (b)(1), Section 4.22 (a), and Section 2.34 (a)(4).

Additionally, the NPS would implement the following recommendations to govern the proposed trail's use:

- Always wear a helmet when cycling;
- If you wish to walk off-trail, leave bicycles adjacent to the trail;
- Ride within your ability and in a manner that is safe for yourself and others;
- Avoid riding when trail is wet. Ride through rather than around puddles;
- Alert other users when passing and meeting; and
- “Stop and lean” rather than riding off-trail when meeting others.
- The majority of the Lone Mt. loop will be designated one-way for bicycle use. Future Phase II loops near the Grapevine Hills road may be designated for one-way or two-way bicycle use.
- A shaded information kiosk will be constructed at trailhead for display of rules, recommendations, safety information, map, etc.
- The trail will be temporarily closed to bicycles and/or hikers when wet conditions create unacceptable rutting and erosion risk.
- Primary signing will be displayed at the trailheads. Essential but minimal safety, resource, and directional signage will be posted along trail where warranted.
- Group size limits will be imposed if warranted in the future.
- Law enforcement, interpretive, and volunteer patrols will occur.
- Signs will be installed on paved Park Route 13 to alert motorists to bicyclists between Grapevine Hills turnoff and trailhead at Panther Junction.
- Trail layout and design will emphasize slow-speed bicycle use, and mitigation of bicycle related resource protection and visitor safety principles.
- The above measures are intended to ensure user compatibility. Should use increase significantly during specific high-use periods, such as holidays, the NPS will consider implementing time-schedule segregation of hiker and bicycle use of the trail, assigning each to separate hours or days as warranted.
- Several rest/observation points with benches may be distributed along the Lone Mountain Loop portion of the trail.
- A pedestrian crossing will be marked on paved Park Route 13, between trailhead and Panther Junction gas station.
- The NPS would work with IMBA to implement a monitoring and maintenance plan to ensure that the design and use of the trail does not cause unacceptable environmental impacts.
- Educate trail users about the importance of staying on existing trails using techniques such as signage, literature, and interpretive walks to minimize soil compaction, surface water runoff, and erosion due to off-trail travel.
- Discourage off-trail travel by using natural barriers to travel such as prickly plants in the center of a climbing turn.
- Design the trail to enter small drainages at a right angle to the flow. Contour into larger drainages.
- Keep water from running down the trail by maintaining a slope of five to seven percent wherever feasible.
- Where needed, use water diversions to keep water off the trail including earthen and stone waterbars. In areas where water may accumulate, use causeways where logs are

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situated parallel to one another at the edge of the desired trail width, and filled with earthen material to provide a raised trail bed for foot and bike traffic to avoid water without causing trail widening.

- Ground disturbance during trail construction would be minimized to prevent the spread of exotic plant species. Disturbed areas would be planted with native vegetation.
- As part of the Park's trail inventory, the trail would receive cyclic maintenance, including repair, rehabilitation, and corrective actions to prevent erosion and to prevent resource damage.
- Charismatic flora such as yuccas would be avoided and not removed during trail construction.
- The NPS will recommend that mountain bikers remove dirt from their wheels before riding on trails to prevent the spread of exotic species. Wayside signs would be installed at both trailheads informing visitors.
- To avoid impacts to archeological resources, the final trail alignment would be designed in consultation with the Park's Archeologist to avoid all archeological features, and all ground-disturbing construction activities would be monitored by an NPS archeologist.
- Should construction unearth previously undiscovered cultural resources, work would stop in the area of discovery and the NPS would consult with the State Historic Preservation Officer and the Advisory Council on Historic Preservation, as necessary, according to 36 CFR 800.13, *Post Review Discoveries*.
- To reduce visitor impacts to the National Register-eligible cultural site at Lone Mountain, the NPS would develop accurate maps for the site along with a narrative description and a complete photographic record of features and structures. The NPS will also document and monitor the site on a cyclical basis for change or visitor-related degradation.
- If human remains are found, the NPS must consult American Indian tribes as required by the Native American Graves Protection and Repatriation Act.
- Should construction unearth previously undiscovered paleontological resources, work would stop in the area of discovery and the Trails Supervisor would consult the Park Archeologist and Geologist. The Park's Science and Resource Management Division would determine the appropriate treatment of paleontological resources, in accordance with *NPS Management Policies 2006*.

## ALTERNATIVE SUMMARIES

Table 1 summarizes the key components of the action and No Action alternatives, and it compares the ability of these alternatives to meet the project objectives, which are identified in the “Purpose and Need” chapter of this EA. As shown in Table 1, Alternative B meets each of the objectives identified for this project, while Alternative A does not meet any of the objectives, and Alternative C only meets one of the two main project objectives.

**Table 1. Alternatives Summary and Extent to which Each Alternative Meets Project Objectives.**

Alternative A No Action Alternative	Alternative B Multi-Use Trail	Alternative C Hiking Only Trail
A trail would not be constructed and the project area would remain in its current condition.	A new 10-mile-long multi-use trail for hiking and mountain biking would be constructed in non-wilderness backcountry.	A new 10-mile-long trail for hiking only would be constructed in non-wilderness backcountry.
Meets Project Objectives?	Meets Project Objectives?	Meets Project Objectives?
No. Continuing existing conditions without the construction of a trail would not meet the objective of creating new recreational opportunities, identifying mountain biking opportunities in the Park, or providing trail-based hiking in vicinity of Panther Junction.	Yes. This alternative meets all the proposal objectives. A new multi-use trail would create new recreational opportunities for Park visitors including hikers and mountain bikers at Panther Junction. It also allows for mountain biking in an area of the Park that is not within Recommended Wilderness and is consistent with the protection of the Park’s resources.	Partially. This alternative meets one of the proposal objectives by creating a new recreational opportunity in the Park. There are currently no designated hiking trails near Panther Junction. Although there are designated hiking trails in other areas of the Park, this alternative would provide a new recreational opportunity for Park visitors near Panther Junction.

Table 2 summarizes and compares the potential environmental impacts of each alternative. Only those impact topics that have been carried forward for further analysis are included in this table. The “Environmental Consequences” section of this EA provides a more detailed discussion of these impacts.

**Table 2. Environmental Impact Summary and Comparison of Impacts.**

Impact Topic	Alternative A No Action Alternative	Alternative B Multi-Use Trail	Alternative C Hiking Only Trail
Soils	No impacts on soils.	Construction activities and trail use would result in long-term, minor, localized, adverse impacts on soils from ground disturbance, compaction, erosion, and alteration of soil surface. The thin gravel and cobble veneer protecting the erodible soils below would be removed increasing	Construction activities and trail use would result in long-term, minor, localized, adverse impacts on soils from ground disturbance, compaction, erosion, and alteration of soil surface. The thin gravel and cobble veneer protecting the erodible soils below would be removed, increasing

		erosion by wind and water.	erosion by wind and water. Ground disturbance from trail construction would be slightly less than Alternative B.
<b>Water Resources</b>	No impacts on water resources.	Construction activities and trail use would result in long-term, negligible to minor, localized, adverse impacts on water resources from increased impervious surface and storm water runoff, concentration of runoff on trail, and redirection of natural surface flows.	Construction activities and trail use would result in long-term, negligible to minor, localized, adverse impacts on water resources from increased impervious surface and storm water runoff, concentration of runoff on trail, and redirection of natural surface flows. Storm water runoff and concentration and redirection of flows would be slightly less than Alternative B.
<b>Floodplains</b>	No impacts on floodplains.	Construction activities and trail use would result in long-term, negligible, localized, adverse impacts on floodplains from increased storm water runoff and potential risk to trail users from flash floods. Increased runoff would not contribute to flooding.	Construction activities and trail use would result in long-term, negligible, localized, adverse impacts on floodplains from increased storm water runoff and potential risk to trail users from flash floods. Increased runoff would not contribute to flooding. Storm water runoff and flood hazard risks would be slightly less than Alternative B.
<b>Vegetation</b>	No impacts on vegetation.	Construction activities and trail use would result in long-term, minor, localized adverse impacts on vegetation from permanent vegetation removal and increased potential for spread of exotics.	Construction activities and trail use would result in long-term, minor, localized adverse impacts on vegetation from permanent vegetation removal and increased potential for spread of exotics. Vegetation removal and the potential for spread of exotics would be

			slightly less than Alternative B.
<b>Visitor Use and Experience/Recreation</b>	Long-term, minor, adverse impacts on visitor use and experience/recreation at Panther Junction from reduced visitor access to the backcountry, preclusion of mountain bikers from the backcountry, and absence of the only recreational trail and picnic area at Panther Junction.	Alternative B would result in long-term, moderate, beneficial impacts on visitor use and experience/recreation at Panther Junction from increased opportunities for hiking and biking, backcountry access, and picnicking.	Alternative C would result in long-term, moderate, beneficial impacts on visitor use and experience/recreation at Panther Junction from increased opportunities for hiking, backcountry access, and picnicking.
<b>Visitor Safety</b>	No impacts on visitor safety.	Alternative B would result in long-term, minor, adverse impacts on visitor safety from potential conflicts between hikers and bikers, risk of heat exhaustion, accidents, and injuries.	Alternative C would result in long-term, minor, adverse impacts on visitor safety from risk of heat exhaustion, accidents, and injuries.
<b>Archeological Resources</b>	No impacts on archeological resources.	Alternative B would result in long-term, minor, adverse impacts on archeological resources from construction and maintenance of Phase 1 of the trail in the Lone Mountain area and off-trail use.	Alternative C would result in long-term, minor, adverse impacts on archeological resources from construction and maintenance of Phase 1 of the trail in the Lone Mountain area and off-trail use.
<b>Socioeconomics</b>	No impacts on existing socioeconomic conditions.	Alternative B would result in short- and long-term, minor, beneficial impacts on local socioeconomic conditions from increased Park visitation, visitor spending, employment, and income.	Alternative C would result in short- and long-term, minor, beneficial impacts on local socioeconomic conditions from increased Park visitation, visitor spending, employment, and income.

## IDENTIFICATION OF THE ENVIRONMENTALLY PREFERRED ALTERNATIVE

In accordance with DO-12, the NPS is required to identify the “environmentally preferred alternative” in all environmental documents, including EAs. The environmentally preferred alternative is determined by applying the criteria suggested in NEPA, which is guided by the CEQ. As stated in Section 2.7D of the DO-12 Handbook for Environmental Impact Analysis, “The environmentally preferred alternative is the alternative that will best promote the national environmental policy expressed in NEPA (Section 101(b)).” This includes alternatives that:

1. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
2. Assure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings;
3. Attain the widest range of beneficial uses of the environment without degradation, risk to health and safety, or other undesirable and unintended consequences;
4. Preserve important historic, cultural, and natural aspects of our national heritage, and maintain wherever possible, an environment which supports diversity and variety of individual choice;
5. Achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life’s amenities; and
6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources (NEPA, 42 USC 4321-4347).

In sum, the environmentally-preferred alternative is the alternative that not only results in the least damage to the biological and physical environment, but that best protects, preserves, and enhances historic, cultural, and natural resources.

The No Action alternative (Alternative A) is not the environmentally preferred alternative because it does not meet as many of the above goals as Alternatives B and C. Maintaining existing conditions in the project area would not attain as wide a range of beneficial recreational uses of the environment and thus would not provide for as many options for public enjoyment of the project area’s resources as would alternatives B and C.

Alternative B, the proposal to construct a multi-use trail in the project area, is the environmentally preferred alternative because it meets the largest number of the above goals. The multi-use trail would contribute to safe, healthful, and productive recreational activities in esthetically and culturally pleasing surroundings. The trail would offer a diverse range of beneficial uses for Park users, including hiking and biking in the Panther Junction area while minimizing environmental impacts to the greatest extent possible. Because new trail construction would follow sustainable design standards, it would be used by future generations for the enjoyment of Park resources. Overall, it would achieve the best balance between public enjoyment of resources and protection of those resources.

Alternative C, the proposal to construct a hiking only trail in the project area is not the environmentally preferred alternative because it does not meet as many goals as Alternative B. A hiking-only trail would not offer Park visitors as much diversity, backcountry accessibility, or range of beneficial uses as the multi-use trail.

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# ENVIRONMENTAL CONSEQUENCES

This section of the EA analyzes the potential environmental consequences or impacts that would occur as a result of implementation of the alternatives. Impact topics analyzed for this project have been identified on the basis of Federal laws and regulations, NPS Director's Orders, NPS *Management Policies 2006*, and NPS resource specialists' knowledge of resources at the Park. A detailed discussion of the potential impacts of each alternative on the impact topics is provided below.

## METHODOLOGY

NEPA requires consideration of context, intensity, and duration of impacts, direct or indirect impacts, cumulative impacts, and measures to mitigate for impacts. NPS policy also requires that "impairment" of resources be evaluated in all environmental documents.

Potential impacts are described in terms of type (are the effects beneficial or adverse?), context (are the effects site-specific, local, or even regional?), duration (are the effects short-term, lasting less than one year, or long-term, lasting more than one year?), timing (is the project seasonally timed to avoid adverse effects), and intensity (are the effects negligible, minor, moderate, or major). Because definitions of intensity (negligible, minor, moderate, or major) vary by impact topic, intensity definitions are provided separately for each impact topic analyzed in this EA.

## CUMULATIVE EFFECTS

CEQ regulations (40 CFR 1508.7) require the assessment of cumulative impacts in the decision-making process for Federal projects. A cumulative impact is an impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of which agency (Federal or non-Federal), organization, or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

Cumulative impacts are considered for all alternatives and are presented at the end of each impact topic discussion analysis. To determine potential cumulative impacts, projects in the vicinity of the proposed project site were identified. Potential projects identified as cumulative actions included any planning or development activity that was currently being implemented or that would be implemented in the reasonably foreseeable future.

These cumulative actions are evaluated in the cumulative impact analysis in conjunction with the impacts of each alternative to determine if they would have any additive effects on natural resources, cultural resources, visitor use, or the socioeconomic environment. Because some of these cumulative actions are in the early planning stages, the evaluation of cumulative effects was based on a general description of the project. Known past, present, and reasonably foreseeable future projects and actions in the vicinity of the project site are described below.

