

Big Cypress National Preserve  
Florida Panther National Wildlife Refuge  
U.S. Department of the Interior

National Park Service  
U.S. Fish and Wildlife Service



# Fire Management Plans Environmental Assessment

July 2016



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# Fire Management Plans

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## Environmental Assessment

### Summary

In accordance with the National Environmental Policy Act (NEPA) and federal wildland fire policy, the Big Cypress National Preserve (hereafter Preserve or BICY) and Florida Panther National Wildlife Refuge (hereafter Refuge or FPNWR) managers have jointly prepared this Environmental Assessment (EA) for updating their respective Fire Management Plans (FMPs).

The two units are adjacent to each other, already work cooperatively on fire management activities, and have similar resources and issues. The agencies feel that a joint NEPA process is more efficient and cost effective than two separate and redundant processes. This EA analyzes the environmental impacts of proposed updates, changes in fire management strategies, and management of threatened and endangered species.

Updated FMPs are required by agency policy. Updates help keep management objectives current and adopt/refine strategies that help the fire management programs operate more effectively. Updated FMPs provide fresh focus on restoring fire-dependent communities and threatened and endangered species. Lastly, they incorporate updates in national fire policy and terminology. In their new FMPs, BICY and FPNWR are considering strategies to increase their ability to actively manage wildland fire and vegetation/fuels.

This EA evaluates two alternatives—a No Action Alternative (A) and one Action Alternative (B).

Under Alternative A, the current fire management practices at BICY and FPNWR would continue. Both units would continue implementing the strategies in their current FMPs, which include fire suppression, prescribed burning, and the use of mechanical treatments. Alternative A could have attendant negative effects resulting from suppression of wildfires burning under favorable conditions that could provide hazard fuel reduction and ecosystem restoration services. BICY would continue to be limited in utilizing mechanical equipment for protection of human values and structures. Alternative A could lead to an insufficient number of acres burned, or lower-priority areas being burned, which may impact recovery and maintenance of fire-adapted plant and wildlife communities.

Alternative B would use all of the same fire management techniques and tools allowed under Alternative A with two added options. BICY would augment their ability to use mechanical treatments to reduce hazard fuels, maintain defensible space and fuel breaks to protect infrastructure and private property, and restore cultural landscapes. BICY could also consider managing wildfires for resource objectives. Alternative B would more clearly outline allowable fire management activities for FPNWR and would provide a more robust analysis of the fire management tools and techniques they utilize. Alternative B would provide greater efficiency and flexibility for BICY and FPNWR to meet agency requirements and resource management goals and objectives. Each alternative is described in more detail in the “Alternatives Carried Forward” section of Chapter 2.

This EA has been prepared in compliance with NEPA to provide the decision-making framework that:

- 1) Analyzes a reasonable range of alternatives to meet objectives of the proposed plans;

2) Evaluates potential issues and impacts to the natural and cultural resources of BICY and FPNWR; and

3) Identifies mitigation measures that are designed to lessen the degree or extent of these impacts.

Resource topics determined to potentially be affected by the alternatives include: air quality, water resources (including wetlands), vegetation (including invasive species), wildlife and their habitat (including invasive species), special status species, cultural resources (including archeological and ethnographic resources), wilderness, visitor use and experience, land use (including tribal use), socioeconomics, and human health and safety. All impacts were determined to be moderate or less in intensity, with many beneficial impacts. Public scoping was conducted to assist with the development of this document and development of the alternatives; the comments received were considered in the evaluation of effects.

### **Public Comment**

If you wish to comment on this EA, you are encouraged to post comments online at <http://parkplanning.nps.gov/BICY>, or you may mail to **Superintendent, Big Cypress National Preserve, 33100 Tamiami Trail East, Ochopee, FL 34141-1000**, or hand deliver to BICY or FPNWR offices. This EA will be available for public review and comment for 30 days.

Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment—including your personal identifying information—may be made publicly available at any time. Although you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

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## CHAPTER 1—PURPOSE AND NEED

### Introduction

BICY and FPNWR are located in south Florida (Figure 1), which contains various vegetative and aquatic habitats, many of which are conserved and managed by federal and state agencies. South Florida contains a dynamic mixture of tropical and temperate plant communities and is home to a diversity of wildlife, including a wide assortment of threatened and endangered animal and plant species. BICY and FPNWR contain fire-dependent habitats, which historically burned with low to moderate burn severity. Fire-dependent communities, such as marl prairie and pine flatwoods, are those where fire is essential for species to reproduce and grow. Natural fire intervals range from as frequent as 3 to 5 years in prairies to as long as 50 to 100 years in mixed hardwood swamps (Burch 2003).

BICY was created by Congress in 1974 and expanded in 1988 (the Addition) to protect the watershed values of the Big Cypress Swamp while integrating multiple human uses with conservation and preservation. It consists of 729,000 acres of extensive prairies and marshes, forested swamps, pinelands, hardwood hammocks, and shallow sloughs. Scattered throughout the Preserve are a number of Native American villages and homesites, single-family dwellings and backcountry camps (800 structures), visitor facilities, an airport, canals, highways, off-road vehicle (ORV) trails, power lines, and other infrastructure. BICY allows multiple human uses, including hunting, fishing, ORVs, and mineral extraction, in addition to most typical recreational uses found in national park units. Eligible and proposed wilderness has been identified in BICY and is managed to preserve wilderness character until Congress makes a decision regarding wilderness designation.

FPNWR was established in 1989 when the U. S. Fish and Wildlife Service (FWS) purchased 24,300 acres from the Collier family to facilitate the recovery of the endangered Florida panther (*Puma concolor coryi*). FPNWR is currently 26,400 acres characterized by mixed forest, cypress, subtropical hardwood hammocks, slash pine, saw palmetto, and wet prairies and sloughs. FPNWR habitats support the greatest number of native orchids in North America. While FPNWR focuses on maintaining habitat and prey for the Florida panther, it also protects other wildlife and threatened and endangered species. FPNWR is mostly closed to the public, with only two hiking trails and an annual open house event.

### Preserve/Refuge Descriptions

The purpose of BICY, as stated in Public Law (P.L.) 93-440, is “to assure the preservation, conservation, and protection of the natural, scenic, hydrologic, floral and faunal, and recreational values of the Big Cypress Watershed in the State of Florida and to provide for the enhancement and public enjoyment thereof.”

BICY is significant because it:

- Is a large wetland mosaic that supports a vast remnant of vegetation types found only in this mix of upland and wetland environments;
- Contains the largest stands of dwarf cypress in North America;
- Is habitat for the Florida panther and other animal and plant species that receive special protection or are recognized by the State of Florida, the U.S. government, or the Convention on International Trade in Endangered Species;
- Provides opportunities for the public to pursue a wide variety of recreational activities in a subtropical environment;



- Is home to the Miccosukee Tribe of Indians of Florida and Seminole Tribe of Florida and sustains resources that are important to their cultures; and
- Is a watershed that is a critical component to the survival of the greater Everglades ecosystem.

The purpose of FPNWR is to conserve fish, wildlife, and plants which are federally listed as threatened and/or endangered species under the Endangered Species Act of 1973 (ESA). In addition, the Refuge was established for the development, advancement, management, conservation, and protection of fish and wildlife resources as stated in the Fish and Wildlife Act of 1956. While focused on providing habitat for the endangered Florida panther, FPNWR also seeks to restore ecosystems and provide habitat for other sensitive species.

The following priorities have been determined by FWS to apply to the south Florida ecosystem, which includes FPNWR (FWS 2000):

- Protect and manage units of the National Wildlife Refuge System and other national interest lands.
- Protect migratory birds and protect, restore, and manage their habitats.
- Protect, restore, and manage candidate, threatened, and endangered species and their habitats.
- Protect, restore, and manage wetlands and other freshwater habitats.
- Protect, restore, and manage fish and other aquatic species and their habitats.
- Protect, restore, and manage for biodiversity.

### **Proposed Action**

BICY and FPNWR propose to implement updated FMPs that include descriptions and management objectives related to wildfire, prescribed fire, and mechanical fuels reduction. FMPs are strategic, operational documents that provide policy, objectives, and guidance for fire management staff in managing their fire management program while pursuing resource management goals and objectives and meeting agency requirements.

This EA analyzes the environmental impacts associated with the proposed action and was prepared in accordance with NEPA regulations of the Council on Environmental Quality (CEQ) (40 CFR §1508.9), the National Park Service (NPS) Director's Order (DO)-12 (Conservation Planning, Environmental Impact Analysis, Decision-Making), and the FWS Manual 550 FW 3 (Documenting and Implementing Decisions).