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## Past and Present Projects and Actions

The proposed project area is located northwest of the Panther Junction visitor center and north of the gas station and store (Figure 3). The Panther Junction complex is near the center of the Park, at the junction of TX 118 (Park Route 13) and US 385 (Park Route 11), comprising over 100 acres of development. Panther Junction serves as the park headquarters and houses the majority of National Park Service (NPS) employees, U.S. Customs and Border Protection staff, San Vicente ISD school staff, Forever Resorts staff, and U.S. Postal Service staff. The site was selected as park headquarters in 1948, four years after the park was officially established. Panther Junction was initially developed in the 1950s and early 1960s. Additional buildings and structures were built between 1980 and 2010 to support park operations.

The maintenance building at Panther Junction was constructed in 1950. The first residences in the Panther Junction complex were constructed in 1951, followed with the school being completed in 1952.

The Panther Junction visitor center and administration building, completed in 1963, is a modern style building designed to accommodate visitors and staff. The visitor center is sited in a conspicuous location along Park Route 13 to be viewed in a position of prominence as visitors approach this area of the park. In 2005, the visitor lobby of the building was expanded for bookstore space. In 2013, additional expansions occurred for the bookstore and the Park's 40-seat auditorium for showing on-demand orientation films and other group activities. A semicircular visitor parking lot at the visitor center and a gas station, built in 1958, approximately 0.25 miles west of the visitor center, comprise the visitor amenities and convenience use area.

A new water storage tank was constructed for Panther Junction in 2006 to expand water storage capacity for projected growth in staff and facilities at Panther Junction. A new Science and Resource Management building was constructed in Panther Junction in 2008. In 2009, Forever Resort concession housing, Park fire dorm, and two Park quad-plexes were built. In 2010, four U.S. Customs and Border Protection houses were built in the residential area of Panther Junction.

Within the project area, the Grapevine Hills road was developed as a ranch road prior to Park establishment (Figure 3). This road is maintained by Park staff to provide visitor access to the popular Grapevine Hills area. Along this road is the Park landfill which was modernized in the 1990s with an electric chainlink fence to prevent wildlife access. The landfill encompasses over 2 acres and is actively managed on a weekly basis with heavy motorized machinery. Multiple water wells were drilled in the project area during the development phase of the Panther Junction complex. These wells are currently used as observation wells, monitored by Park staff. North of Lone Mountain, a ranch road was established prior to Park establishment that connected with Grapevine Hills road and Route 11. This road area has been used by Park staff to monitor air quality and weather since the early 1990s. The road is currently maintained as an administrative access road for continuing the monitoring of two observation wells and air resources. West of Lone Mountain, Park staff currently walk the old access road to two observation wells to monitor water levels.

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## Future Projects and Actions

The NPS proposes to construct new housing, operations, and recreation facilities in the Park. At Panther Junction, new construction would potentially include a duplex for Big Bend Natural History Association staff, storage building for Science and Resource Management staff and equipment, expansion of gas station and convenience store, law enforcement complex, and housing complex. The proposed construction would implement Big Bend National Park GMP objectives and needs.

Additionally, the Park continues to consider the non-wilderness backcountry around Lone Mountain as a potential future location for the development of additional drinking water resources. Continuing drought conditions, changing weather patterns, and climate change necessitates this Park management direction.

## SOILS

### Affected Environment

The soils in Big Bend National Park occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. The NRCS has delineated soil survey maps and depicted soil map units for the project area.

There are three soil map units within the project area and they include CLC – Chilicotol very gravelly fine sandy loam, undulating; CMD – Chilicotol – Monerosa association, rolling; and LAE – Lajitas – Rock outcrop complex, hilly (NRCS 1985). The Chilicotol soil map unit is the dominant soil in the project area, followed by the Chilicotol – Monerosa association, and the Lajitas – Rock outcrop complex represents a small portion of the study area.

The Chilicotol soils are located on the eastern and northern flats from Lone Mountain and are a deep, very gravelly soil on dissected piedmont slopes. The Chilicotol soils are well drained, moderately permeable, and have medium surface runoff. Slopes are predominately one to six percent. Wind and water erosion are only slight hazards because of the gravel and cobbles on the surface (NRCS 1985). While the Chilicotol soils are used for recreation, the recreational development is considered severe for all categories (camping, picnicking, playgrounds, and paths and trails) due to small stones (NRCS 1985). The Phase 1 portion of the trail lies primarily in the Chilicotol soil type, except the southern portion of trail circling Lone Mountain.

The Chilicotol – Monerosa association soils are located on the rolling uplands/flats to the west and south of Lone Mountain and consist of deep to shallow, very gravelly and cobbly soils. The Chilicotol – Monerosa association soils are well drained, moderately permeable, and have medium surface runoff. Slopes are generally five to 15 percent, but these areas are incised with frequent drainageways that have side slopes of eight to 20 percent and as much as 40 percent. Wind and water erosion are only slight hazards because of the gravel and cobbles on the surface.

While the Chilicotol – Monerosa association soils are used for recreation, the recreational development is considered severe for all categories (camping, picnicking, playgrounds, and paths and trails) due to small stones and the steep slopes prohibit leveling areas for playgrounds

(NRCS 1985). The Phase 2 portion of the trail lies primarily in the Chilicotal – Monterosa association soil type.

The Lajitas – Rock outcrop complex includes the steep slopes associated with Lone Mountain and consists of very shallow to shallow, very cobbly and very gravelly soils. The Lajitas soils typically dominate the soil map units, but this unit has a high percentage of rock outcroppings. The Lajitas soils are well drained and moderately permeable. Wind and water erosion are only slight hazards because of the gravel and cobbles. The Rock outcrop component of this soil type consists mainly of igneous rocks, which are mostly rhyolite.

The Lajitas soils are used for recreation although recreational development is considered severe for all categories (camping, picnicking, playgrounds, and paths and trails) due to slopes, large stones, and depth to rock (NRCS 1985). The proposed trail circles Lone Mountain and would reside on the lower edge of this soil type, crossing only small portions of this soil.

## Intensity Level Definitions

The methodology used for assessing impacts to soils is based on how the No Action Alternative and the two action alternatives would affect soil resources in the project area. The thresholds of change for the intensity of an impact on soils are defined as follows:

- Negligible:** Soils would not be affected or the effects on soils would be below or at the lower levels of detection. Any effects to soils would be slight.
- Minor:** The effects on soils would be detectable. Effects on soil area would be small. Mitigation may be needed to offset adverse effects and would be relatively simple to implement and likely be successful.
- Moderate:** The effects on soils would be readily apparent and result in a change to the soil character over a relatively wide area. Mitigation measures would be necessary to offset adverse effects and likely be successful.
- Major:** The effects on soils would be readily apparent and substantially change the character of the soils over a large area in and out of the Park. Mitigation measures to offset adverse effects would be needed, extensive, and their success could not be guaranteed.

The thresholds of change for the duration of an impact on soils are defined as follows:

- Short-term:** Recovers in less than three years.
- Long-term:** Takes more than three years to recover.

## Regulations and Policies

Current laws and policies require that the following conditions be achieved for soils in the Park:

Desired Condition	Source
The NPS will actively seek to understand and preserve the soil resources of parks, and to prevent, to the extent possible, the unnatural erosion, physical removal, or contamination of the soil, or its contamination of other resources.	NPS <i>Management Policies 2006</i>
Management action will be taken by superintendents to prevent or at least minimize adverse, potentially irreversible impacts on soils. Soil conservation and soil amendment practices may be implemented to reduce impacts. Importation of off-site soil or soil amendments may be used to restore damaged sites. Off-site soil normally will be salvaged soil, not soil removed from pristine sites, unless the use of pristine site soil can be achieved without causing any overall ecosystem impairment. Before using any off-site materials, parks must develop a prescription, and select the materials that will be needed to restore the physical, chemical, and biological characteristics of original native soils without introducing any exotic species.	NPS <i>Management Policies 2006</i>
When soil excavation is an unavoidable part of an approved facility development project, the NPS will minimize soil excavation, erosion, and off-site soil mitigation during and after the development activity.	NPS <i>Management Policies 2006</i>
When use of a soil fertilizer or other soil amendment is an unavoidable part of restoring a natural landscape or maintaining an altered plant community, the use will be guided by a written prescription. The prescription will be designed to ensure that such use of soil fertilizer or soil amendment does not unacceptably alter the physical, chemical, or biological characteristics of the soil, biological community, or surface or ground waters.	NPS <i>Management Policies 2006</i>

### Impacts of Alternative A (No Action Alternative)

Under the No Action Alternative, the NPS would not construct a new trail. Therefore, soils within the project area would not be impacted and current conditions would remain.

### Cumulative Effects

The No Action Alternative would not contribute to cumulative impacts on soils.

### Conclusion

The No Action Alternative would not result in any impacts on soils. In addition, no unacceptable impacts or impairment of the Park's soil resources would occur under this alternative.

### Impacts of Alternative B (Multi-Use Trail)

Under Alternative B, the NPS would construct a multi-use trail that would be used by hikers and mountain bikers. Trail construction activities would permanently alter the soil surface along the trail from removal of vegetation and the gravel and cobble veneer that protects the erodible soils

beneath. Alternative B would increase the potential for soil erosion by wind and water. Construction of the parking lot would require minor grading and pavement over top of soil causing long-term alteration of the soil surface. Trail and associated facility construction would likely result in long-term, minor adverse impacts on soils. Use of the trail would cause soil erosion and compaction resulting in long-term, minor, adverse impacts on soils.

Soil disturbance during trail construction would occur from vegetation clearing and minor surface grading. The estimated permanent ground disturbance required for one-way and two-way traffic trail construction is shown in Table 3. The trail would actually be constructed with a combination of one-way and two-way traffic widths depending on the topography of the area; therefore, the two-way traffic total represents the upper limit of ground disturbance or worst case disturbance scenario.

**Table 3. Estimated Permanent Ground Disturbance for Trail Construction.**

	Length of trail	One-way traffic (36"-wide trail)	Two-way traffic (48"-wide trail)
Phase 1	4.75 miles	1.73 acres	2.30 acres
Phase 2	5.12 miles	1.86 acres	2.48 acres
<b>Totals</b>	<b>9.87 miles</b>	<b>3.59 acres</b>	<b>4.78 acres</b>

The construction of the trail would expose soils which are vulnerable to erosion during rainfall and can become suspended in surface water runoff contributing sediment to downstream waters. However, the trail would be designed along natural contours and with dips to prevent runoff flows from concentrating, to minimize soil erosion and sediment runoff.

Trail use by hikers and mountain bikers would cause soil erosion and compaction. Soil erosion and compaction could also occur on areas adjacent to the trail due to off-trail use by hikers and mountain bikers. To minimize these effects, desert trail design and construction techniques would be used as well as various techniques to discourage off-trail use such as informative signs and visitor literature. Specific mitigation measures are provided in this EA under Alternatives Considered. Additionally, the NPS would temporarily close the trail to bicycles and/or hikers when wet conditions create unacceptable risks for rutting and erosion.

General widening of the trail depending on tread surface and vegetation would likely occur from use over time. Estimates of ground disturbance impacts after one year of use are shown in Table 4 for one-way and two-way trail traffic. Again, the trail would actually be constructed with a combination of one-way and two-way traffic widths depending on the topography of the area; therefore, the two-way traffic total represents the upper limit of ground disturbance or worst case disturbance scenario from use.

**Table 4. Estimated Increase in Ground Disturbance After One Year of Use.**

	Length of trail	One-way traffic. Increased disturbance of 4 to 12 inches	Two-way traffic. Increased disturbance of 6 to 24 inches
Phase 1	4.75 miles	0.19 to 0.58 acres	0.29 to 1.15 acres
Phase 2	5.12 miles	0.21 to 0.62 acres	0.31 to 1.24 acres
<b>Totals</b>	<b>9.87 miles</b>	<b>0.40 to 1.20 acres</b>	<b>0.60 to 2.39 acres</b>

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## Cumulative Effects

Past and present projects affecting soils have included the construction of the NPS-owned landfill near Lone Mountain and the new Science and Resource Management Building at Panther Junction. Future projects affecting soils include new construction proposed at Panther Junction. These new and expanded developments would have adverse impacts on soils from ground disturbance and compaction during construction, and increases in impervious surfaces and subsequent increases in surface water runoff and erosion potential. Overall, the cumulative effects of past, present, and future projects on soils in Panther Junction would be minor, localized, and adverse over the short- and long-term. Alternative B would contribute to short- and long-term adverse impacts on soils; however, contribution would be minor overall and would not change the intensity level of cumulative effects.

## Conclusion

Alternative B would result in minor, long-term, adverse impacts on soils from trail construction, associated facility construction, and trail use. Cumulative impacts on soils from Alternative B in conjunction with past, present, and future projects would be minor, localized, and adverse over the short- and long-term. Alternative B would not impair the Park's soil resources and would not result in unacceptable impacts.

## Impacts of Alternative C (Hiking Only Trail)

Under Alternative C, the NPS would construct a hiking only trail that would be strictly limited to hikers. No directional restrictions for hikers are planned. The trail would be 24 inches wide for its entire length and would not require widths of 36 inches for two-way traffic (Table 3). Impacts from Alternative C would be similar to Alternative B; however, the total area of ground disturbance from trail construction would be less resulting in a decrease in soil impacts from vegetation clearing and minor surface grading. Impacts from trail use would not differ. The NPS would temporarily close the trail to hikers when wet conditions create unacceptable risks for rutting and erosion. Overall, impacts to soils would be long-term and minor.

## Cumulative Effects

Past and present projects affecting soils have included the construction of the new Science and Resource Management Building at Panther Junction. Future projects affecting soils include new construction proposed at Panther Junction. These new and expanded developments would have adverse impacts on soils from ground disturbance and compaction during construction and increases in impervious surfaces and subsequent increases in surface water runoff and erosion potential. Overall, the cumulative effects of past, present, and future projects on soils in Panther Junction would be minor, localized, and adverse over the short- and long-term. Alternative C would contribute to short- and long-term adverse impacts on soils; however, contribution would be minor overall and would not change the intensity level of cumulative effects.

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## Conclusion

Alternative C would result in minor, long-term, adverse impacts on soils from trail construction, associated facility construction, and trail use. Cumulative impacts on soils from Alternative C in conjunction with past, present, and future projects would be minor, localized, and adverse over the short- and long-term. Alternative C would not impair the Park's soil resources and would not result in unacceptable impacts.

## WATER RESOURCES

### Affected Environment

The average annual precipitation at the Park ranges from 10 inches on the valley floor to 16 inches in the Chisos Mountains. The rainy season extends from mid-June to October with locally heavy thunderstorms and some flash flooding, however, the water recedes rapidly. The month of August typically receives the most precipitation at 2.35 inches and the month of March typically receives the least precipitation at 0.31 inches. This presence or absence of water (primarily rainfall) affects every aspect of the Park. The rain sculpts the landscape, controls vegetation and wildlife, affects visitor use, and places severe restrictions on development.

There are no perennial surface waters in the vicinity of the proposed trail; however, there are numerous intermittent drainages or washes which support flow only in response to rainfall. The two main drainages in the project area are Green Gulch and Avery Canyon which flow generally from the southwest to the northeast. No base flow exists in these drainages between runoff periods. The Green Gulch drainage begins at Panther Pass to the south of the project area and gathers surface water runoff from the Chisos Mountains to the south, east, and west. The Avery Canyon drainage picks up surface water runoff from Panther Canyon and Mouse Canyon and other smaller drainages from the Chisos Mountains to the south. The slope of the project area ranges from approximately two to five percent, with steeper slopes in some of the drainage channels. The NRCS (1985) considers water erosion to be a slight hazard due to the soil type, presence of surface gravel and cobbles, and gentle slopes.

### Intensity Level Definitions

The thresholds of change for the intensity of an impact on water resources are defined as follows:

**Negligible:** Neither water quality nor hydrology would be affected, or changes would be either non-detectable or if detected, would have effects that would be considered slight, local, and short-term.

**Minor:** Changes in water quality or hydrology would be measurable, although the changes would be small, likely short-term, and the effects would be localized. No mitigation measure associated with water quality or hydrology would be necessary.

**Moderate:** Changes in water quality or hydrology would be measurable and long-term but would be relatively local. Mitigation measures associated with water quality or hydrology would be necessary and the measures would likely succeed.

**Major:** Changes in water quality or hydrology would be readily measurable, would have substantial consequences, and would be noticed on a regional scale. Mitigation measures would be necessary and their success would not be guaranteed.

The thresholds of change for the duration of an impact on water resources are defined as follows:

**Short-term:** Recovery will take less than one year.

**Long-term:** Recovery will take longer than one year.

## Regulations and Policies

Current laws and policies require that the following conditions be achieved for water resources in the Park:

Desired Condition	Source
NPS will avoid, whenever possible, the pollution of park waters by human activities occurring within and outside the parks.	NPS <i>Management Policies 2006</i>
NPS will take all the necessary actions to maintain or restore the quality of surface waters and groundwaters within the parks consistent with the CWA and all other applicable federal, state, and local laws and regulations.	Clean Water Act (CWA); Executive Order (EO) 11514; NPS <i>Management Policies 2006</i>
NPS will work with appropriate government bodies to obtain the highest possible standards available under the CWA for the protection of park waters.	CWA; EO 12088; Rivers and Harbors Act; NPS <i>Management Policies 2006</i>
NPS will manage streams to protect stream processes including flooding, stream migration, and associated erosion and deposition.	NPS <i>Management Policies 2006</i>

## Impacts of Alternative A (No Action Alternative)

Under the No Action Alternative, the NPS would not construct a new trail. Therefore, water resources within the project area would not be impacted and current conditions would remain.

## Cumulative Effects

The No Action Alternative would not contribute to cumulative impacts on water resources.

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## Conclusion

The No Action Alternative would not result in any impacts on water resources. In addition, no unacceptable impacts or impairment of the Park's water resources would occur under this alternative.

## Impacts of Alternative B (Multi-Use Trail)

Under Alternative B, the NPS would construct a multi-use trail that would be used by hikers and mountain bikers. Trail and associated facility construction activities and use could result in long-term, negligible to minor, localized adverse effects on water resources due to increased potential for storm water runoff, concentration of storm water runoff on the trail, and redirection of natural surface flows.

Construction of the parking lot would require minor grading and pavement of approximately 7,500 square feet of a currently undeveloped area. Paving the parking lot with an impermeable surface treatment would make it impervious to rainwater infiltration and result in an increase in storm water runoff.

Vegetation removal for trail construction and compaction of soils from trail use would increase runoff along the trail during storm events. Estimates of ground disturbance from trail construction and use are provided in Tables 3 and 4, Soils section. The trail also has the potential to capture and concentrate runoff at wash crossings causing erosion gullies to form and redirecting flows. Of particular concern are the trail crossings of Avery Canyon and Green Gulch. These washes only flow in response to rainfall but can have considerable flows during major storm events. Flows have the potential to cause washouts of the trail and to concentrate along the trail causing trail erosion. To minimize these impacts, mitigation measures would be implemented as detailed under Alternatives Considered. Additionally, the NPS would temporarily close the trail to bicycles and/or hikers when wet conditions create unacceptable risks for rutting and erosion.

The construction of the trail would expose erodible soils which are vulnerable to erosion during rainfall and can become suspended in surface water runoff contributing sediment to downstream waters. However, the natural hydrology of the Park is defined by local heavy thunderstorms causing rapid runoff and flash-flooding, which erodes and deposits sediments in washes that are dry between storm events. Any increase in sediments would be negligible compared to baseline amounts.

## Cumulative Effects

The Panther Junction area is drained by intermittent streams or washes which support flow only in response to rainfall. Construction of new and expanded facilities proposed in Panther Junction would avoid directly impacting these drainages. However, these developments would result in increased potential for storm water runoff and redirection of natural surface flows during storm events. Overall, the cumulative effects of past, present, and future projects on

water resources in Panther Junction would be minor, localized, and adverse over the long-term. Alternative B would contribute to long-term adverse impacts on water resources; however, contribution would be minor overall and would not change the intensity level of cumulative effects.

## Conclusion

Trail construction activities and use could result in long-term, negligible to minor, localized adverse effects on water resources due to increased potential for storm water runoff, concentration of storm water runoff on the trail, and redirection of natural surface flows. Cumulative effects on water resources in Panther Junction from Alternative B in conjunction with past, present, and future projects would be minor, localized, and adverse over the long-term. Alternative B would not impair the Park's water resources and would not result in unacceptable impacts.

## Impacts of Alternative C (Hiking Only Trail)

Under Alternative C, the NPS would construct a hiking only trail that would be strictly limited to hikers. Impacts from Alternative C would be similar to Alternative B; however, the total area of ground disturbance from trail construction and use would be less resulting in a slight decrease in impacts from increased storm water runoff, redirection of flows, and erosion. The NPS would temporarily close the trail to hikers when wet conditions create unacceptable risks for rutting and erosion. Overall, adverse impacts to water resources from implementation of Alternative C would still be long-term, negligible to minor, and localized.

## Cumulative Effects

The developed areas of Panther Junction are drained by intermittent streams or washes which support flow only in response to rainfall. Construction of new and expanded facilities proposed in Panther Junction would avoid directly impacting these drainages. However, these developments would result in increased potential for storm water runoff and redirection of natural surface flows during storm events. Overall, the cumulative effects of past, present, and future projects on water resources in Panther Junction would be minor, localized, and adverse over the long-term. Alternative C would contribute to long-term adverse impacts on water resources; however, contribution would be minor overall and would not change the intensity level of cumulative effects.

## Conclusion

Trail construction activities and use could result in long-term, negligible to minor, localized adverse effects on water resources due to increased potential for storm water runoff, concentration of storm water runoff on the trail, and redirection of natural surface flows. Cumulative effects on water resources in Panther Junction from Alternative C in conjunction with past, present, and future projects would be minor, localized, and adverse over the long-term. Alternative C would not impair the Park's water resources and would not result in unacceptable impacts.

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## FLOODPLAINS

### Affected Environment

The trail crosses the Green Gulch and Avery Canyon washes. Both of these drainages have upper canyons to the south of the project area that are steep with a large proportion of exposed bedrock, which increases the capability for high runoff. The lower canyons of these drainages have a gentle slope where thick deposits of alluvium have accumulated. These drainages are intermittent streams which flow only in response to rainfall. No base flow exists between runoff periods. Due to the physical characteristics of these watersheds and intense thunderstorm events, there is the potential for flash floods. The Panther Junction area is considered flash flood prone (NPS 2004).

Flood events may result in bank loss from erosion, inundation from floodwaters, and destruction from debris flows in the project area. Also, hazardous flood events may occur in a very short time period due to the relatively steep portions of the upper watersheds, allowing little opportunity for warning or evacuation. While the Green Gulch drainage is quite large, by the time it reaches the project area, the drainage is divided into multiple channels and along with the gentle slope, will reduce the impact of a hazardous flood event in the project area.

Bank loss in the project area is occurring as part of natural geologic processes. The drainage channels may be expected to migrate as well, furthering loss of bank material. Channels with steeper slopes may be expected to lose more bank material.

Debris flow damage is a possibility in the project area. There are large amounts of alluvium and colluvium in the upper portions of the drainages, but the low channel gradient and relatively great distance make a destructive debris flow unlikely. However, the large amount of debris could be transported downstream in moderate to high magnitude floods, aggrading any incised channels and reducing flood conveyance capacity. This type of event would increase the flood hazard.

Seasonal hurricanes and tropical depressions entering the region may cause flooding in the project area. In mid-September 2008, Tropical Depression Lowell dumped extreme amounts of precipitation in the Mexican state of Chihuahua, southwest of the Park. The high volume of runoff in the Rio Conchos watershed over-topped Mexican reservoirs, broke levees, and dumped into the Rio Grande just above the Ojinaga/Presidio International Bridge. The release from the Rio Conchos, combined with heavy local runoff, created the deepest flood in the Park's recorded history (NPS 2008). However, the flooding at the Park was confined to the Rio Grande, some 30 miles from the project area.

### Intensity Level Definitions

The thresholds of change for the intensity of an impact on floodplains are defined as follows:

**Negligible:** There would be no change in the ability of the floodplain to convey floodwaters, or its values and functions. The project would not contribute to flooding.

- Minor:** Changes in the ability of the floodplain to convey floodwaters, or its values and functions, would be measureable and local, although the changes would be only just measurable. The project would not contribute to flooding. No mitigation measures would be necessary.
- Moderate:** Changes in the ability of the floodplain to convey floodwaters, or its values and functions, would be measurable and local. The project could contribute to flooding. Impacts could be mitigated by modification of proposed facilities in floodplains.
- Major:** Changes in the ability of the floodplain to convey floodwaters, or its values and functions, would be measureable and widespread. The project would contribute to flooding. Impacts could not be mitigated by modification of proposed facilities in floodplains.

The thresholds of change for the duration of an impact on floodplains are defined as follows:

- Short-term:** Usually less than one year. Impacts would not be measurable or measurable only during the life of construction.
- Long-term:** Usually more than one year. Impacts would be measurable during and after project construction.

## Regulations and Policies

Current laws and policies require that the following conditions be achieved for floodplains in the Park:

Desired Condition	Source
Protect, preserve, and restore the natural resources and functions of floodplains; avoid the long -and short-term environmental effects associated with the occupancy and modification of floodplains; and avoid direct and indirect support of floodplain development and actions that could adversely affect the natural resources and functions of floodplains or increase flood risks.	Executive Order 11988 – Floodplain Management; CWA; Rivers and Harbors Act; NPS <i>Management Policies 2006</i>
When it is not practicable to locate or relocate development or inappropriate human activities to a site outside and not affecting the floodplain, the NPS will: prepare and approve a statement of findings, in accordance with procedures described in Director’s Order 77-2; Floodplain Management; use non-structural measures as much as practicable to reduce hazards to human life and property, while minimizing the impact to the natural resources of floodplains; and ensure that structures and facilities are designed to be consistent with the intent of the standards and criteria of the National Flood Insurance Program (44 CFR Part 40).	<i>NPS Management Policies 2006</i>

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## Impacts of Alternative A (No Action Alternative)

Under the No Action Alternative, the NPS would not construct a new trail. Therefore, floodplains within the project area would not be impacted and current conditions would remain.

### Cumulative Effects

The No Action Alternative would not contribute to cumulative impacts on floodplains.

### Conclusion

The No Action Alternative would not result in any impacts on floodplains. In addition, no unacceptable impacts or impairment of the Park's floodplains would occur under this alternative.

## Impacts of Alternative B (Multi-Use Trail)

Under Alternative B, the NPS would construct a multi-use trail that would be used by hikers and mountain bikers. The trail and associated facilities would be located in flood prone areas of Panther Junction. Trail and associated facility construction and use would have long-term, negligible and localized adverse effects on floodplains due to increased storm water runoff from vegetation removal, soil compaction, and increase in impervious surfaces.

Vegetation removal from trail construction, soil compaction from trail use, and paving of the parking lot would result in a slight increase in runoff during storm events. However, this increase would not contribute to flooding. There would be no change in the ability of the floodplain to convey floodwaters because the trail and parking lot would not obstruct flows. The trail crossing of the Avery Canyon and Green Gulch washes would be designed to allow flood flows and debris to pass. Flooding may cause washouts of the trail in these areas. The NPS would temporarily close the trail to bicycles and/or hikers when wet conditions create unacceptable risks for rutting and erosion.

Flash floods would present a hazard to Park visitors using the trail. Hazardous flood events may occur in a very short time period allowing little opportunity for warning or evacuation. To reduce risks to trail users, signs warning the public of flood hazards and informing them where to go when there is a flood would be located at the trailheads.

### Cumulative Effects

The developed areas of Panther Junction are drained by intermittent streams or washes which support flow only in response to rainfall. These watersheds are underlain by bedrock and have high runoff capabilities. Because of these physical characteristics and the possibility of intense summer thunderstorms, these drainages are capable of producing flash floods. Construction of new and expanded facilities proposed in Panther Junction would be at risk from flood-related hazards. The cumulative effects of past, present, and future projects on floodplains in Panther Junction would likely be moderate, localized, and adverse over the long-term. Alternative B

would not contribute to these structural impacts to the floodplain; however, users of the trail and its facilities would be at potential risk from flash floods.

## **Conclusion**

Long-term, negligible, localized, adverse effects on floodplains would occur under Alternative B from increased storm water runoff and potential risk to trail users from flash floods. Cumulative impacts on floodplains from Alternative B, in conjunction with past, present, and future activities, would be moderate, localized, and adverse over the long-term. Alternative B would not impair the Park's floodplains and would not result in unacceptable impacts.