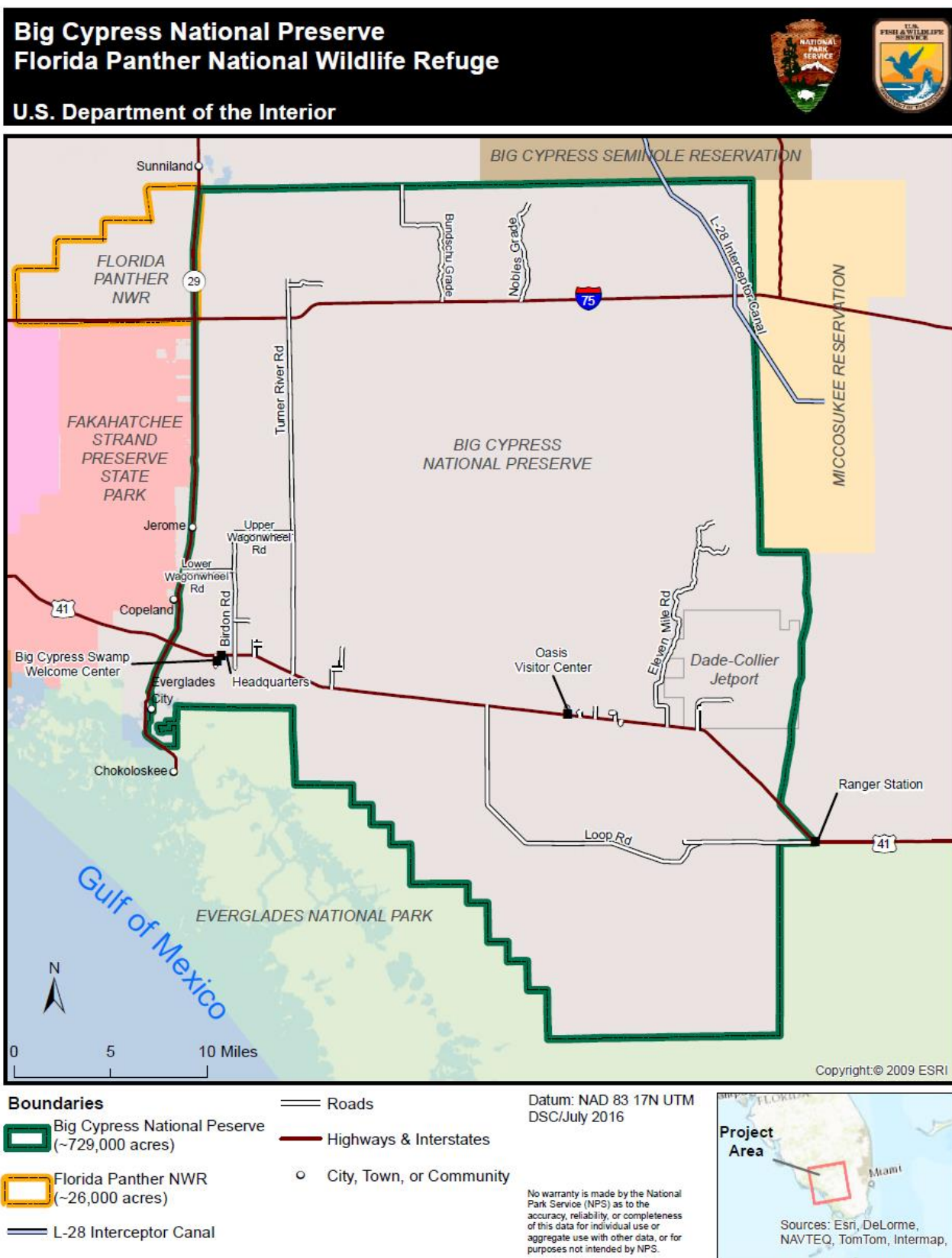


Figure 1. Vicinity Map of BICY and FPNWR.

### **Fire Management in the Preserve/Refuge**

Historically, fires played an integral role in the maintenance of south Florida ecosystems. Many of the habitats and species adaptations that exist in the greater Big Cypress area resulted from frequent burning by wildland fires. Wade et al. (1980) indicated that 70% of plants endemic to southern Florida occur in fire-dependent communities. Fire-dependent plant and wildlife communities developed over eons and require burning to maintain unique plant and animal relationships. The Preserve has a total of 32 animal and 107 plant species that are federally or state listed as threatened or endangered or are recognized as rare species by the state of Florida. The Refuge has a total of 24 animal and 2 plant species that are federally listed as threatened or endangered or candidates for federal listing.

While there are numerous reasons why these species are imperiled, many of them are related to fire suppression and infrequent burning in certain areas. Without frequent fire, vegetative fuels build up relatively quickly in the subtropical environment. Absent reduction and restoration by fire, native habitat develops different climactic vegetation communities from those found in a frequent fire environment. Nutrients are “locked up” in live and dead vegetation instead of cycling through the active ecosystem. These fuels also develop vegetative accumulations of live and dead fuels that burn with higher severity and intensity outside the natural range of historical fires. These high-intensity fires may destroy the fundamental conditions that allowed fire-dependent species to thrive. Periodic wildfires helped maintain many of the plant communities and their associated wildlife that depend on periodic burning to reproduce and survive.

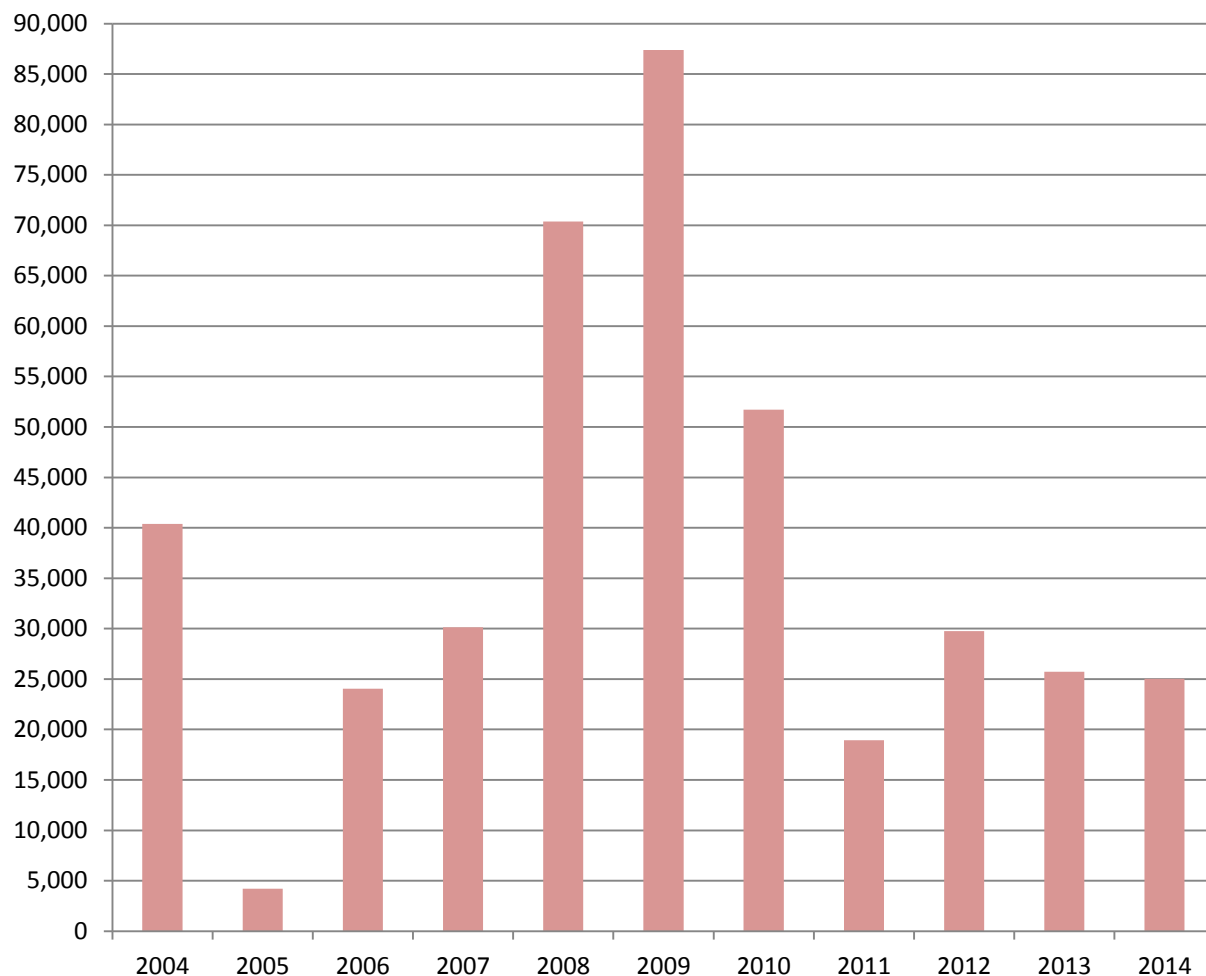
#### ***Preserve***

Besides ecosystem values, BICY contains numerous structures and recreational, cultural, and human values that were described previously. These values are located in a combustible mix of vegetation habitats that burn relatively frequently in some areas, while other areas burn infrequently resulting in fuel buildup.