## **Impacts of Alternative C (Hiking Only Trail)**

Under Alternative C, the NPS would construct a hiking only trail that would be strictly limited to hikers. The trail would be located in flood prone areas of Panther Junction. Impacts from Alternative C would be similar to Alternative B; however, the total area of ground disturbance from trail construction and use would be less, resulting in a slight decrease in impacts from increased storm water runoff. However, this increase would not contribute to flooding. Alternative C would have long-term, negligible and localized adverse effects on floodplains due to increased storm water runoff from vegetation removal and soil compaction. Alternative C would likely present less of a flood hazard than Alternative B due to the potential for fewer people on the trail during or after a flood hazard event. The NPS would temporarily close the trail to hikers when wet conditions create unacceptable risks for erosion.

## **Cumulative Effects**

The developed areas of Panther Junction are drained by intermittent streams or washes which support flow only in response to rainfall. These watersheds are underlain by bedrock and have high runoff capabilities. Because of these physical characteristics and the possibility of intense summer thunderstorms, these drainages are capable of producing flash floods. Construction of new and expanded facilities proposed in Panther Junction would be at risk from flood-related hazards. The cumulative effects of past, present, and future projects on floodplains in Panther Junction would likely be moderate, localized, and adverse over the long-term. Alternative C would not contribute to these structural impacts to the floodplain; however, users of the trail and its facilities would be at potential risk from flash floods.

## **Conclusion**

Long-term, negligible, localized, adverse effects on floodplains would occur under Alternative C from increased storm water runoff and potential risk to trail users from flash floods. Cumulative impacts on floodplains from Alternative C in conjunction with past, present, and future activities, would be moderate, localized, and adverse over the long-term. Alternative C would not impair the Park's floodplains and would not result in unacceptable impacts.

## VEGETATION

### Affected Environment

The Park is located at the northern end of the Chihuahuan desert and much of the Park flora is typical for the Chihuahuan desert. Given its harsh environment, the Park has an amazing variety and number of plant species. It has more than 1,200 species of plants, including 60 different cacti species. The diversity of life is largely due to the diverse ecology and changes in elevation, ranging from the dry, hot desert to the cool mountains to the Rio Grande corridor..

The primary vegetation community present in the project area is the High Desert Grassland or Sotol Grassland community. There is also some Creosote Scrub community present. These general categories include many different associations, as vegetation communities in Big Bend form a complex matrix due to patchy differences in important environmental factors such as soils, aspect, slope, elevation, and local rainfall patterns (Sirotnak et al. 2007).

According to a vegetation map by Plumb (1992), the local communities range from lechuguilla-grass-viguiera to creosote-lechuguilla as the dominant members. A dense cover of lechuguilla covers many parts of the proposed trail route, and it is interspersed with black grama or false-grama on the flatter areas. The most common shrubs include creosote, sotol, mariola, mesquite, *Acacia* and *Mimosa* species including various catclaws, broomweed, skeleton-leaf goldeneye, ceniza, tarbush, ratany, and guayacan. Deeper drainages include persimmon, hackberry, and desertwillow.

A botanical study of the project area was conducted in August and September of 2006, followed by a supplemental survey in May 2007. The study observed 18 species from Big Bend National Park's sensitive species list, but observed no federally listed endangered, threatened, or candidate taxa within the study area (Sirotnak et al. 2007). The 18 observed sensitive plant species are listed in Table 5.

**Table 5. Species of Concern Found within the Lone Mountain Plant Survey Area, September 2006.**

Family	Scientific Name	TNC Global Status+	TNC State Status+
Asclepiadaceae	<i>Funastrum torreyi</i> (A. Gray) Schltr.	G4	S3
Asteraceae	<i>Machaeranthera pinnatifida</i> var. <i>pinnatifida</i> (hook.) Shinners	G5 T4Q	S3
Boraginaceae	<i>Cryptantha coryi</i> I.M. Johnst.	G4	S3
Bromeliaceae	<i>Hechtia texensis</i> S. Watson	G4	S3
Cactaceae	<i>Coryphantha dasyacantha</i> (Engelm.) Orcutt		S2
Cactaceae	<i>Echinocereus chloranthus</i> var. <i>russanthus</i> [syn. <i>Echinocereus viridiflorus</i> var. <i>russanthus</i> (Weniger) A.D. Zimmerman]	G4 TNR	SNR
Cactaceae	<i>Echinocereus enneacanthus</i> var. <i>enneacanthus</i> Englem.	G5 T4Q	S3
Cactaceae	<i>Ferocactus hamatacanthus</i> (Muelhlenpf.) Britton & Rose	G4 T4Q	S3
Cactaceae	<i>Glandulicactus uncintaus</i> (Galeolfi ex Pfeiff.) Backeb.		S3
Euphorbiaceae	<i>Chamaesyce setiloba</i> (Engelm. ex Torr.) Norton	G5	S1
Fabaceae	<i>Calliandra conferta</i> Benth. ex A. Gray [syn. <i>Calliandra</i>	GNR	SNR

	<i>isleyi</i> B. L. Turner]	G4	S3
Poaceae	<i>Cathestecum erectum</i> Vasey & Hack.	G5	S1
Pteridaceae	<i>Notholaena grayii</i> Davenport	G4	S2
Rosaceae	<i>Vauquelinia corymbosa</i> Correa ex Humb. & Bonpl.*	G4 G5 T4Q	S1
Rosaceae	<i>Prunus havardii</i> (W. Wight) S. C. Mason	G3	S3
Scrophulariaceae	<i>Castilleja rigida</i> Eastw.	G4 N2	S2
Scrophulariaceae	<i>Leucophyllum minus</i> A. Gray	G5	S4
Solanaceae	<i>Lycium puberulum</i> var. <i>berberoides</i> (Correll) Chiang	G3 T3	S3

\*one tree observed within 200' of survey area

+The Nature Conservancy (TNC) has ranked rarer plant taxa of Texas according to population size, number of populations, and distribution globally and state-wide. TNC suggests that G/G1 and G/S2 species could be called "rare plants" and G/S3 species "quasi-rare" (Carr 2005).

Most plants on the sensitive species list in Table 5 are more abundant than those termed by The Nature Conservancy of Texas as "quasi-rare" plants (Carr 2005). Many of these plants are quite common in Big Bend. The majority of observed population of sensitive species were scattered throughout the project area, were quite abundant and seemingly not at risk of local extirpation (Sirotnak et al. 2007). According to the Sirotnak et al. (2007) survey, only *Cryptantha coryi* and *Hechtia texensis* were limited in distribution to one site with only two *Cryptantha coryi* plants, but it was noted that *Hechtia* is abundant and dominant in many other areas of the Park.

The same botanical survey found three non-native vascular plant species in the project area and they are: Lehmann's lovegrass, King Ranch bluestem and African buffelgrass. Lehmann's lovegrass was found consistently scattered throughout the project area and King Ranch bluestem was only found at the eastern end of the NPS service road (Sirotnak et al. 2007). The one African buffelgrass, the group found on the eastern side of Lone Mountain just above the proposed trail, was pulled and removed from the site.

The general vegetative character of the project area was described by Sirotnak et al. (2007) as follows: the eastern flats appear to have a higher density of pitaya cacti than the rest of the project area. This same area was subject to a prescribed burn in April 1999 and it appears to have affected the overall canopy coverage and perhaps plant densities in this area. The western flats appear to have more robust stands of black grama in terms of density and number of populations. Chino grama and California cottontop were common throughout with Chino grama dominant on the lower slopes of Lone Mountain. A few healthy and large basketgrass appear sporadically in a couple of the larger drainages.

## Intensity Level Definitions

Impact analyses on vegetation were based on observations made in the field during a site visit in July 2008, vegetation surveys conducted by NPS, and consultation with Park staff.

**Negligible:** No native vegetation would be affected or some individual native plants could be affected as a result of the alternative, but there would be no effect on native species populations. The effects would be short-term, on a small scale, and no species of special concern would be affected.

**Minor:** The alternative would temporarily affect some individual native plants and would also affect a relatively minor portion of that species' population. Mitigation to

offset adverse effects, including special measures to avoid affecting species of special concern, could be required and would be effective.

**Moderate:** The alternative would affect some individual native plants and would also affect a sizeable segment of the species' population in the long-term and over a relatively large area. Mitigation to offset adverse effects could be extensive, but would likely be successful. Some species of special concern could also be affected.

**Major:** The alternative would have a considerable long-term effect on native plant populations, including species of special concern, and affect a relatively large area in and out of the Park. Mitigation measures to offset the adverse effects would be required, extensive, and success of the mitigation measures would not be guaranteed.

The thresholds of change for the duration of an impact on vegetation are defined as follows:

**Short-term:** Recovers in less than three years.

**Long-term:** Takes more than three years to recover.

## Regulations and Policies

Current laws and policies require that the following conditions be achieved for native vegetation in the Park:

Desired Condition	Source
The NPS will maintain as parts of the natural ecosystem, all native plants and animals in the park.	NPS <i>Management Policies 2006</i> ; NPS-77 "Natural Resources Management Guideline"
Exotic species will not be allowed to displace native species if displacement can be prevented.	NPS <i>Management Policies 2006</i>

## Impacts of Alternative A (No Action Alternative)

Under the No Action Alternative, the NPS would not construct a new trail. Therefore, vegetation within the project area would not be impacted and current conditions would remain.

## Cumulative Effects

The No Action Alternative would not contribute to cumulative impacts on vegetation.

## Conclusion

The No Action Alternative would not result in any impacts on vegetation. In addition, no unacceptable impacts or impairment of the Park's vegetation would occur under this alternative.

## Impacts of Alternative B (Multi-Use Trail)

Under Alternative B, the NPS would construct a multi-use trail that would be used by hikers and mountain bikers. Trail and associated facility construction and maintenance would result in long-term, minor, localized adverse effects on vegetation from permanent vegetation removal and potential spread of exotics. Trail construction and maintenance would require permanent removal of vegetation along the length and width of the trail estimated in Table 3. Vegetation removed would include native and sensitive species that are quite common in the Park and are not at risk of local extirpation. Impacts to these populations would be minor. Vegetation would also be permanently removed through widening of the trail over time. Table 4 estimates the increase in ground disturbance after one year of use.

Short-term impacts from construction and off-trail use may also occur. During construction, disturbance to vegetation adjacent to the trail could occur from vegetation clearing and minor grading. Increased erosion in these areas could expose root systems and lead to the subsequent death of plants needing more moderate amounts of water. To minimize vegetation damage due to erosion, desert trail design and construction techniques would be used. Additionally, the NPS would temporarily close the trail to bicycles and/or hikers when wet conditions create unacceptable risks for rutting and erosion. Disturbance during construction would be minimized and disturbed areas would be planted to minimize impacts to vegetation adjacent to the trail. Some vegetation may be trampled or destroyed by off-trail use; however, mitigation measures such as using natural barriers such as native prickly plants or cacti, informational signs, and visitor literature to discourage off-trail use would minimize impacts.

Clearing of vegetation, soil disturbance, and soil compaction could increase the potential spread of exotic species, specifically Lehmann's lovegrass. The NPS would implement mitigation measures to minimize the spread of Lehmann's lovegrass in the project area by minimizing ground disturbance during trail construction and planting disturbed areas with native vegetation. Hikers and mountain bikers can also cause the spread of exotics through dispersion of seeds that stick to clothes, shoes, and tires. The NPS would educate visitors on exotic species using wayside signs at both trailheads. The NPS would recommend that mountain bikers remove dirt from their tires and wheels before riding on the trail to prevent the spread of exotics. The trail would be monitored for exotic species and managed according to NPS *Management Policies 2006*.

## Cumulative Effects

Past and present projects affecting vegetation have included the construction of the new Science and Resource Management Building in Panther Junction. Future projects affecting vegetation include new construction proposed at Panther Junction. These new and expanded developments would likely require permanent vegetation removal and would increase the potential spread of exotics. The areas proposed for development in Panther Junction are likely already disturbed from current uses and do not provide quality habitat for native plant species. Overall, the cumulative effects of past, present, and future projects on vegetation in Panther Junction would be minor, localized, and adverse over the short- and long-term. Alternative B

would contribute to short- and long-term adverse impacts on vegetation; however, contribution would be minor overall and would not change the intensity level of cumulative effects.

## **Conclusion**

Alternative B would result in short- and long-term, minor, localized adverse impacts on vegetation from trail construction, associated facility construction, and trail use. Cumulative impacts on vegetation from Alternative B in conjunction with past, present, and future projects would be minor, localized, and adverse over the short- and long-term. Alternative B would not impair the Park's native vegetation and would not result in unacceptable impacts.

## **Impacts of Alternative C (Hiking Only Trail)**

Under Alternative C, the NPS would construct a hiking only trail that would be strictly limited to hikers. Impacts from Alternative C would be similar to Alternative B; however, the total area of ground disturbance from trail construction and use would be less, resulting in a slight decrease in impacts on vegetation from permanent vegetation removal and potential spread of exotics. In addition, the absence of mountain bikers would reduce the potential spread of exotics through dispersion of seeds that stick to clothes, shoes, and tires. Alternative C would have short- and long-term, minor, localized, adverse impacts on vegetation.

## **Cumulative Effects**

Past and present projects affecting vegetation have included the construction of the new Science and Resource Management Building in Panther Junction. Future projects affecting vegetation include new construction proposed at Panther Junction. These new and expanded developments would likely require permanent vegetation removal and would increase the potential spread of exotics. The areas proposed for development in Panther Junction are likely already disturbed from current uses and do not provide quality habitat for native plant species. Overall, the cumulative effects of past, present, and future projects on vegetation in Panther Junction would be minor, localized, and adverse over the short- and long-term. Alternative C would contribute to short- and long-term adverse impacts on vegetation; however, contribution would be minor overall and would not change the intensity level of cumulative effects.

## **Conclusion**

Alternative C would result in short- and long-term, minor, localized adverse impacts on vegetation from trail construction, associated facility construction, and trail use. Cumulative impacts on vegetation from Alternative C in conjunction with past, present, and future projects would be minor, localized, and adverse over the short- and long-term. Alternative C would not impair the Park's native vegetation and would not result in unacceptable impacts.