Long-term experience by wildland fire agencies in south Florida and throughout the U.S. has shown that not all fires can be prevented. When fire suppression is utilized as the primary vegetation management tool, fuels sometimes build up to the point where wildfire behavior is too intense for fire agencies to control; those fires may burn with intensity and severity that may permanently damage and alter both human and ecosystem values.

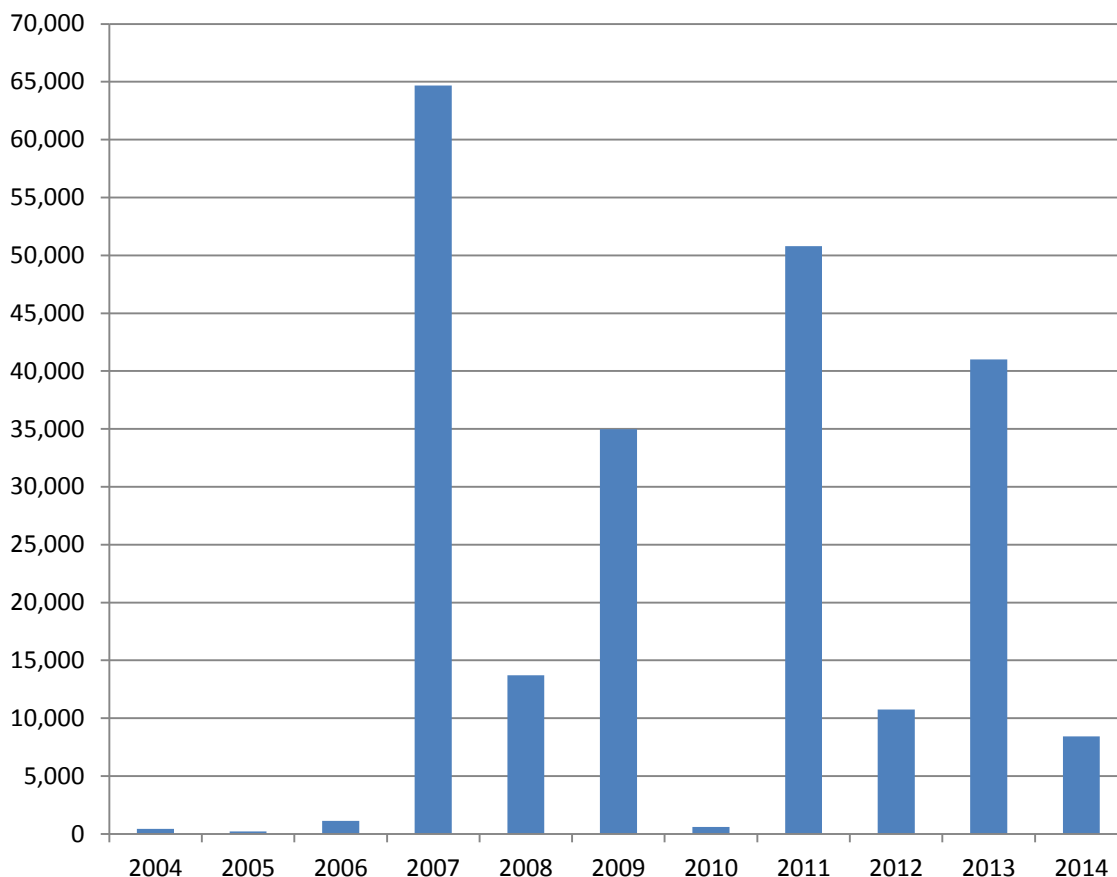
The NPS developed a FMP for BICY in 2005 that was updated annually, with a major revision in 2010. The 2010 version was most recently updated in 2015. The FMP provides for long-term direction for achieving goals for the protection of life and property and ecosystem management.

The original 2005 and updated 2010 and 2015 FMP versions utilized prescribed burning as the primary means to treat and restore vegetation at BICY. The NPS has had difficulty accomplishing enough prescribed burning to provide for ecosystem needs and protection of human values. These issues include inadequate and shrinking funding for treatment projects, a relatively small fire staff, increasing numbers of threatened and endangered species with special requirements, and erratic weather and fire prescription windows. Additionally, research shows the importance of seasonal timing of fire as a critical factor in fire-adapted communities (Burch 2003). The NPS wants to move to more “in-season” burning to benefit fire-adapted habitats and threatened and endangered species. From 2004 to 2014, BICY treated between 4,000 to 87,000 acres a year with prescribed fire (Figure 2).



**Figure 2. Annual Acres of Prescribed Fire at BICY from 2004 to 2014.**

Besides using prescribed fire, BICY also suppressed wildfires under all previous FMPs. Some of these fires escaped initial attack and became larger and were managed under a suppression confine and contain strategy, in which the fires were allowed to burn out to natural or manmade barriers. This strategy is utilized when direct attack of the fire edge is impractical and/or unreasonable because of safety, cost, firefighting resource availability, terrain, or fire behavior. While benefits to natural resources may be considered as part of the decision process for determining the response to wildfires, resource benefits may not be a primary decision factor under the current FMP. BICY has had to suppress wildfires that were burning within a natural and historic range of fire behavior variability. These fires could have provided beneficial effects to the ecosystem and minimal risk to private property and human values by reducing adjacent hazard fuels. From 2004 to 2014, about 226,500 acres in BICY were burned by wildfires, ranging from 200 acres to 65,000 acres in a year (Figure 3).



**Figure 3. Annual Acres Burned by Wildfires at BICY from 2004 to 2014.**

### *Refuge*

Although smaller than BICY, the FPNWR fire program has similar themes. It is dedicated to wildlife and habitat protection, with the focus on the Florida panther. There are no private property values on the Refuge proper, but there are three adjacent communities at risk from wildfires in Collier County and FPNWR. These are Golden Gate Estates, Immokalee, and Lee Williams. Interstate 75 (I-75), which forms the south boundary of FPNWR, is a major traffic corridor that receives focused attention from smoke on all prescribed burns and wildfires at both BICY and FPNWR. Potential smoke impacts can be a major factor in safely managing wildland fire in this area.

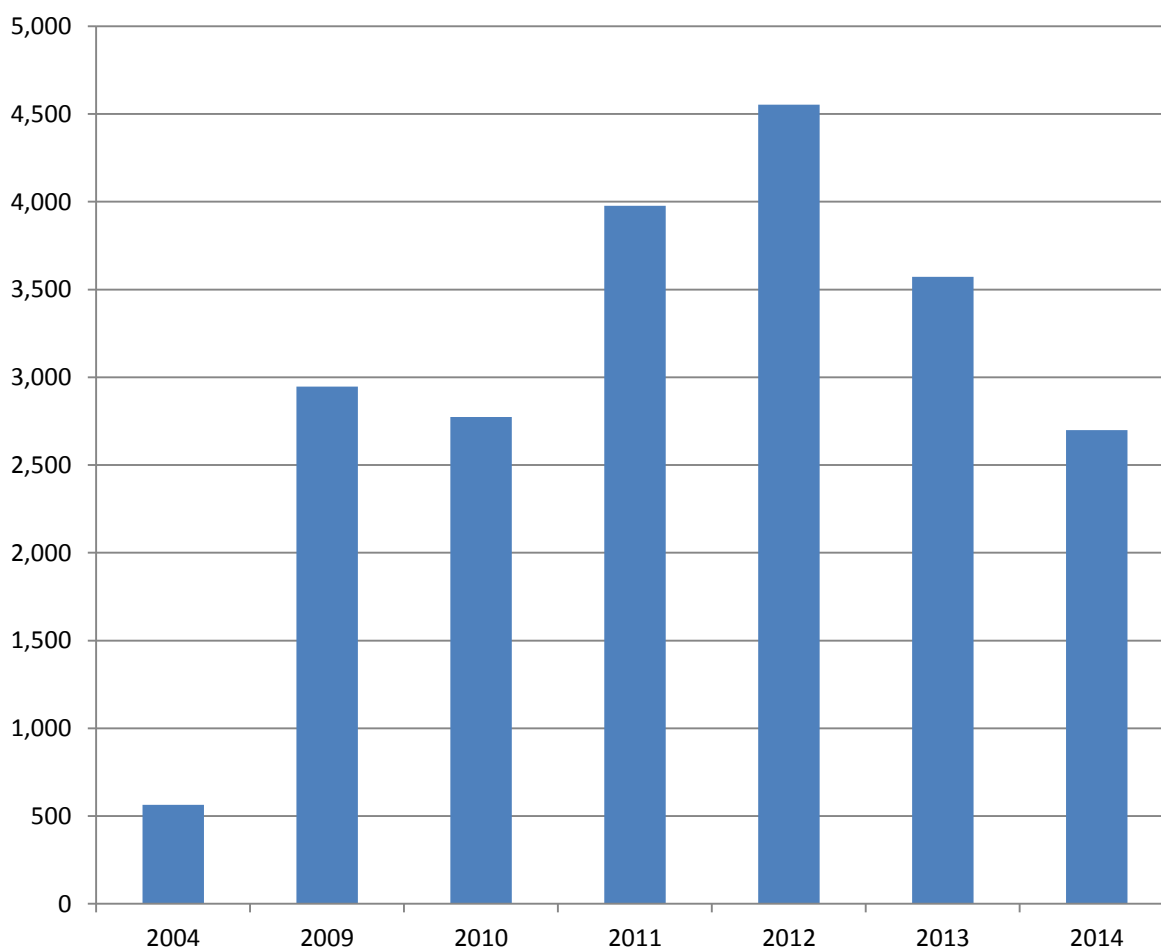
The FPNWR 2009 FMP has similar goals to the BICY FMP, but it does allow for managing wildfires for resource objectives. Because of its comparatively small size, FPNWR has had few opportunities to utilize this management strategy. From 2004 to 2014, FPNWR treated between 565 acres to 4,550 acres annually with prescribed fire (Figure 4).