## **VISITOR USE AND EXPERIENCE/RECREATION**

### **Affected Environment**

The Park typically receives between 300,000 and 400,000 visitors every year. In 2007, Big Bend received 364,856 recreation visits, a 22 percent increase from 2006. The 2007 recreation visits represented approximately six percent of visitors to the national park system in Texas (Statistical Abstract 2007). A 2004 survey of 477 visitors found that 76 percent were from Texas. Relatively large proportions of out-of-state visitors responding to the survey were from California, Florida, the Great Lakes region, and New England (TCE 2004).

Big Bend's hiking, bicycling, and picnic facilities contribute to the visitor experience and offer recreational opportunities. More specifically, approximately 80 percent of visitors use the Park's 201 miles of hiking trails, which interpret many of the Park's cultural and natural resources. The Park also includes 304 miles of paved and unpaved roads that motorists share with bicyclists. Big Bend also features seven picnic areas including Dugout Wells, Daniels Ranch, Castolon, Cottonwood Campground, Chisos Basin, Fossil Bone, and Santa Elena Canyon. The visitor survey found that day hiking, star gazing, wildlife viewing, and visiting historic sites were the top four activities that the respondents took part in (TCE 2004). "Less than one percent" of visitors ride their horses in the Park (Elkowitz 2008).

To accommodate visitors staying overnight, Big Bend offers camping and lodging facilities. For frontcountry camping, Big Bend features 25 sites at the Rio Grande Village RV Park, 31 sites at Cottonwood Campground, 63 sites at Chisos Basin Campground, and 100 sites at Rio Grande Village Campground. For backcountry camping, visitors can use Big Bend's 116 campsites including primitive roadside facilities and camping in the High Chisos. For lodging, visitors can stay at the Chisos Mountain Lodge, which includes four historic cottages and 72 rooms in motel units. Big Bend's concessioner, Forever Resorts, operates the lodge. In 2007, Big Bend accommodated 169,916 visitors who stayed overnight. Of these visitors, 35 percent stayed at NPS campgrounds, 34 percent stayed at the concessioner-operated lodge and campgrounds, and 12 percent stayed overnight in the backcountry (Statistical Abstract 2007).

## Intensity Level Definitions

The methodology used for assessing impacts to visitor use and experience/recreation is based on how the No Action Alternative and the two action alternatives would affect the visitors' enjoyment of the Park. The thresholds for this impact assessment are:

- Negligible:** Visitors would not be affected or changes in visitor use and experience/recreation would be below or at the level of detection. Any effects would be short-term. The visitor would not likely be aware of the effects associated with the alternative.
- Minor:** Changes in visitor use and experience/recreation would be detectable, although the changes would be slight and likely short-term. The visitor would be aware of the effects associated with the alternative, but the effects would be slight.
- Moderate:** Changes in visitor use and experience/recreation would be readily apparent and likely long-term. The visitor would be aware of the effects associated with the alternative, and would likely be able to express an opinion about the changes.

**Major:** Changes in visitor use and experience/recreation would be readily apparent, severely adverse or exceptionally beneficial, and have important long-term consequences. The visitor would be aware of the effects associated with the alternative, and would likely express a strong opinion about the changes.

The thresholds of change for the duration of an impact on visitor use and experience are defined as follows:

**Short-term:** Occurs only during the proposal action.

**Long-term:** Occurs after the proposal action.

## Regulations and Policies

Current laws and policies require that the following conditions be achieved for visitor use and experience/recreation in the Park:

Desired Condition	Source
The NPS is committed to providing appropriate, high quality opportunities for visitors to enjoy the parks. Within the parks, NPS maintains an atmosphere that is open, inviting, and accessible to all. Further, the NPS provides opportunities for forms of enjoyment that are uniquely suited and appropriate to the exceptional natural and cultural resources found in the parks.	NPS <i>Management Policies 2006</i>
Service-wide regulations addressing off-road bicycling require that special, park-specific regulations be developed before these uses may be allowed in parks.  A new form of recreational activity will not be allowed within a park until a superintendent has made a determination that it will be appropriate and not cause unacceptable impacts.  Backcountry use will be managed in accordance with a backcountry management plan (or other plan addressing backcountry uses) designed to avoid unacceptable impacts on park resources or adverse effects on the visitor enjoyment of appropriate recreational experiences. The Service will seek to identify acceptable limits of impacts, monitor backcountry use levels and resource conditions, and take prompt corrective action when unacceptable impacts occur.	NPS <i>Management Policies 2006</i>
All trails and walks will be carefully situated, designed, and managed to reduce conflicts with automobiles and incompatible uses, allow for a satisfying park experience, allow accessibility by the greatest number of people, and protect park resources.  Backcountry trails will offer visitors a primitive outdoor experience, and these trails will be unsurfaced and modest in character except where a more durable surface is needed.	NPS <i>Management Policies 2006</i>

<p>A determination may be made to designate [bicycle] routes outside developed areas and special use zones; however, the designation must be made by promulgating a special regulation.</p> <p>Trailheads, and trail access points from which trail use can begin, will be carefully tied into other elements of the park development and circulation system to facilitate safe and enjoyable trail use and efficient management.</p>	
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## Impacts of Alternative A (No Action Alternative)

Under the No Action Alternative, a multi-use trail would not be constructed in the project area. The No Action Alternative would be expected to have minor long-term adverse impacts on visitor use and experience/recreation in Panther Junction. By not constructing the trail, visitors would not have the opportunity to enjoy the only recreational trail at Panther Junction, as well as one of the few off-road mountain biking trails in the national park system. Additionally, without an established trail in Panther Junction, the No Action Alternative may preclude hikers with limited experience from venturing into the Park's backcountry. In these ways, the No Action Alternative may reduce hikers' and bicyclists' opportunities for recreational enjoyment of the Park's backcountry. Further, the proposed trail would include a picnic area that currently does not exist in Panther Junction. By not constructing the trail, visitors may feel that the Park missed an opportunity to provide a new recreational use close to Park Headquarters, which is the first stop upon entering the Park from the Route 11 entrance to the Park.

## Cumulative Effects

Past and present projects affecting visitor use and experience have included the new water storage tank in Panther Junction serving new and future facilities. Future projects affecting visitor use and experience include new construction proposed at Panther Junction. These new and expanded developments would benefit Park visitors by providing additional gas, food, group activity, and educational facilities at Park headquarters. Overall, the cumulative effects of past, present, and future projects on visitor use and experience in Panther Junction would be moderate and beneficial over the long-term. Alternative A would not contribute to these beneficial cumulative effects.

## Conclusion

The No Action Alternative would be expected to have moderate long-term adverse impacts on visitor use and experience/recreation in Panther Junction. Cumulative impacts on visitor use from Alternative A in conjunction with past, present, and future projects would be moderate and beneficial over the long-term. Additionally, Alternative A would not result in unacceptable impacts to visitor use and experience/recreation.

## Impacts of Alternative B (Multi-Use Trail)

Under Alternative B, the NPS would construct a multi-use trail in the project area. Implementing Alternative B would be expected to have moderate long-term beneficial impacts

on visitor use and experience/recreation. Not only would Alternative B provide the only established hiking opportunity and picnic area at Park Headquarters (Panther Junction), it would provide one of the few off-road mountain biking trails in the national park system. Currently, the NPS allows bicycles on all established roads open to the public, including paved and unpaved roads. The new multi-use trail would allow mountain bikers access to backcountry away from vehicle traffic. The trail would be used by both NPS staff residing in Panther Junction and Park visitors.

To date, the majority of public comments support constructing the proposed trail. Supporters, many of whom belong to various mountain biking organizations throughout Texas, view the proposal as a way to increase the use and enjoyment of the Park's natural resources. Additionally, supporters suggest that constructing the trail would be a positive step in opening the Park to mountain bikers of all ages and skill levels. Many supporters also suggest that they would visit the Park more often if the NPS constructs the trail. Further, trail support facilities at the Panther Junction trailhead including a picnic area, parking lot, and bathroom would serve as a central gathering place for trail users. Additionally, the NPS would implement the rules, recommendations, and administrative actions listed above in Alternatives Considered. In all of these ways, implementing Alternative B could boost Park visitation and enhance visitors' experiences.

The Park's remote location requires most visitors to drive long distances in order to reach the Park. The nearest airport and large city is Midland-Odessa, located about 240 miles away. Other large cities in Texas are even farther away, with Austin being 435 miles away, El Paso being 290 miles away, Dallas being 535 miles away, San Antonio being 410 miles away, and Houston being 600 miles away. After spending many hours in vehicles to reach the park, visitors arriving in Panther Junction may be looking for recreational opportunities, such as hiking or biking, to provide exercise or an opportunity to immediately enjoy park resources. At present, there are no such recreational opportunities in the Panther Junction area; the proposed trail would provide this type of opportunity for visitors arriving at the Park's primary visitor center in Panther Junction.

To provide a more robust analysis, it is important to note that many public comments oppose and express concern for constructing the proposed trail. Though these comments represent the minority of all comments received, they merit consideration because they highlight important concerns for visitor use and experience/recreation. More specifically, some comments suggest that allowing mountain biking on a dedicated trail would cater to a small user group and accommodate a particular sport at the expense of other users. Another comment suggests that by allowing mountain bikers to use the trail, other special interest groups might lobby for trails nationwide, again at the expense of other users. Comments also indicate that allowing mountain bikers on the trail would degrade the hiking experience, and that the mountain bikes would produce more noise than hikers. Other comments express concern for protecting cultural and natural resources, and that allowing mountain bikers to use the trail would contradict the Park's mission of preserving and protecting these resources. Implementing Alternative B could boost Park visitation. However, some visitors might not enjoy their experience sharing the proposed trail with mountain bikers.

Until the trail is completed and visitor-use statistics are available, there will be a level of uncertainty regarding intensity of use by cyclists, hikers, or both. Thus, the trail and associated features (parking, signs, etc.) would be designed and constructed to standards appropriate for a

range of visitor use intensity similar to that experienced at other Park trail facilities of a similar nature. Measures identified in the Mitigation Measures section of this document are for the purpose of protecting natural resources, visitor safety, and the visitor experience under varying levels of use intensity. Additional appropriate mitigation measures would be implemented if warranted by future visitor intensity levels.

## **Cumulative Effects**

Past and present projects affecting visitor use and experience have included the new water storage tank in Panther Junction serving new and future facilities. Future projects affecting visitor use and experience include new construction proposed at Panther Junction. These new and expanded developments would benefit Park visitors by providing additional gas, food, group activity, and educational facilities at Park Headquarters. Overall, the cumulative effects of past, present, and future projects on visitor use and experience in Panther Junction would be moderate and beneficial over the long-term. Alternative B would contribute to long-term beneficial impacts on visitor use and experience; however, the contribution would not change the intensity level of cumulative effects.

## **Conclusion**

Alternative B would be expected to have moderate long-term beneficial impacts on visitor use and experience/recreation in Panther Junction. Cumulative impacts on visitor use from Alternative B in conjunction with past, present, and future projects would be moderate and beneficial over the long-term. However, some trail users who perceive future project activities, including new construction and/or off-road mechanical vehicle use, as a detriment to the aesthetic experience, would not experience the long-term beneficial impacts. While public feedback indicates that such users might be the minority, it is important to note this concern. In general, Alternative B would not result in unacceptable impacts to visitor use and experience/recreation.

## **Impacts of Alternative C (Hiking Only Trail)**

Under Alternative C, the NPS would construct a trail in the project area for hikers only. Implementing Alternative C would be expected to have moderate long-term beneficial impacts on visitor use and experience/recreation. Alternative C would provide an existing recreational user group with additional hiking opportunities. It would also provide the only hiking opportunity at Park Headquarters (Panther Junction) and unobstructed access to the Park's backcountry by foot. The new trail would not be expected to increase Park visitation substantially relative to existing conditions. The novelty of exploring a new area would be expected to be short-term because the project area's landscape resembles others in the Park. However, because the project area is rarely accessed, hikers would benefit from exploring an area that they may not have visited before. Further, trail support facilities at the Panther Junction trailhead including a picnic area, parking lot, and bathroom would serve as a central gathering place for trail users. Additionally, to help enhance visitors' experiences, NPS would implement the rules, recommendations, and administrative actions listed above in Alternatives Considered.

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## Cumulative Effects

Past and present projects affecting visitor use and experience have included the new water storage tank in Panther Junction serving new and future facilities. Future projects affecting visitor use and experience include new construction proposed at Panther Junction. These new and expanded developments would benefit Park visitors by providing additional gas, food, group activity, and educational facilities at Park Headquarters. Overall, the cumulative effects of past, present, and future projects on visitor use and experience in Panther Junction would be moderate and beneficial over the long-term. Alternative C would contribute to long-term beneficial impacts on visitor use and experience; however, the contribution would not change the intensity level of cumulative effects.

## Conclusion

Alternative C would be expected to have moderate long-term beneficial impacts on visitor use and experience/recreation in Panther Junction. Cumulative impacts on visitor use from Alternative C in conjunction with past, present, and future projects would be moderate and beneficial over the long-term. In general, Alternative C would not result in unacceptable impacts to visitor use and experience/recreation.

## VISITOR SAFETY

### Affected Environment

Currently, the project area is not promoted as a destination for Park visitors and is rarely accessed. There is no information available concerning visitor accidents and injuries, safety conditions, and hazards in the project area (Zubee 2008).

Between 1993 and 1998, researchers collected visitor accident data and conducted park staff surveys concerning visitor risk and safety in the national park system. In 2001 and 2002, the researchers released the reports. According to the 2001 report, visitor activities in the Park that resulted in the most accidental injuries and illnesses included hiking, motor vehicle operation, and walking. The researchers found that visitor characteristics played “a more prominent role in visitor accidents than did infrastructure hazards, communication hazards, environmental hazards, social hazards, and technological hazards” (Tuler et al. 2001). More specifically, research literature found that visitors “are consistently overconfident about their driving abilities” (Tuler and Golding 2002). Additionally, although visitors to the Park were concerned with their exposure to the elements, none of the visitors surveyed indicated that they were prepared for the desert environment.

During the 1993 to 1998 study period, nine fatal accidents occurred in the Park. Three fatalities were hikers – two due to heat exhaustion, one due to a fall. Other fatalities resulted from a fall while horseback riding, a motor vehicle accident, a capsized boat, drowning while swimming or wading, and a reaction to flora. An additional fatality resulted from an unknown cause (Golding et al. 2002).

According to the 2002 report, 72 percent of visitors to the Park agreed or strongly agreed that most of the risks to visitors are beyond the NPS' control (Tuler and Golding 2002). Additionally, the report found that the percentage of respondents agreeing with this statement was higher in backcountry parks.

## Intensity Level Definitions

The methodology used for assessing impacts to visitor safety is based on how the No Action Alternative and the two action alternatives would affect the visitors' enjoyment of the Park. The thresholds for this impact assessment are:

- Negligible:** Visitor safety would not be affected, or the effects would be at low levels of detection and would not have an appreciable effect on visitor safety.
- Minor:** The effects on visitor safety would be detectable and would likely be short-term, but would not have an appreciable effect on visitor safety. If mitigation were needed, it would be relatively simple and would likely be successful.
- Moderate:** The effects on visitor safety would be readily apparent and long-term, and would result in substantial noticeable effects to visitor safety on a local scale. Mitigation measures would probably be necessary and would likely be successful.
- Major:** The effects on visitor safety would be readily apparent and long-term, and would result in substantial noticeable effects to visitor safety on a regional scale. Extensive mitigation measures would be needed, and their success would not be guaranteed.

The thresholds of change for the duration of an impact on visitor safety are defined as follows:

- Short-term:** Effects last one year or less.  
**Long-term:** Effects last longer than one year.

## Regulations and Policies

Current laws and policies require that the following conditions be achieved for visitor safety in the Park:

Desired Condition	Source
Saving human life will take precedence over all other management actions as the NPS strives to protect human life and provide for injury-free visits. While recognizing that there are limitations on its capability to totally eliminate all hazards, the NPS and its concessioners, contractors, and cooperators will seek to provide a safe and healthful environment for visitors and employees. The NPS will work cooperatively with other federal, tribal, state, and local agencies, organizations, and individuals to carry out this responsibility.	NPS <i>Management Policies 2006</i>
The means by which public safety concerns are to be addressed is left to the discretion of superintendents and other decision-makers at the park level,	NPS <i>Management</i>

who must work within the limits of funding and staffing.	<i>Policies 2006</i>
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### **Impacts of Alternative A (No Action Alternative)**

Under the No Action Alternative, a multi-use trail would not be constructed in the project area. Therefore, visitor safety in the project area would not be impacted and current conditions would remain.

### **Cumulative Effects**

The No Action Alternative would not contribute to cumulative impacts on visitor safety.

### **Conclusion**

The No Action Alternative would not result in any impacts on visitor safety. Additionally, Alternative A would not result in unacceptable impacts to visitor safety.

### **Impacts of Alternative B (Multi-Use Trail)**

Under Alternative B, the NPS would construct a multi-use trail in the project area that would be used by hikers and mountain bikers. Alternative B would be expected to have minor long-term adverse impacts on visitor safety in Panther Junction. Implementing Alternative B could lead to conflicts between hikers and bicyclists using the trail at the same time and increase the potential for visitor accidents and injuries. Mountain bikers travel at faster speeds than hikers and these differences in speeds can result in collisions if the bicyclist is not paying attention. Hikers and bicyclists using the trail could have accidents and injuries including falls and heat exhaustion. Currently, visitors rarely access the project area. A new trail introducing more visitors to an area that they may have limited, if any, knowledge of could increase the potential for visitor accidents and injuries to occur. The NPS would provide visitors using the trail with information on safety hazards, including heat exhaustion and proper trail etiquette, to minimize impacts to visitor safety.

Implementing Alternative B would also increase traffic congestion near the proposed trailhead/parking lot. A gas station/store across the road from the proposed trailhead/parking lot along Route 13, the Park's Headquarters/visitor center, the intersection of Routes 13 and 11, and new development in the area would place motorists, bicyclists, and pedestrians in close proximity to each other. Bicyclists and pedestrians might cross the road to buy supplies at the gas station/store or to pick up information at the Headquarters/visitor center. To improve visitor safety and minimize the potential for accidents to occur, the NPS would install more signs alerting motorists to the presence of bicyclists and pedestrians in the area, enforce the speed limit in this area, and extend the 30-mile-per-hour speed zone farther west along Route 13. The NPS would also install a pedestrian crosswalk between the proposed trailhead/parking lot and the gas station. The NPS would implement these and other mitigation measures, as well as the administrative actions, listed above in Alternatives Considered.

### **Cumulative Effects**

Past and present projects in Panther Junction do not affect visitor safety. Future projects affecting visitor safety include the new law enforcement complex and potential expansion of the gas station and convenience store proposed at Panther Junction. The new law enforcement complex would benefit visitor safety with additional law enforcement protection at the Park.

The expanded gas station and convenience store would also benefit visitor safety by providing visitors with additional car and food services in the Park. Overall, the cumulative effects of past, present, and future projects on visitor safety in Panther Junction would be minor and beneficial over the long-term. Alternative B would not contribute to long-term beneficial impacts on visitor safety; however, the benefits provided by other future developments in Panther Junction would reduce the potential adverse impacts on visitor safety from Alternative B. Trail users would have improved access to food and beverage services, reducing the risk of heat exhaustion.

## Conclusion

Alternative B would be expected to have minor long-term adverse impacts on visitor safety from potential conflicts between hikers and mountain bikers using the trail, risk of heat exhaustion, and accidents. Cumulative impacts on visitor safety from Alternative B in conjunction with past, present, and future projects would be minor and beneficial over the long-term. Alternative B would not result in unacceptable impacts to visitor safety.

## Impacts of Alternative C (Hiking Only Trail)

Under Alternative C, the NPS would construct a trail in the project area for hikers only. Similar to Alternative B, Alternative C would be expected to have minor long-term adverse impacts on visitor safety from the increased potential for accidents, injuries, and heat exhaustion. Alternative C would likely result in less potential for accidents and injuries than Alternative B because there would be no conflicts between hikers and bikers.

Implementing Alternative C would also increase traffic congestion near the proposed trailhead/parking lot. A gas station across the road from the proposed trailhead/parking lot along Route 13, the Park's Headquarters/visitor center, the intersection of Routes 13 and 11, and new development in the area would place motorists and pedestrians in close proximity to each other. Pedestrians might cross the road to buy supplies at the gas station or to pick up information at the Headquarters/visitor center. To improve visitor safety and minimize the potential for accidents to occur, the NPS would install more signs alerting motorists to the presence of pedestrians in the area, enforce the speed limit in this area, and extend the 30-mile-per-hour speed zone farther west along Route 13. The NPS would also install a pedestrian crosswalk between the proposed trailhead/parking lot and the gas station. The NPS would implement these and other mitigation measures, as well as the administrative actions, listed above in Alternatives Considered.

## Cumulative Effects

Past and present projects in Panther Junction do not affect visitor safety. Future projects affecting visitor safety include the new law enforcement complex and possible expansion of the gas station and convenience store proposed at Panther Junction. The new law enforcement complex would benefit visitor safety with additional law enforcement protection at the Park. The expanded gas station and convenience store would also benefit visitor safety by providing visitors with additional car and food services in the Park. Overall, the cumulative effects of past, present, and future projects on visitor safety in Panther Junction would be minor and beneficial over the long-term. Alternative C would not contribute to long-term beneficial impacts on visitor safety; however, the benefits provided by other future developments in Panther Junction would reduce the potential adverse impacts on visitor safety from Alternative C. Trail users would have improved access to food and beverage services, reducing the risk of heat exhaustion.

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## Conclusion

Alternative C would be expected to have minor long-term adverse impacts on visitor safety from potential accidents, injuries, and heat exhaustion. Cumulative impacts on visitor safety from Alternative C in conjunction with past, present, and future projects would be minor and beneficial over the long-term. Alternative C would not result in unacceptable impacts to visitor safety.

## ARCHEOLOGICAL RESOURCES

### Affected Environment

The potential to affect eligible archeological resources must be evaluated for the “area of potential effect” (APE) for a given undertaking. In an August 2007 report, the NPS developed criteria for a cultural resource reconnaissance survey. In the report, the NPS defined the APE to include “a survey corridor that is a minimum of 60 meters wide plus adjacent level terrain features having potential for archeological sites” (Alex 2007). The 60-meter-wide corridor includes a 30-meter-wide buffer on each side of the proposed trail’s centerline. The report adds that the proposed trail should be rerouted if archeological sites are found within the buffer (Alex 2007). The total area to be surveyed for Phase 1 and Phase 2 totaled approximately 226 acres.

In 2008, the Center for Big Bend Studies conducted the survey. One site, 41BS116, contains at least two stacked rock structures and is “highly significant to one or more major region-wide research domains” (Center for Big Bend Studies 2008). Site 41BS116 is considered eligible for listing in the National Register of Historic Places. Based on this information and the findings presented below, mitigation would be required to protect the archeological resources in the APE.

The Center for Big Bend Studies survey, in combination with other previous archeological surveys in the project area, documented nine archeological sites. Five sites are exclusively prehistoric, two are exclusively historic, and the remaining two include prehistoric and historic components. All of the exclusively prehistoric sites are open campsites including 41BS1521, 41BS1522, 41BS1523, 41BS1524, and 41BS1525. The exclusively prehistoric features include hearths, a rock circle, rock alignments, rock groupings, and fire-cracked rock scatters. Prehistoric artifacts collected during the survey included four dart points at sites 41BS1520, 41BS1523, and Isolated Occurrence-350, as well as a dart point base at 41BS1520. Other prehistoric artifacts included manos, metates, metate fragments, hammerstones, bifaces, a scraper, a chopper, and debitage.

The historic sites included a stock tank at 41BS1526 and an historic artifact scatter at 41BS1527. The historic features include cairns, a dam, a stock tank, and a diversion berm. Historic artifacts included cartridge casings, tin cans, bottles, horseshoes, and milled lumber.

Sites with mixed components included a prehistoric open campsite with a historic artifactual component at 41BS1519 and a prehistoric open campsite overlaid with historic fence line remnants at 41BS1520.

## Intensity Level Definitions

Certain important research questions about human history can only be answered by the actual physical material of cultural resources. Archeological resources have the potential to answer, in whole or in part, such research questions. To be eligible for listing in the National Register, 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; and D) have yielded, or may be likely to yield, information important in prehistory or history. Additionally, the archeological resource must possess integrity of location, design, setting, materials, workmanship, feeling, and association (*National Register Bulletin 36, Guidelines for Evaluating and Registering Archeological Properties*). For purposes of analyzing impacts to archeological resources either listed in or eligible to be listed in the National Register, the thresholds of change for intensity of an impact are:

**Negligible:** Impact is at the lowest levels of detection – barely measurable with no perceptible consequences, either adverse or beneficial, to archeological resources. For purposes of Section 106 of the National Historic Preservation Act (NHPA), the determination of effect would be “no adverse effect.”

**Minor:** Adverse: Disturbance of a site(s) results in little, if any, loss of significance or integrity and the National Register eligibility of the site(s) is unaffected. For purposes of NHPA Section 106, the determination of effect would be “no adverse effect.”

Beneficial: Maintenance preservation of a site(s). For purposes of NHPA Section 106, the determination of effect would be “no adverse effect.”

**Moderate:** Adverse: Disturbance of a site(s) does not diminish the significance or integrity of the site(s) to the extent that its National Register eligibility is jeopardized. For purposes of NHPA Section 106, the determination of effect would be “adverse effect.”

Beneficial: Stabilization of the site(s). For purposes of NHPA Section 106, the determination of effect would be “no adverse effect.”

**Major:** Adverse: Disturbance of a site(s) diminishes the significance and integrity of the site(s) to the extent that it is no longer eligible to be listed in the National Register. For purposes of NHPA Section 106, the determination of effect would be “adverse effect.”

Beneficial: Active intervention to preserve the site. For purposes of NHPA Section 106, the determination of effect would be “no adverse effect.”

The thresholds of change for the duration of an impact on archeological resources are defined as follows:

**Short-term:** Effects last less than one year.

**Long-term:** Effects last longer than one year or permanent.

## Regulations and Policies

Current laws and policies require that the following conditions be achieved for archeological resources in the Park:

Desired Condition	Source
The NPS is committed to providing appropriate, high quality opportunities for visitors to enjoy the parks. Within the parks, NPS maintains an atmosphere that is open, inviting, and accessible to all. Further, the NPS provides opportunities for forms of enjoyment that are uniquely suited and appropriate to the exceptional natural and cultural resources found in the parks.	NPS <i>Management Policies 2006</i>
Archeological resources will be managed in situ, unless the removal of artifacts or physical disturbance is justified by research, consultation, preservation, protection, or interpretive requirements. The Park Service will incorporate information about archeological resources into interpretive, educational, and preservation programs.	NPS <i>Management Policies 2006</i>
Archeological resources subject to erosion, slumping, subsidence, or other natural deterioration will be stabilized using the least intrusive and destructive methods.	NPS <i>Management Policies 2006</i>
Archeological resources will be protected against human agents of destruction and deterioration whenever practicable. Archeological resources subject to vandalism and looting will be periodically monitored and, if appropriate, fencing, warning signs, remote-sensing alarms, and other protective measures will be installed.	NPS <i>Management Policies 2006</i>
Appropriate and, when feasible, native vegetation will be maintained when necessary to prevent the erosion of prehistoric and historic earthworks, even when the historic condition might have been bare earth.	NPS <i>Management Policies 2006</i>

## Impacts of Alternative A (No Action Alternative)

Under the No Action Alternative, a multi-use trail would not be constructed in the project area. Therefore, archeological resources in the project area would not be impacted and current conditions would remain.

## Cumulative Effects

The No Action Alternative would not contribute to cumulative impacts on archeological resources.

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## Conclusion

The No Action Alternative would not result in any impacts on archeological resources. In addition, no unacceptable impacts or impairment of archeological resources in the Park would occur under this alternative.

## Impacts of Alternative B (Multi-Use Trail)

Under Alternative B, the NPS would construct a multi-use trail in the project area. With the implementation of mitigation measures described previously in Alternatives Considered, Alternative B would be expected to have minor long-term adverse effects on archeological resources in Phase 1 of the project area, most notably at Lone Mountain and its environs.

The multi-use trail would introduce visitors to an area that is rarely accessed. According to the 2008 survey, the proposed multi-use trail's construction and maintenance are the primary concerns for impacts to three sites. More specifically, at 41BS1524, a well-embedded hearth is situated within six meters of the proposed trail. At 41BS1526, Phase 2's northern loop and the Grapevine Hills Road spur converge. The proposed multi-use trail also crosses 41BS1520. In addition to these sites, 41BS116 contains at least two stacked rock structures that must be protected from visitor impact.