FPNWR recognized early on the need to utilize fire as an ecological process and has integrated fire into various management plans. The Refuge has depended primarily on prescribed fire for vegetation restoration and maintenance. FPNWR has a smaller fire staff than BICY and has had significant budget reductions impacting prescribed burns and fuels treatments.

### *Preserve/Refuge*

The current FMPs for BICY and FPNWR may be found at <http://www.nps.gov/bicy/naturescience/fire-management-plan.htm> and [http://www.fws.gov/refuge/florida\\_panther/](http://www.fws.gov/refuge/florida_panther/), respectively.

Recently BICY and FPNWR have combined fire management staffs to share offices, fire resources, and expertise to counter reduced staffs and budgets. They carefully plan project work to ensure that each agency gets a fair share of work accomplished and believe this arrangement leads to increased efficiencies. Both agencies also cooperate with additional state and local agencies.



**Figure 4. Annual Acres of Prescribed Fire at FPNWR from 2004 to 2014.**

## **Purpose and Need**

### **Purpose**

The purpose of the proposal is to allow BICY and FPNWR to use more effective fire management strategies and updated fire terminology and to facilitate management of threatened and endangered species. FPNWR would no longer depend on the Categorical Exclusions (CEs) for their prescribed fire program (U.S. Department of the Interior (DOI) Departmental Manual, Part 516, Chapter 8.5, Resource Management 4 and 5). The overall intent of these changes is to allow BICY and FPNWR

to be more effective in meeting their resource management goals and objectives and to follow agency policy.

### **Need**

The proposed action needs to be taken because the current FMPs and compliance documents do not take into consideration the Florida bonneted bat, *Eumops floridanus*, listed as federally endangered in 2013 and found in both BICY and FPNWR. The current FMPs also do not adequately reflect updated fire management techniques, strategies, and fire terminology. Updated FMPs would provide a management framework for all BICY and FPNWR wildland fire activities, both planned and unplanned, that would best meet overall resource management and human value protection goals.

### **Objectives in Taking Actions**

Objectives are purpose statements that describe what must be accomplished to a large degree for the action to be considered a success (NPS 2011). Based on consideration of the purpose and need, the following overarching fire management objectives for BICY and FPNWR were developed by agency staff during the scoping portions of the project:

1. Ensure that firefighter and public safety are the first priority in all fire management activities.
2. Facilitate the protection of private property, infrastructure and federal facilities, critical transportation corridors, recreational values, and other special values within and adjacent to BICY and FPNWR.
3. Enhance the protection of natural and cultural resources with fire management activities. This includes taking actions related to:
  - Protecting and enhancing threatened and endangered species and their habitats, migratory birds, and eligible and proposed wilderness;
  - Sustaining a healthy ecosystem;
  - Perpetuating, restoring, replacing, and/or replicating natural ecosystem processes when practical; and
  - Preventing the further invasion and spread of non-native invasive plants.
4. Use wildland fire response strategies, prescribed fire, and vegetation management activities where and when appropriate to reduce hazard fuels and meet BICY and FPNWR natural resource objectives.
5. Encourage and support monitoring and research to advance the understanding of local fire behavior, fire effects, ecology, and fire management while using adaptive management to update and improve fire management activities.
6. Promote public education and understanding of fire processes and management.
7. Conduct fire management activities in an efficient, cost effective manner and to ensure progress toward BICY and FPNWR management goals and objectives.
8. Promote an interagency ecosystem approach for fire management activities that includes federal, tribal, state, and local agencies.



## **Relationship to Other Laws, Regulations, and Policies**

Numerous laws, regulations, and policies at the federal and state levels guide the decisions and actions regarding this EA. The primary legal and regulatory requirements that relate to fire management in BICY and FPNWR include the following.

### **Federal Laws and Executive Orders**

#### *National Environmental Policy Act of 1969*

Section 102(2) (c) of NEPA (42 USC § 4321) requires that an environmental analysis be prepared for proposed federal actions that may significantly affect the quality of the human environment or are major or controversial federal actions. NEPA is implemented through regulations of the CEQ (40 CFR 1500-1508), DOI (43 CFR Part 46), and Departmental Manual 516. DOI, NPS, and FWS have, in turn, adopted procedures to comply with the act and the CEQ regulations. Section 102(2) (c) of this act requires that a detailed environmental analysis be prepared for proposed major federal actions that may significantly affect the quality of the human environment. Fire management within BICY and FPNWR is considered a major federal action; therefore, a NEPA analysis and documentation is required.

#### *National Historic Preservation Act of 1966*

The National Historic Preservation Act (16 USC § 470) was enacted to preserve historical and archeological sites in the U.S. This act created the National Register of Historic Places (NRHP), the list of National Historic Landmarks, and the State Historic Preservation Offices. The National Historic Preservation Act (NHPA) requires federal agencies to consider the effects of their undertakings on properties listed or potentially eligible for listing on the NRHP. In accordance with this act, coordination was conducted with the State Historic Preservation Officer (SHPO) for this EA.

#### *Endangered Species Act of 1973*

The ESA (16 USC § 1531-1543) requires all federal agencies to consult with the Secretary of the Interior on all projects and proposals with the potential to impact federally endangered or threatened plants and animals. It also requires federal agencies to use their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of endangered and threatened species and to ensure that any agency action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of designated critical habitat. This act was reviewed in the development of this EA for impacts to federally endangered and threatened species, including the Florida panther.

#### *Executive Order (EO) 13112—Invasive Species*

This EO requires federal agencies to prevent the introduction of invasive species, provide for their control, and minimize the economic, ecological, and human health impacts that invasive species may cause. Since fire management activities could potentially have an impact on invasive species in BICY or FPNWR, this EO was reviewed in the development of this EA.

#### *Executive Order 11990—Protection of Wetlands*

This EO directs federal agencies to avoid, to the extent possible, long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands where there is another practicable alternative. Further,



Section 404 of the Clean Water Act authorizes the U.S. Army Corps of Engineers to prohibit or regulate, through a permitting process, discharge of dredged or fill material or excavation within waters of the United States. NPS Director's Order 77-1 *Wetlands Protection*, strives to prevent the loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.

### **National Park Service Laws and Policies**

#### *National Park Service Organic Act (1916)*

NPS managers are tasked with the mission to preserve unimpaired the natural and cultural resources and values of the national park system for the enjoyment and education of future generations.

#### *NPS Management Policies and Director's Orders*

In accordance with the NPS Management Policies 2006, the wildland fire management program will be designed to protect natural and cultural resource objectives; address potential impacts on public and private land adjacent to the Preserve; protect public health and safety; and provide for safety considerations for Preserve visitors, employees, and developed facilities.

Director's Order 12 (DO-12; NPS 2011a) and the associated handbook provide guidance on how the NPS complies with NEPA. DO-12 and the handbook provide a planning process for incorporating scientific and technical information and establishing a solid administrative record for NPS projects.