The 2008 survey included recommendations for avoiding visitor impacts to the four sites above. At 41BS1524, the survey recommended rerouting the trail to provide a 10-meter-wide buffer between the trail and the site. At 41BS1526, no significant impacts are anticipated if neither the dam nor diversion berm is damaged during trail construction. At 41BS1520, the survey recommended rerouting the trail approximately 80 meters down slope to avoid the site and reduce the chance for site visibility. At 41BS116, the survey recommended recording and updating the site to establish a baseline against which to monitor visitor impacts. Additionally, the August 2007 report notes that a separate study be conducted at 41BS116 to gather more archeological information before opening this area to Park visitor use. Since the August 2007 report, the NPS identified another site containing an architectural structure at Lone Mountain.

Visitor impacts are a concern along the proposed trail. The 2008 survey concluded that a greater concern is an increase in visitor use along with the possibility that visitors would venture off the trail to access other, more significant, archeological sites (Center for Big Bend Studies, 2008). Proposed mitigation measures would gather cultural information that might otherwise be lost or destroyed upon implementing the proposed trail, and the associated increase in visitor use and exploration of the project area.

Due to a lack of information, it is unknown if any of the nine sites are eligible for listing in the National Register of Historic Places (Center for Big Bend Studies, 2008). The Texas SHPO concurred with these findings.

Final trail alignment will be placed to avoid any adverse effects upon archeological sites.

## Cumulative Effects

In general, past and present projects in Panther Junction have affected archeological resources. Future projects that may affect archeological resources include the new and expanded developments proposed at Panther Junction. These new developments would avoid and minimize any impacts to cultural sites, so adverse impacts would likely be negligible to minor. However, past, present, and future projects at Panther Junction have adversely impacted site 41BS611, a site determined eligible for listing in the National Register of Historic Places. Several smaller sites were impacted during the initial construction of the Panther Junction developed area and on-going maintenance must be monitored to avoid additional impacts to those sites. The proposed trail adds to the cumulative effects of development at Panther Junction. Overall, the cumulative effects of past, present, and future projects on archeological resources in Panther Junction would be negligible to minor, adverse, and long-term at the local level. Alternative B would contribute to long-term adverse impacts on archeological resources; however, the contribution would not change the intensity level of cumulative effects.

## Conclusion

Alternative B would likely result in minor, adverse, and long-term impacts on archeological resources in the Lone Mountain area of the trail alignment. Cumulative impacts on archeological resources from Alternative B in conjunction with past, present, and future projects would be minor, adverse and long-term. Alternative B would not impair the Park's archeological resources and would not result in unacceptable impacts.

## Impacts of Alternative C (Hiking Only Trail)

Under Alternative C, the NPS would construct a trail in the project area for hikers only. With the implementation of mitigation measures described previously in Alternatives Considered, Alternative C would be expected to have minor long-term adverse effects on archeological resources at Lone Mountain and its environs. No impacts are anticipated for Phase 2's APE. Impacts would be the same as those described under Alternative B.

## Cumulative Effects

In general, past and present projects in Panther Junction have affected archeological resources. Future projects that may affect archeological resources include the new and expanded developments proposed at Panther Junction. These new developments would avoid and minimize any impacts to cultural sites so adverse impacts would likely be negligible to minor. However, past, present, and future projects at Panther Junction have adversely impacted site 41BS611, a site determined eligible for listing in the National Register of Historic Places. Several smaller sites were impacted during the initial construction of the Panther Junction developed area and on-going maintenance must be monitored to avoid additional impacts to those sites. The proposed trail adds to the cumulative effects of development at Panther Junction. Overall, the cumulative effects of past, present, and future projects on archeological resources in Panther Junction would be negligible to minor, adverse, and long-term at the local level. Alternative C would contribute to long-term adverse impacts on archeological resources; however, the contribution would not change the intensity level of cumulative effects.

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## Conclusion

Alternative C would likely result in minor, adverse, and long-term impacts on archeological resources in the Lone Mountain area of the trail alignment. Cumulative impacts on archeological resources from Alternative C in conjunction with past, present, and future projects would be minor, adverse and long-term. Alternative C would not impair the park's archeological resources and would not result in unacceptable impacts.

## SOCIOECONOMICS

### Affected Environment

For purposes of this EA, socioeconomics includes population, employment, income, and visitor spending. The project area for socioeconomics covers all of the Park and the remainder of Brewster County. Because it is important to understand how the alternatives might affect the socioeconomic variables in localities adjacent to Brewster County, the project area also covers Jeff Davis, Pecos, Presidio, and Terrell counties. To understand local and regional dynamics, the following discussions describe each of the socioeconomic variables. Subsequent discussions present the direct and secondary effects of Park visitors' spending on the local economy. A concluding discussion describes the routes visitors take to enter and exit the Park, as traffic patterns can influence adjacent localities' economic wellbeing.

#### Population

According to the 2000 U.S. Census, the project area's population is 36,267 (USCB 2000). Pecos County composes approximately 46 percent of this population, with 16,809 residents. Of these residents, 13,953 live in Fort Stockton. Brewster County's population is 8,866. Most of Brewster County's population resides in Alpine. The populations of Marathon and Terlingua/Study Butte total 554 and 267, respectively. It is important to note these smaller locations, as they are the closest towns to the Park. Terlingua/Study Butte is situated approximately 35 miles west of the Park's headquarters. Marathon is situated approximately 70 miles north of Park headquarters. Presidio County's population is 7,304, most of which reside in Presidio. Populations in Jeff Davis and Terrell counties total 2,207 and 1,081, respectively. By comparison, between 1999 and 2008, the number of Park visitors during peak visitation in March averaged 52,289 (NPS 2008a).

#### Employment

The Texas Workforce Commission provides a snapshot of employment in the project area. Based on the Commission's First Quarter 2008 data, the project area employed 12,471 workers (TWC 2008). Brewster County featured the largest employment base with 4,663, followed by Pecos County with 4,542, Presidio County with 2,064, Jeff Davis County with 954, and Terrell County with 248.

The primary employment industries in the project area included trade, transportation, and utilities; leisure/hospitality; unclassified; and local government. More specifically, in Brewster County, the trade, transportation, and utilities industry totaled 1,056 employees. The

unclassified and leisure/hospitality industries followed relatively close with 831 and 809 employees, respectively. In Jeff Davis County, the unclassified industry represented the largest base, with 225 employees. Local government's 145 employees ranked second. However, in Pecos and Presidio counties, local government represented the largest base with 1,181 and 535 employees, respectively. Similarly, in Terrell County, local government employed 104 workers, which represented the largest employment base.

Concerning average weekly wages, Pecos County ranked highest at \$617.94. Jeff Davis, Terrell, and Brewster counties followed at \$530.84, \$492.74, and \$488.83, respectively. Presidio County ranked lowest at \$453.25. All of the counties fell below the Texas average of \$728.40.

Based on the Commission's August 2008 unemployment rate data, Brewster and Jeff Davis counties stood at 3.7 and 4.3 percent, respectively. The Texas average was 5.1 percent; the U.S. average, 6.1 (TWC 2008a). In contrast, the Commission reported Pecos County at 5.2, Terrell County at 6.8, and Presidio County at 13.9 percent unemployment.

### Income

The project area's isolation from the state's population centers limits its ability to attract a labor force that, in turn, can attract high-paying industries. According to the 2000 U.S. Census, more than half of the household incomes in Brewster, Pecos, Presidio, and Terrell counties were less than \$30,000. In contrast, 46.1 percent of the household incomes in Jeff Davis County were less than \$30,000. Jeff Davis County also featured the project area's highest median household income at \$32,212. Pecos, Brewster, and Terrell counties followed at \$28,033, \$27,386, and \$24,219, respectively. Presidio County featured the lowest median household income at \$19,860. However, all of the counties in the project area fell below the Texas average of \$39,927.

Per capita income reflected the median household income data. More specifically, Jeff Davis County ranked highest at \$18,846. Brewster, Terrell, and Pecos counties followed at \$15,183, \$13,721, and \$12,212, respectively. Presidio County ranked lowest at \$9,558. Again, all of the counties fell below the Texas average of \$19,617.

### Visitor Spending

Visitor spending at the Park can produce direct and secondary effects on the local economy. According to a 2003 NPS economic study, visitor spending totaled \$11.25 million. On average, visitors spent \$83 per party per day in the local area. The direct effects of this spending covered sales, income, and jobs in businesses selling goods and services directly to Park visitors. The direct effects included \$8.7 million in sales, \$4.42 million in value added, and \$2.94 million in wages and salaries, which supported 248 jobs. The hotel sector realized the largest sales with \$3.28 million, restaurants and bars followed with \$2.21 million, retail trade with \$1.15 million, and amusements with \$1.03 million. As visitor spending circulated through the local economy, secondary effects created an additional \$2.87 million in sales, \$1.78 million in value added, and \$970,000 in wages and salaries, which supported an additional 44 jobs. Collectively, visitor spending totaled \$11.57 million in sales, \$6.2 million in value added, and \$3.9 million in wages and salaries, which supported 292 jobs (NPS 2003).

Driving patterns can influence the project area's economic wellbeing as Park visitors stop at banks, convenience stores, gas stations, hotels, and restaurants. Between 1999 and 2008, during peak visitation in March, 182,001 vehicles entered the Park. Of this total, 65 percent entered from the west along Route 118, which connects to Terlingua/Study Butte. In contrast, 35 percent of visitor traffic entered the Park from the north along Route 385, which connects to Marathon (NPS 2008a).

## Intensity Level Definitions

The methodology used for assessing impacts to socioeconomics is based on effects on nearby towns, economic contribution of the Park to local economies, and land uses external to Park boundaries. The impact intensity thresholds for this impact assessment are:

- Negligible:** No effects would occur or the effects to socioeconomic conditions would be below or at the level of detection. The effect would be slight and no long-term effects to socioeconomic conditions would occur.
- Minor:** The effects to socioeconomic conditions would be detectable. While the effects would likely be short-term, they could also be long-term. However, any effects would be small and if mitigation were needed to offset potential adverse effects, it would be simple and successful.
- Moderate:** The effects to socioeconomic conditions would be readily apparent and likely long-term. Any effects would result in changes to socioeconomic conditions on a local scale. If mitigation is needed to offset potential adverse effects, it could be extensive, but would likely be successful.
- Major:** The effects to socioeconomic conditions would be readily apparent, long-term, and would cause substantial changes to socioeconomic conditions in the region. Mitigation measures to offset potential adverse effects would be extensive and their success could not be guaranteed.

The thresholds of change for the duration of an impact on socioeconomics are defined as follows:

**Short-term:** Effects last one year or less.

**Long-term:** Effects last longer than one year.

## Regulations and Policies

Current laws and policies require that the following conditions be achieved for socioeconomics in the Park:

Desired Condition	Source
NPS must consider potential direct and indirect impacts to the local economy, including impacts to neighboring businesses in the general project vicinity.	NPS DO-12

## Impacts of Alternative A (No Action Alternative)

Under the No Action Alternative, the NPS would not construct a new trail in the project area. The No Action Alternative would maintain existing socioeconomic conditions in the Park and surrounding communities.

## Cumulative Effects

The No Action Alternative would not contribute to cumulative impacts on socioeconomics.

## Conclusion

The No Action Alternative would not result in any impacts on socioeconomics. Additionally, Alternative A would not result in unacceptable impacts to socioeconomic conditions in the Park or in the surrounding communities.

## Impacts of Alternative B (Multi-Use Trail)

Under Alternative B, the NPS would construct a multi-use trail in the project area for hiking and mountain biking. Alternative B would be expected to have minor short- and long-term beneficial impacts on the local economy. The multi-use trail would have minor effects on socioeconomic conditions because Park visitation and visitor spending would not be expected to increase substantially. Because the Park is relatively isolated from population centers, it is likely that the proposed trail would be used primarily by local Park residents (250 to 300 people). IMBA projected the Park would attract about 2,000 mountain bikers per year as a result of the new multi-use trail. However, considering the proposed trail's relatively short length and terrain, coupled with other existing and more challenging mountain biking trails in communities west of the Park including Study Butte, Terlingua, and Big Bend Ranch State Park, it may discourage mountain bikers who enjoy longer and more challenging rides. These types of mountain bikers may choose to spend their time, and their money, elsewhere.

Alternative B would likely have long-term effects on socioeconomic conditions, particularly during the spring when Park visitation is typically at its highest. More specifically, as visitation peaks in the spring, it might increase the sales for local businesses including convenience stores, gas stations, hotels, restaurants, and shops. Increases in sales could create the demand for hiring additional staff. As this employment base grows in the communities that surround the Park, so does local residents' per capita incomes, albeit on a seasonal basis. Construction of the trail and its associated facilities could employ local labor and help lower Brewster County's unemployment rate over the short-term. The laborers' income could then circulate through the local economy as they purchase goods and services.

Additionally, Alternative B could also have long-term effects on the local economy because the multi-use trail would be a permanent facility. Park visitors would have access to the multi-use trail throughout the year. Thus, visitor spending in the local economy might not only increase during the construction period, but it could boost the economy throughout the year.

In sum, implementing Alternative B would benefit the local economy. However, the benefits would only slightly improve existing socioeconomic conditions.

## **Cumulative Effects**

Past and present projects in Panther Junction that have affected socioeconomics include the new water storage tank and expansion of the visitor center in Panther Junction. During construction these new facilities provided short-term employment and income to construction workers from surrounding communities. These new facilities also support the projected growth in staff and facilities at Panther Junction contributing to Park employment, income, and visitor spending. Future projects that would affect socioeconomics include the new and expanded developments proposed at Panther Junction. These new developments would generate employment and income over the short-term during construction. Over the long-term, these new facilities would increase employment, income, and visitor spending in the Park. Overall, the cumulative effects of past, present, and future projects on socioeconomic conditions in the Park and surrounding communities would be moderate, beneficial, and short- and long-term. Alternative B would contribute to these beneficial impacts on socioeconomics; however, the contribution would not change the intensity level of cumulative effects.

## **Conclusion**

Alternative B would likely result in minor, beneficial, short- and long-term impacts on local socioeconomic conditions. Cumulative impacts on socioeconomics from Alternative B in conjunction with past, present, and future projects would be moderate, beneficial, short- and long-term. Alternative B would not result in unacceptable impacts to socioeconomic conditions in the Park or in the surrounding communities.