Director's Order 18 (DO-18; NPS 2008) states that "Each park with burnable vegetation must have an approved Fire Management Plan that will address the need for adequate funding and staffing to support its fire management program." DO-18 defines what an approved FMP must include; emphasizing that firefighter and public safety is the first priority and an interagency approach to managing fires on an ecosystem basis across agency boundaries. DO-18 also directs parks to identify, manage, and where appropriate, reduce hazard fuels. Reference Manual 18 (RM-18) is derived from DO-18 and provides comprehensive guidance and policy for NPS fire management programs.

Director's Order 28 (DO-28) requires the consideration of impacts on historic properties that are listed or eligible to be listed in the NRHP. DO-28 states that FMPs should address cultural resource concerns and protect archeological sites, historic structures, and cultural landscape features.

Director's Order 41 (DO-41; NPS 2013) provides requirements and guidance for the management of wilderness areas. It provides accountability, consistency, and continuity with respect to the NPS wilderness program and guides NPS efforts in meeting the letter and spirit of the Wilderness Act of 1964. Section 6.7 of Director's Order 41 states that "In many NPS wilderness areas fires resulting from natural ignitions are considered a natural process that contributes to ecosystem function and are necessary to maintain wilderness in an unimpaired condition. As a result of many factors, including past fire management actions within wilderness, and the need to control wildfires on adjacent lands, fire is not adequately functioning as the natural change agent that would have been present in the ecosystem in the past. In those cases, augmenting natural ignitions with prescribed fire or other fuel treatments within wilderness may be necessary to restore or maintain ecological function."

## **U.S. Fish and Wildlife Service Laws and Policies**

### *National Wildlife Refuge System Improvement Act of 1997*

The mission of this act is to administer lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats for the benefit of the present and future generations.

### *FWS Service Manual (2015)*

In accordance with the FWS Service Manual, every unit with burnable vegetation must have a FMP unless the Regional Director determines otherwise. The fire management program will “integrate fire as an ecological process into resource management plans and activities on a landscape scale and across jurisdictional boundaries.”

### *2008 Florida Panther Recovery Plan*

This plan states that two to five year burn rotations and burn compartments less than 10 square miles are recommended to increase habitat heterogeneity for the panther and the panther’s prey species (Schortermeyer et al. 1991).

## **Other Plans, Policies, and Actions**

### *Big Cypress National Preserve General Management Plan/Environmental Impact Statement (1991)*

This plan guides visitor use, natural and cultural resource management, and general development. It provides a direction for resource management and preservation as well as appropriate visitor use and interpretation of the resources within the original Preserve boundary. This document discusses fire management and states that prescribed fire is used to meet BICY objectives.

### *Addition General Management Plan/Wilderness Study/Off-road Vehicle Management Plan/Environmental Impact Statement (2010a)*

This document provides a comprehensive direction for resource preservation and visitor use and general decision-making guidance for the Addition. Areas proposed for wilderness are also discussed in this document. This document also discusses fire ecology and management within BICY and states that wildland fire management will be used as a tool to meet NPS management objectives in the Addition.

### *South Florida and Caribbean Parks Exotic Plant Management Plan and Environmental Impact Statement (2010b)*

The NPS prepared an exotic plant management plan to control non-native plant species in nine south Florida and Caribbean park units, including BICY. Appendix A of the plan addresses BICY, and it identifies fire as an initial treatment method for some of the exotic vegetation treatments.

### *Florida Panther National Wildlife Refuge Comprehensive Conservation Plan (2000)*

This is the primary document that directs activities at FPNWR and provides objectives and strategies to meet the Refuge management goals. This plan includes objectives and strategies relevant to fire and fuels management, such as to conduct mosaic burns within fire-dependent habitats to maintain/enhance deer habitat, a panther prey species, and to use the prescribed fire

program and other habitat management tools to achieve and maintain optimum vegetative conditions for panther habitation.

### **Fire Management Guidance**

The FMPs and this EA will also conform to and help achieve the resource management goals defined in the following guidance documents:

- Department of Interior Manual, Part 620 DM, Chapter 1, Wildland Fire Management: General Policy and Procedures (USDI 1998)
- Managing the Impact of Wildfires on Communities and the Environment, A Report to the President in Response to the Wildfires of 2000 (National Fire Plan; USDI and USDA 2000)
- Protecting People and Sustaining Resources in Fire-adapted Ecosystems: A Cohesive Strategy (USFS 2000)
- Interagency Standards for Fire and Fire Aviation Operations (Red Book 2015; National Interagency Fire Center 2015)
- Guidance for Implementation of Federal Wildland Fire Management Policy (USDI and USDA 2009)
- Review and Update of the 1995 Federal Wildland Fire Management Policy January 2001 (USDI et al. 2001)
- A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-year Implementing Strategy (Wildland Fire Leadership Council 2006)
- Fish and Wildlife Service Fire Management Handbook (FWS 2015a)
- Wildland Fire Management, RM-18 (NPS 2014a)

### **Impact Topics**

#### **Impact Topics Analyzed**

This section identifies the resources and other values (impact topics) that were identified for this project that could be affected by the alternatives. Impact topics were identified on the basis of federal laws, regulations, and orders, NPS Management Policies 2006, FWS Service Manual (2015b), NPS and FWS knowledge of the resources, and public scoping. Impact topics carried forward for detailed analysis in Chapter 4 include:

- Air quality
- Vegetation (including invasive species)
- Water resources (including wetlands)
- Wildlife (including invasive species)
- Special status species
- Wilderness
- Archaeological resources
- Ethnographic resources
- Visitor use and experience
- Socioeconomics
- Land use (including tribal uses)
- Human health and safety

### **Impact Topics Dismissed from Further Analysis**

This section provides an explanation for why some impact topics were not evaluated in detail. Impact topics were dismissed from further evaluation if:

- They do not exist in the analysis area, or
- They would not be affected by the proposal, or the likelihood of impacts are not reasonably expected, or
- Through the application of mitigation measures, there would be minor or less effects (i.e. no measurable effects) from the proposal, and there is little controversy on the subject or reasons to otherwise include the topic.

The intensity and type of impact is described as negligible, minor, moderate, or major, and as beneficial or adverse. The term “major” effects equates to “significant” effects. The identification of “major” effects would trigger the need for an Environmental Impact Statement (EIS). Where the intensity of an impact could be described quantitatively, the numerical data are presented; however, most impact analyses are qualitative and use best professional judgment in making the assessment.

The term “measurable” impact is defined as moderate or greater effects. It equates “no measurable effects” as minor or less effects. “No measurable effects” is used to determine if a CE applies or if impact topics may be dismissed from further evaluation in an EA or EIS. The reason “no measurable effects” is used to determine whether impact topics are dismissed from further evaluation is to concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail, in accordance with CEQ regulations at 1500.1(b).

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

**Soils.** Impacts to soils from wildland fire activities would be negligible due to the implementation of minimum impact suppression tactics and the reduced potential for intense fires that would sterilize the soil due to the current fire management activities. Fire may alter soil composition and characteristics; however, with the use of prescribed fire and wildfires managed for resource objectives, it is unlikely that organic soils would be impacted because the intensity of wildfires would be reduced and therefore the potential for sustained organic soil ignitions. Soils could be disturbed by equipment and vehicles during fire suppression events, but the use of minimum impact suppression tactics would reduce soil disturbance as much as possible. Therefore, soils were dismissed as an impact topic from further analysis in this EA.

**Floodplains.** Executive Order 11988 *Floodplain Management* requires all federal agencies to avoid construction within the 100-year floodplain unless no other practicable alternative exists. The NPS, guided by the 2006 Management Policies and Director’s Order 77-2 *Floodplain Management*, and both agencies, guided by Executive Order 11988 *Floodplain Management*, will strive to preserve floodplain values and minimize hazardous floodplain conditions. According to Director’s Order 77-2, certain construction within a 100-year floodplain requires preparation of a Statement of Findings for floodplains. Neither alternative would result in filling or alterations of floodplain areas and would not require or result in the construction of structures. Firelines or minor vegetation cutting may occur but is expected to have no measureable impact on floodplains. Under both alternatives, the protection and conservation of floodplains would continue as required by the EO and other related

regulations. Many floodplain-related topics are covered in “Wetlands,” which was retained as a sub-topic in “Water Resources”. Therefore, floodplains were dismissed as an impact topic for further analysis in this EA.

**Night Sky.** Wildland fires could cause a glow and light up the night sky within and adjacent to the fire. However, wildfires are a natural process that occurs in the south Florida ecosystems. Furthermore, the scope and scale of wildland fires in the Preserve and Refuge would emulate the natural fire process. Therefore, this impact topic was dismissed from further analysis in this EA.

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

Although local soundscapes may be temporarily affected by vehicles, equipment, and aircraft during fire management activities, these effects are expected to be minimal. Nor would the temporary increase in noise be expected to impact the overall tranquility and solitude associated with BICY or FPNWR; thus, this topic was dismissed from further consideration.

**Prime or Unique Farmlands.** The Farmland Protection Policy Act of 1981, as amended, requires federal agencies to consider adverse effects to prime and unique farmlands that would result in the conversion of these lands to non-agricultural uses. Prime or unique farmland is classified by the U.S. Department of Agriculture’s Natural Resources Conservation Service (NRCS). Prime farmland is defined as land that has the best combination of physical and chemical properties for producing food, forage, fiber, and oil seed, and for other uses (e.g., pasture, forest, and crop lands). Unique farmland is defined as land other than prime farmland that can produce high value and fiber crops, such as fruits, vegetables, and nuts. There are no prime and unique farmlands designated in BICY or FPNWR (NRCS 2015); thus, this topic was dismissed from further analysis.

**Museum Collections.** Director’s Order 24 *Museum Collections* states that NPS is required to consider the impacts on museum collections (historic artifacts, natural specimens, and archival and manuscript material) and provides further policy guidance, standards, and requirements for preserving, protecting, documenting, and providing access to and use of NPS museum collections. Museum collection items would be unaffected by the alternatives, although measures such as implementing defensible space practices to protect buildings that house the collections from wildfires may be needed. Therefore, museum collections were dismissed from further analysis.

**Environmental Justice.** Any proposed federal project must comply with the provisions of Title VI of the Civil Rights Act (1964), as amended by Title VIII of the Civil Rights Act (1968). Title VI of the 1964 Civil Rights Act provides that no person will, on the grounds of race, color, religion, sex, national origin, marital status, disability, or family composition, be excluded from participation in, be denied the benefits of, or be otherwise subject to discrimination under any program of the federal, state, or local government. Title VIII of the 1968 Civil Rights Act guarantees each person equal opportunity in housing. Additionally, EO 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” requires federal agencies to identify and

address disproportionately high and adverse human health or environmental effects on minority and low-income populations.

There are minority and low-income populations in the vicinity of BICY and FPNWR; however, environmental justice was dismissed as an impact topic, as public participation as part of the planning process gave equal consideration to input from all persons. Regardless of age, race, or income status, the alternatives are not expected to have disproportionate health or environmental effects on minorities or low-income populations or communities as defined by the U.S. Environmental Protection Agency (US EPA) Environmental Justice Guidance (US EPA 1998). Therefore, environmental justice was dismissed from further analysis.

***Indian Trust Resources.*** Secretarial Order 3175 requires that any anticipated impacts to Indian trust resources from a proposed project or action by the DOI agencies be explicitly addressed in environmental documents. The federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes. The BICY and FPNWR lands and resources related to this project are not held in trust by the Secretary of the Interior for the benefit of Native Americans. Therefore, this topic was dismissed from further analysis in this document.

***Management and Operations.*** Management and operations refers to the current staff available to adequately protect and preserve resources and provide for an effective visitor experience, including education and interpretation, maintenance, and law enforcement activities. The alternatives would not require a permanent increase in fire management staff to implement the proposed fire management tools (i.e., prescribed fires, mechanical and manual vegetation treatments, wildfire for resource objectives); thus, management and operations was dismissed from further analysis.

***Energy Resources.*** Neither of the alternatives would result in the extraction of energy resources for BICY or FPNWR, and neither alternative would result in a measurable change in energy consumption or extraction compared to current conditions. Furthermore, neither alternative would have measurable impacts to ongoing oil and gas operations in BICY. Therefore, this impact topic was dismissed from further analysis.



## CHAPTER 2—ALTERNATIVES

This chapter describes two alternatives for fire management in BICY and FPNWR—Alternative A and Alternative B.

### **Alternatives Carried Forward**

Alternatives A and B, as described below, were developed through internal and external scoping and are examined in this EA:

- Alternative A—Continue Current Fire Management at BICY and FPNWR (No Action Alternative) and
- Alternative B—Utilize Range of Vegetation/Fuels Management Techniques and Manage Wildfires for Resource Objectives (Preferred Alternative).

### **Elements Common to Both Alternatives**

The activities that occur at BICY/FPNWR and may affect or contribute to fire management, fire preparedness, and/or defensible space are described below. These activities would continue under both alternatives.

These activities are allowed under the 2010 BICY FMP, the 2000 FPNWR CCP (FWS 2000) and the 2009 FPNWR Complex FMP (FWS 2009). Some of these activities also occur under the authority of CEs under NEPA as outlined in 40 Code of Federal Regulations (CFR) §1508.4, 43 CFR §46.205, 43 CFR §46.210, 43 CFR §46.215, 516 Departmental Manual (DM) 8 (FWS), and 516 DM 12 (NPS).

All fire management activities, regardless of what alternative is selected, would comply with Section 7 of the ESA and Section 106 of the NHPA and would be compatible with agency policies, approved plans, and applicable laws and regulations.

### ***Wildfire Suppression***

Wildfires occurring within the boundaries of BICY/FPNWR are suppressed at minimum cost, considering firefighter and public safety and weighing values to be protected, consistent with BICY/FPNWR management objectives.

Fire suppression tactics may include but are not limited to application of foam, water, and/or retardant by ground equipment or aircraft; limited off-road use of swamp buggies outfitted with pumps, hoses, and suppression tools; use of wildland fire engines from roads; cutting of vegetation in advance of the fire front by chainsaws and tracked or wheeled equipment; “burning out” from firelines or roads; and potential use of heavy equipment, such as fireplows or bulldozers, when approved by the BICY Superintendent or FPNWR Refuge Manager.

Dozer/fireplow use is unusual due to unfavorable terrain and swampy ground and is only considered if other alternatives are ineffective and for fires that pose serious risk to life and property. Retardant use is also rarely considered due to the threat of water contamination, high cost, and availability of other more effective strategies. Like heavy equipment, it must be specifically approved by the BICY Superintendent or FPNWR Refuge Manager.

Both agencies require firefighters to consider Minimum Impact Suppression Tactics (MIST) in all fire suppression tactics. Fire behavior monitoring is also used to provide up-to-date intelligence on fire behavior and general fire effects and location to aid fire managers in decision-making.

Indirect and direct attack tactics are often used to suppress wildfires, dependent on conditions and resources available. Direct attack methods may include extinguishing the fire edge with water from engines or pumps, dropping water from aircraft on the burning edge of the fire, and/or building firelines against the edge of the fire. Due to significant hazard fuels, extreme fire behavior, and safety concerns, direct attack is infrequently used at BICY/FPNWR except on small fires.

Indirect attack methods might include mowing around buildings before the fire arrives to reduce fire intensity or intentional burning out of vegetation along selected roads or other barriers in advance of the fire front. Indirect attack utilizing burnout tactics is a frequently used tactic by firefighters at BICY and FPNWR. Point protection is another indirect tactic that focuses on protecting a specific value location from fire damage while letting the fire pass. Indirect tactics may include applying water, foam, and/or retardant to specific natural resource, cultural resource, or infrastructure sites in advance of the fire's arrival to decrease fire behavior and intensity. Specific values might include structures, location or habitat of a species of management concern, a historic site, power line, or other critical infrastructure.

Suppression success and effectiveness in protecting BICY and FPNWR resources and local values depends on fire behavior, fuel buildup, risk, hydrologic levels, seasonal trends, availability of firefighting resources, and other circumstances that vary by fire timing and location.

Fire suppression response options and guidance are based on national fire policy (Interagency Standards for Fire and Fire Aviation Operations 2015, Chapters 9–12).

### ***Prescribed Burning***

Prescribed burning (planned ignitions) has a successful history at BICY and FPNWR. It is used primarily for habitat restoration, to reduce hazard fuels, and to mimic natural fire frequency and effects in the many fire-adapted communities. It is currently allowed under the 2010 BICY FMP and the 2009 FPNWR Complex FMP. Prescribed burning is promoted in the FPNWR CCP and is consistent with the following objectives, strategies, and goals for the FPNWR fire program:

#### Objective

Achieve and maintain vegetative conditions using prescribed fire within 15,000 acres of pine flatwoods, prairies, and cypress; a maximum of 4,500 acres could be burned annually using prescribed fire (30% of total FPNWR acreage).

#### Strategies

- a) Continue to refine the Refuge prescribed fire program to achieve and maintain optimum fire-evolved vegetative conditions. Use annual reviews and updates to incorporate applied research findings.
- b) Fully incorporate and understand the fire monitoring program in order to identify optimum forest characteristics that benefit panthers and their prey, and assess and predict fire management influence on flora and fauna.

#### Goal

Restore and conserve the natural diversity, abundance, and ecological function of flora and fauna.