## **Impacts of Alternative C (Hiking Only Trail)**

Under Alternative C, the NPS would construct a trail in the project area for hikers only. As with Alternative B, implementing Alternative C would be expected to have minor, short- and long-term beneficial effects on the local economy. Currently, Big Bend's residents and visitors enjoy the Park's existing hiking trails. Alternative C would provide an existing user group with additional hiking opportunities. In this way, Park visitation and visitor spending would not be expected to increase substantially relative to existing conditions. Additionally, similar to Alternative B, local labor and income may rise during the trail's construction, providing short-term benefits to the local economy.

## **Cumulative Effects**

Past and present projects in Panther Junction that have affected socioeconomics include the new water storage tank and expansion of the visitor center in Panther Junction. During construction these new facilities provided short-term employment and income to construction workers from surrounding communities. These new facilities also support the projected growth in staff and facilities at Panther Junction contributing to Park employment, income, and visitor spending. Future projects that would affect socioeconomics include the new and expanded

developments proposed at Panther Junction. These new developments would generate employment and income over the short-term during construction. Over the long-term, these new facilities would increase employment, income, and visitor spending in the Park. Overall, the cumulative effects of past, present, and future projects on socioeconomic conditions in the Park and surrounding communities would be moderate, beneficial, and short- and long-term. Alternative C would contribute to these beneficial impacts on socioeconomics; however, the contribution would not change the intensity level of cumulative effects.

## **Conclusion**

Alternative C would likely result in minor, beneficial, short- and long-term impacts on local socioeconomic conditions. Cumulative impacts on socioeconomics from Alternative C in conjunction with past, present, and future projects would be moderate, beneficial, short- and long-term. Alternative C would not result in unacceptable impacts to socioeconomic conditions in the Park or in the surrounding communities.

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## UNACCEPTABLE IMPACTS AND IMPAIRMENT ANALYSIS

As previously described, unacceptable impacts are those that fall short of impairment, but are still not acceptable within a particular park's environment. As defined in §8.2 of 2006 Management Policies, unacceptable impacts are impacts that, individually or cumulatively, would:

- be inconsistent with a park's purposes or values, or
- impede the attainment of a park's desired future conditions for natural and cultural resources as identified through the park's planning process, or
- create an unsafe or unhealthful environment for visitors or employees, or
- diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values, or
- unreasonably interfere with park programs or activities, or an appropriate use, or
- the atmosphere of peace and tranquility, or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the park, or
- NPS concessioner or contractor operations or services.

Neither alternative is inconsistent with Big Bend's purposes and values. The park was established for resource protection and recreational purposes for the benefit and enjoyment of visitors. All the alternatives protect resources and provide recreational opportunities for visitor enjoyment. None of the alternatives impede the attainment of the parks' desired future conditions; in fact the desired conditions of other park plans and policies are included in the purpose and objectives of the proposed project.

The analysis of effects on soils indicated that there are no major adverse effects; effects were analyzed as minor and localized. Under Alternatives B and C, trail construction would cause minimal ground disturbance increasing the potential for erosion by wind and water. The analysis of effects on water resources indicated that adverse impacts would be negligible to minor from increased impervious surface and storm water runoff, concentration of runoff on trail, and redirection of natural surface flows. Potential risk to trail users from flash floods would be negligible since signs warning the public of flood hazards and where to go when there is a flood would be located at trailheads for both alternatives. The removal of vegetation for construction of the trail under Alternatives B and C would result in minor, long-term impacts on vegetation and increase the potential for the spread of exotic species. Both action alternatives would have moderate beneficial impacts on visitor use from increased recreational opportunities in Panther Junction. Minor adverse impacts to visitor safety may result from potential conflicts between hikers and bikers, risk of heat exhaustion, accidents and injuries. Visitor safety measures such as display of rules, recommendations, safety information, and maps at trailheads would be implemented to reduce the likelihood of adverse impacts. Construction of Phase 1 of the trail would have minor adverse impacts on archeological resources in the Lone Mountain area of the park from potential off-trail use. Off-trail use would be discouraged and minimized by mitigation measures such as the use of natural barriers and education of trail users. The action alternatives would have minor beneficial impacts on local socioeconomic

conditions from the potential for increased Park visitation, visitor spending, employment, and income.

Unacceptable impacts have to be greater than major, and the alternatives will have impacts less than major. Guided by this analysis and the Superintendent's professional judgment, there would be no impairment of park resources and values from implementation of Alternatives A, B and C.

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## CONSULTATION AND COORDINATION

The NPS engaged the following public process to ensure that the discussions above reflect the concerns of the general public; Park staff; local, state, and Federal agencies; and non-governmental organizations.

### EXTERNAL SCOPING

The NPS commenced a 30-day public scoping period from January 26, 2006 to February 26, 2006. During this period, the NPS held two public scoping meetings to gather input from the general public, agencies, and organizations concerning the proposed multi-use trail. The first public scoping meeting was held on January 30, 2006 at Sul Ross State University in Alpine, Texas. The second meeting took place on January 31, 2006 at the Community Center in Study Butte, Texas. Both meetings began at 7:00 p.m. Twenty persons attended the first meeting and 24 persons attended the second. During the 2006 public scoping period, most of the comments received supported the possibility of mountain biking in the Park. Over the next year, the Park selected a proposed trail route and conducted resource surveys.

In 2008, the NPS revisited the proposal and opened another 30-day public scoping period from August 22 to September 20. Two public scoping meetings were held during this period. On August 21, 2008, the NPS published the meeting notices in local newspapers serving communities surrounding the Park. Appendix A presents the public meeting notices that appeared in local newspapers. The first public scoping meeting was held on September 10, 2008 from 7:00 p.m. to 9:00 p.m. at the Brewster County Community Center in Study Butte, Texas. The second meeting took place on September 11, 2008 from 6:30 p.m. to 8:30 p.m. at Sul Ross State University in Alpine, Texas. Ten persons attended the first meeting and 14 persons attended the second. During each meeting, the NPS provided comment forms to meeting attendants and encouraged them to submit written comments for consideration in preparing this Environmental Assessment. The forms included the Park Superintendent's mailing address on the reverse side to enable attendants to mail the forms at a later date. Eight written comments were received during the public scoping meetings. All of the written comments support the multi-use trail proposal.

The NPS also received four letters and one e-mail during the public scoping period. A letter from the Big Bend Trails Alliance supported the proposal, while a letter from the Sierra Club opposed it. The International Boundary and Water Commission's letter "applauds the efforts to increase recreational activities at the park" and had "no comments at this time" concerning the multi-use trail proposal. The Texas Parks and Wildlife Department's letter encouraged the Park to continue coordinating with the Department to avoid or minimize impacts to wildlife and wildlife habitat. An e-mailed comment suggested using existing ranch roads to accommodate the multi-use trail. Additionally, the NPS collected public comments electronically via the PEPC website. During the public scoping period, most of the comments received via the PEPC website supported the proposed multi-use trail. It is also important to note that, of the PEPC comments supporting the proposal, approximately 60 percent were submitted as standard text. That is, each comment repeated the same discussions supporting the possibility of mountain biking in the Park. Further, of the 60 percent that were standard comments, approximately half of these

were submitted by IMBA members. Additionally, many standard comments were submitted by members of other mountain biking associations.

## INTERNAL SCOPING

Big Bend National Park's interdisciplinary staff of environmental resource, visitor use, and trail maintenance specialists conducted internal scoping. The first formal internal scoping meeting was held between key NPS staff and representatives of IMBA on October 9, 2005. During the same time as the external public scoping period described above, the NPS held three "all-staff invited" internal scoping meetings on February 14, 16, and 24, 2006 at the Panther Junction auditorium. Approximately 15 to 20 people attended one of these meetings and 48 comments were received, none in support of the proposal.

On July 30, 2008, interdisciplinary team members held a project kick-off meeting to discuss the project's purpose and need, various alternatives, and potential environmental impacts. After the project kick-off meeting, some interdisciplinary team members conducted a site visit to the proposed project area.

## ENVIRONMENTAL ASSESSMENT REVIEW PERIOD

The NPS released the original EA for public review from March 4, 2011 through April 2, 2011. To inform the public of the EA's availability, the NPS published and distributed a press release to media outlets, including local newspapers, and sent letters to various agencies, tribes, and members of the public on the NPS's mailing list. Copies of the EA were provided to interested individuals upon request. The EA was available for review at <http://parkplanning.nps.gov/bibe>.

The original EA resulted in a Finding of No Significant Impact (FONSI). The FONSI also addressed substantive comments and provided corrections to errata in the original EA. Unfortunately, the FONSI was not published upon approval due to a clerical oversight. In recognition of this error, the Park is releasing a revised EA for an additional 30 day public review. The revised EA provides additional details that may help clarify some issues and corrects errata in the original EA.

The revised EA is subject to a 30-day public comment period. During this time, the public is encouraged to submit their written comments on-line to <http://parkplanning.nps.gov/bibe> or to the NPS address provided 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 Environmental Assessment/Assessment of Effect, as needed. The decision document will then be published to notify the public of the NPS's final decision.

## REGULATORY COMPLIANCE

Bicycling within the Park is restricted to paved and unpaved roads open to motor vehicle use. Planning, designing, and constructing a multi-use trail to accommodate mountain biking would

require amending Title 36, Part 4, Section 4.30 of the Code of Federal Regulations. More specifically, Section 4.30 (b) states “routes designated for bicycle use shall be promulgated as special regulations.” Thus, the NPS would create a special regulation to permit mountain biking on the proposed multi-use trail. It is important to note that the special regulation would apply only to the multi-use trail at Big Bend National Park. To create the special regulation, the NPS would adhere to the following Federal rulemaking process:

- Advance notice of proposed rulemaking
- The NPS would publish the initial analysis of the subject matter and ask for early public input
- Proposed rulemaking
- The NPS would submit the proposed rule for Office of Management and Budget (OMB) review
- The NPS would publish the proposed rule in the Federal Register for public comment
- Public comment period of 30 to 180 days
- Final rule and Congressional review
- OMB would review rule again
- The NPS would publish the final rule in the Federal Register, respond to public comments, and submit the rule to Congress and General Accounting Office
- Effective date of rule would be a 30 day minimum following initial publication

## LIST OF PREPARERS

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- Wendy Hosman, Water Resources Specialist
- Ben Bainbridge, Wildlife Biologist
- Jill Norton, Geographic Information System (GIS) Specialist

### Contributors (provided information and guidance):

NPS Big Bend National Park, Texas

- Bill Wellman, Park Superintendent (2006-2012)
- Cindy Ott-Jones, Park Superintendent (2012-current)
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- Raymond Skiles, Acting Chief Science and Resource Management (2007-2009)
- Phil Wilson, Chief Science and Resource Management (2010-2012)
- David Larson, Chief Science and Resource Management (2012-current)
- David Elkowitz, Chief of Interpretation and Visitor Services
- Joe Sirotnak, Botanist
- Don Corrick, Geologist and Paleontologist
- Thomas Alex, Archeologist
- Betty Alex, GIS Specialist
- Erik Walker, Trail Supervisor
- Jeffery Bennett, Hydrologist and Physical Scientist
- Chris Turk, Regional Environmental Coordinator
- Mark Spier, Chief, Division of Visitor and Resource Protection
- Lisa Turecek, Chief of Facilities Management

Public Cooperators

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### Reviewers (provided guidance and recommendations on content):

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- Chris Turk, Regional Environmental Coordinator
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- Lisa Turecek, Chief of Facilities Management
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# APPENDIX A: PUBLIC MEETING NOTICE



## Big Bend National Park News Release

**For Immediate Release:** August 18, 2008

**Contact:** David Elkowitz (432) 477-1107

### **Big Bend National Park Seeks Comment, Sets Public Meetings on Proposal to Develop Multi-Use Mountain Biking Trail**

**Big Bend National Park** – The National Park Service (NPS) proposes to construct a new multi-use trail, to include mountain biking, in Big Bend backcountry. The public, organizations, and other agencies are invited to help the NPS identify issues, questions and concerns related to the proposal.

The 30-day Public Comment period begins August 22. Public meetings will be held in Study Butte on September 10 and in Alpine on September 11. Comments will be considered in development of an Environmental Assessment (EA), a decision-making process that will analyze the proposal and alternatives to the proposal. The EA will be developed in the coming year.

The proposed new trail would be located in currently undeveloped backcountry, northeast of Panther Junction. Nearly five miles of trail would be constructed for use by hikers, horseback riders, and bicyclists. The proposal includes creating a trailhead parking and picnic area near the Panther Junction Visitor Center, and a second trailhead along the Grapevine Hills road. The area is not within the Recommended Wilderness areas of Big Bend backcountry, which remain off-limits to mountain bikes.

The purpose of the proposed project is to provide new recreational opportunities to park visitors, including an experience not currently available to bicyclists. The proposal results from a 2002 Memorandum of Agreement between the NPS and the International Mountain Biking Association, established for the purpose of identifying mountain biking opportunities in the national parks.

Because federal regulations currently prohibit use of bicycles off of existing paved and unpaved roads in all units of the National Park system, formal federal rulemaking would be required to create an exception at Big Bend, including publication in the Federal Register and an associated public comment period.

The 30-day public scoping / comment period begins August 22, 2008 and ends September 20, 2008. Public Meetings will be held September 10, 7 to 9 p.m. at the Brewster County Community Center in Study Butte, and September 11, 6:30 to 8:30 p.m. at the Sul Ross State University - Espino Conference Center. Meetings will follow an Open-House format, with a general presentation beginning at 7:30 in Study Butte and 7:00 in Alpine.

To provide comments and identify issues for consideration, visit the National Park Service Planning, Environment and Public Comment (PEPC) website at: <http://parkplanning.nps.gov/bibe> during the comment period. Written comments may be submitted on the PEPC website, at a public meeting, or may be sent to: Superintendent, P.O. Box 129, Big Bend National Park, Texas, 79834.

The EA will be prepared in accordance with the National Environmental Policy Act of 1969, the Council on Environmental Quality regulations (40 CFR 1500 et seq), and NPS Director's Order 12: *Conservation Planning, Environmental Impact Analysis, and Decision-making*.

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 public at any time. While you can ask in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

**--END--**