Use of prescribed burning is limited by available funding, decreasing staffing, and limited burning windows. There are concerns that under present and projected management scenarios, the annual prescribed burning acreage cannot keep up with ecosystem fire needs, and in some circumstances prescribed burning alone is insufficient for successful vegetation restoration and may need to be



combined with mechanical work, herbicide work, and/or other techniques. Timing of burning has become recognized as a critical factor in many wildlife species considerations and continuance of fire-adapted vegetation communities.

The Preserve needs to burn about 100,000 acres per year to provide hazard fuel reduction and ecosystem needs, but for most of the past 10 years, much less has been burned (Figures 2 and 3). Currently, the acres burned are achieved using prescribed fire and suppression-oriented management of wildfires. Ideally, BICY plans to burn about 30,000–60,000 acres annually by prescribed burning, although that could be exceeded in some years. The remaining acres would be accomplished through wildfires managed for multiple objectives, which may include a combination of protection, suppression and/or resource objectives.

The Refuge needs to burn about 5,500 acres per year to reduce hazard fuels to manageable levels and to maintain favorable habitat for the Florida panther and other fire-dependent species (page 39, 2009 FPNWR Complex FMP). FPNWR plans to complete 2,000–4,000 acres through prescribed burning and may achieve an additional 500–1,500 acres by wildfires managed for multiple objectives in some years.

Both agencies plan their prescribed burning activities at least five years in advance. Actual annual acreage burned in prescribed fire depends on many factors, including environmental conditions, funding, staff turnover, difficulty and complexity of burn units, and past treatment history.

Fire monitoring and research (e.g., fire history data collection, fire effects observations and data collection, spatial data collection, science-based investigations) will provide updates and adaptive management techniques for the fire management programs.

### ***Maintenance Activities***

Routine vegetation management maintenance procedures at BICY and FPNWR occur for operational reasons and are performed regularly as needed. This work may contribute to fire management readiness or creation of defensible space. An example would be mowing and removal of fallen trees and debris. This activity occurs around buildings, infrastructure, campgrounds, and picnic areas; along roadsides, hiking trails, fences, and boundaries; and on primitive roads and ORV trails used for fire access. Activities on primitive roads and ORV trails are authorized under the BICY General Management Plan/Wilderness Study/Off-road Vehicle Management Plan/Environmental Impact Statement (NPS 2010a), the BICY General Management Plan and Final Environmental Impact Statement (NPS 1991), and CEs and therefore are not analyzed as part of this EA.

### ***Easements and Rights-of-Way***

Brush and small tree clearing is conducted by utility, transportation agencies, or service companies as part of their maintenance and operation activities along power lines, pipeline rights-of-way, roadways and canals. These activities are controlled by legal right-of-way or easement agreements.

### ***Integrated Pest Management***

Integrated pest management, including herbicide use, is allowed to control invasive, non-native plants in both BICY and FPNWR. About 1,200 exotic, non-native plant species have become established in Florida (Wunderlin 1998), and 65 species have been reported in BICY (Shamblin et al. 2013). Four species—Brazilian pepper (*Schinus terebinthifolius*), melaleuca (*Melaleuca quinquenervia*), cogongrass (*Imperata cylindrica*) and climbing fern (*Lygodium microphyllum*)—are identified problem species for FPNWR (page 37, FWS CCP 2000). Since the 2000 CCP, melaleuca has been effectively reduced and additional exotic, non-native plants have been identified on the

Refuge. Herbicide work is done primarily by natural resource management staff, volunteers, and contractors. BICY and FPNWR personnel apply only US EPA-approved herbicides, following the conditions specified on the labels. Herbicide use may occur before or after prescribed burns, in areas unrelated to burning, and after wildfires. Prescribed fire may be utilized to support or reinforce herbicide treatments used to control invasives as part of the Integrated Pest Management Program.

At BICY, herbicide use is limited to targeted application for exotic, invasive non-native plants. Method of application ranges from spot applications using a backpack sprayer to aerial applications (NPS 2010b). Removing invasive, non-native plants greatly contributes to vegetation and wildlife habitat restoration and maintenance. Herbicide treatment is covered by the 2010 South Florida and Caribbean Parks Exotic Plant Management Plan and Environmental Impact Statement (NPS 2010b). For approval of herbicide use, BICY's Integrated Pest Management Coordinator submits a pesticide use proposal into the NPS Pesticide Use Proposal System. Approval comes only after regional and national staff consider numerous factors such as the target use, location where the application would occur, potential threatened/endangered species concerns, potential for getting into surface or ground water, persistence in the ecosystem, safety to employees and the public, and type of application (e.g., spot spraying). BICY utilizes the NPS-designated recordkeeping system for purchasing, storing, tracking, and maintaining each approved product.

FPNWR uses herbicides to control invasive, non-native plants but may also utilize herbicide treatments in selected areas to reduce cabbage palms and small hardwoods to aid in ecological restoration of pine stands and wet prairies. Past absence of fire and changes in hydrology from adjacent roads, canals, and agricultural fields have altered stand composition to a mostly high-density, second-growth pine overstory with a competing cabbage palm understory. Where the density of cabbage palms is high, desirable forest floor herbaceous/grass forage plants are prevented from growing. In addition, due to the heavy fuel loading of the extremely combustible cabbage palms, prescribed burning for restoration and habitat maintenance cannot occur without creating control issues or stand-replacing fire that kills the pines. The pine stands with herbaceous/grass understories are a desirable restoration condition and historic forest community that benefits wildlife grazers, which are Florida panther prey species. Herbicide treatment in FPNWR is covered under the 2000 CCP EA, 7 USC 136 Federal Insecticide, Fungicide and Rodenticide Act, 517 DM 1 Integrated Pest Management Policy, and 569 FW 1 Integrated Pest Management. BICY does not have the same allowance to use herbicide to treat cabbage palms.

#### **Alternative A: Continue Current Fire Management at BICY and FPNWR (No Action Alternative)**

Alternative A would continue the fire management activities that presently occur at BICY and FPNWR. Both units would continue using the strategies in their current FMPs and other approved environmental documents to do work related to fire management. Fire suppression, prescribed burning, and herbicide use that would continue at BICY and FPNWR are discussed in detail in the *Elements Common to All Alternatives* section.

BICY and FPNWR would update their existing FMPs continuing the above activities, but only utilizing previously approved vegetation/fuels management techniques in accordance with current requirements and policies.

### ***Preserve***

At BICY, fire and vegetation/fuels management would be limited to the options approved under the BICY 2005 FMP and Finding of No Significant Impact (FONSI) or otherwise available under other environmental documents or through CE(s).

Continued fire management would include wildfire suppression, prescribed burning, installing small sites for fire operations (see below), limited mechanical treatments, and treatment of invasive vegetation by herbicide. Wildfires would continue to be suppressed when appropriate, although confine/contain strategies could be utilized as a suppression strategy considering such factors as risk to firefighters, minimizing incident costs, available firefighting resources, or weather.

BICY would have a target goal of conducting prescribed burns on approximately 30,000–60,000 acres annually. That goal would be highly variable, depending on a host of factors (e.g. weather conditions, acres burned by wildfires, available fire management resources) each year.

Facilities to aid in fire suppression and management, such as water dip sites for helicopter use, could be constructed as necessary at BICY to ensure timely response and protection of life, property, and resources. Locations for sites would be restricted to previously disturbed areas unless a separate NEPA process is completed.

Fuel reduction by mechanical equipment would continue to be limited to certain approved circumstances. These include protecting sensitive habitat areas and removing vegetation, native or otherwise, which has invaded prairies and other areas due to previous disturbance and/or human activities. This would aid in ecological restoration to pre-disturbance conditions; after mechanical work these areas would likely be maintained by prescribed fire or wildfires. BICY operational maintenance activities would also allow mechanical work for some minor, small-scale vegetation management/defensible space work.

### ***Refuge***

The Refuge would be limited to the options presented in the 2000 CCP EA and FONSI, as detailed in the 2009 FPNWR FMP, or otherwise available under other environmental documents or through CE(s).

Fire management activities would include fire suppression, prescribed burning, wildfires managed for resource objectives, and mechanical and/or chemical treatments.

The Refuge would have a goal of implementing prescribed fires on 3,000–5,000 acres annually. The goal would be highly variable, depending on a host of factors each year.

Mechanical treatments would be used to maintain fuel breaks associated with burn unit boundaries (2009 FPNWR FMP). Mechanical treatments could also be used to reduce hazard fuel levels, maintain defensible space, protect infrastructure and private property, protect cultural resources, control invasive plant species, and restore fire-dependent vegetation communities.

### **Alternative B: Utilize Range of Vegetation/Fuels Management Techniques and Manage Wildfires for Resource Objectives (Preferred Alternative)**

Alternative B would incorporate the fire management activities allowed under Alternative A, allow BICY the increased ability to utilize mechanical work for more vegetation/fuels management, and allow the management of wildfires for resource objectives. Alternative B would consolidate these authorities for FPNWR and provide a more robust analysis that more clearly outlines the fire management tools and techniques they would utilize.

Allowed mechanical treatments would be the same for FPNWR as under Alternative A. At BICY mechanical treatments would include additional vegetation/fuels management options—reducing hazard fuel levels, developing or maintaining defensible space, protecting infrastructure and private property, restoring and maintaining cultural resources and landscapes, and helping to define burn unit or agency boundaries for controlling fire. BICY already has the ability to utilize mechanical treatments to control invasive plant species and to restore fire-dependent vegetation communities under Alternative A.

The use of wheeled or tracked equipment would be very limited at BICY/FPNWR under Alternative A to minimize impacts on natural and cultural resources. Mechanical equipment use in both areas is limited by water features and wetlands; widespread mechanical work would be inconsistent with BICY and FPNWR management objectives. The agencies also limit the use of mechanical equipment to minimize soil and vegetation disturbance, which can provide opportunities for the spread of invasive species. However, mechanical treatments may be needed in certain circumstances to help protect life and property, manage wildland fire, and assist in ecosystem restoration.

The Refuge would continue to manage wildfire for resource objectives where the natural ignition is contained in a prescribed fire unit or other defined area that could be used as a geographic containment boundary for the wildfire. Other primary considerations before allowing a particular unplanned ignition would be weather, fuels, nearness to the Refuge boundary and neighboring private properties, smoke issues if adjacent to I-75, and fire staff availability.

### **What is “wildfire managed for resource objectives”?**

Wildfires managed for resource objectives may be managed by qualified fire management personnel, or allowed to burn, in certain areas under certain conditions (as specified in the 2009 Guidance for Implementation of Federal Wildland Fire Policy). This management technique would not be required for any specific wildfire, only considered.

The decision process for all wildfires initially involves the on-duty fire manager utilizing fire personnel to immediately gather information on the unplanned ignition. This includes location, expected weather and fire behavior, firefighter and public safety, vegetative fuels, threats and distance to values (agency infrastructure, neighboring properties, natural and cultural resources), previous fire history, fire season severity, available firefighting resources, resource benefits, and other factors.

After this initial assessment, the agency administrator (Superintendent or Refuge Manager) consults with fire resource specialists and management staff, and a decision is made on how to manage the fire, utilizing the full range of strategic and tactical objectives. Basically this determines whether firefighters will manage or suppress the fire, or some combination of both strategies. While sounding cumbersome, this process occurs very quickly, so there is no delay in initiating firefighter operations. The Superintendent or Refuge Manager must sign and approve the decision.

Different areas of the same fire can be managed differently in certain cases; for example, one flank of fire nearing private structures may be suppressed, while another flank burning into an open area and wilderness may be allowed to continue for habitat maintenance and hazard fuel reduction objectives. If conditions are too rigorous or inappropriate, the agencies could select full suppression as the appropriate response strategy.

Since wildfires managed for resource objectives have not yet been utilized at BICY, the decision process would be developed and formalized in their updated FMP and other fire operational guidance documents. FPNWR has a decision process outlined on page 28 of their 2009 FMP. Both agencies will likely update their decision processes upon completion of this EA.

The goal of wildfires managed for resource objectives would be to utilize fire as a natural disturbance process to help restore and maintain fire-dependent plant and wildlife communities; to reduce hazard fuels and to decrease the chance for widespread, uncharacteristically severe wildfires that may impact human and natural values.

To be able to use this management strategy, agencies must include this strategy in their FMPs, provide for firefighter and public safety, address values to be protected and public health issues, be consistent with BICY/FPNWR resource management objectives, and follow environmental laws and regulations.

BICY could safely manage wildfires for resource objectives with more distant or not immediately defined containment boundaries such as water features or vegetation changes.

BICY and FPNWR fire management staff would evaluate specific conditions associated with a particular wildfire (unplanned) ignition to determine the level of management or suppression needed and the capability to manage the wildfire for resource objectives.

Estimating the acres to be burned annually by wildfires for resource objectives is not realistic due to the uncertainties of ignitions, area of start, constraints on use, weather, variation in seasons, staffing, timing, fire behavior, and a host of other issues. It may vary widely by year. Ideally, total acres burned by prescribed fire, suppression fires, and wildfires managed for resource objectives would support a goal of burning about 100,000 acres annually in BICY and about 5,500 acres annually in FPNWR.

All techniques described above would be utilized under carefully prescribed conditions, plans, and objectives to restore, protect, and enhance BICY/FPNWR natural and human values. The updated FMPs would incorporate changes in national fire terminology. They would also include fire-related values, strategies, and mitigations important for newly listed threatened and endangered species and discuss processes to incorporate future threatened and endangered species listings into fire management planning.

Fire management procedures related to wilderness would also be included in the BICY FMP. Spatial fire management planning would be integrated into the updated FMPs, utilizing geographic information system (GIS) based products. While the fire management goals (see Chapter 1, Objectives in Taking Actions) of both BICY and FPNWR are the same, each agency may develop specific fire management objectives in their FMPs related to their agency missions and unit goals.

Alternative B would provide greater flexibility for BICY and FPNWR to meet agency requirements and resource management goals and objectives. Implementation of all activities may be limited by available funding.

### **Fire Management in BICY Wilderness**

All fire management activities affecting wilderness at BICY (eligible and proposed) must utilize the minimum requirement analysis (MRA) concept defined in NPS *Management Policies* and Director's Order 41. This planning tool and documentation process is used to determine whether administrative activities affecting wilderness resources or the visitor experience are necessary, and if so, what techniques and tools are needed to minimize impacts to the wilderness resource. The MRA is applied as a two-step process: (1) the NPS determines whether the proposed fire management action is necessary or appropriate for administration of the area as wilderness and does not cause a significant impact to wilderness resources and character; and (2) if the action is necessary/appropriate, the agency analyzes the techniques and types of equipment needed to ensure that impacts on wilderness resources and character are minimized.

At BICY, fire management is necessary in wilderness to enhance wilderness character. More specifically, active management is necessary to restore a fire regime in wilderness that more closely approximates what would occur naturally but for the impact of past human activities, such as logging, agriculture, and fire suppression. To do this, active manipulation is necessary in the short run to enhance the natural quality of wilderness in the long run. The primary resource objective of managed fires in wilderness would be to restore and maintain natural fire regimes and ecosystem stability by altering vegetative fuel conditions to within the range of natural variability. Research science and published literature suggest that natural systems at the Preserve can be restored over



time with careful reintroduction of wildland fire using both prescribed fire (planned ignitions) and wildfire (unplanned ignitions) managed to achieve resource objectives, supplemented with the limited use of non-fire vegetation treatments. In that regard, Section 6.3.7 of *Management Policies* provides that active intervention in wilderness may be undertaken where necessary to correct past mistakes and the impacts of human use. Likewise, Section 6.3.9 of *Management Policies* and Director's Order 41, Section 6.7 authorize the use of wildland fire (including prescribed fire) in wilderness to reach desired future resource conditions, as established in park planning documents. Additional direction is provided by Section 4.4.1 of *Management Policies*, which directs park units to preserve and restore the natural abundances, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations, and the communities and ecosystems in which they occur.

Fire management procedures and tools related to wilderness would be described in the BICY FMP and analyzed in a programmatic MRA document attached to the FMP (see Appendix A). Under the programmatic MRA, the primary wilderness incursion would be via aviation, but to the extent feasible, flights would stay within the 0.25-mile buffer on either side of official ORV trails. Approved fire management tools would include, but not be limited to, hand tools such as axes, pulaskis, cross-cut saws, pruners, and shovels; handheld motorized equipment such as weed eaters, chainsaws, leaf blowers, or similar; and brush cutters. The application of MIST would be required. The programmatic MRA would authorize the use of swamp buggies on a limited basis, but for the most part their use would be discouraged. If off trail use of swamp buggies were needed, such as to catch a spot fire, a single pass would be made where possible to minimize soil disturbance and compression (typically depressions of less than two inches may disappear during the next wet season). Moreover, BICY would continue to discourage the construction of firelines in wilderness but would rely instead on roads, trails, canals, and other natural features outside of wilderness to the extent possible. Flexible management would allow updating management techniques or using improved methods as they are developed and evolve over the years, so long as they are within the scope of the programmatic MRA analysis in the FMP.

Project plans for fuel treatments in wilderness would address the minimum requirement. If the proposed treatment was confirmed to be within the framework of the programmatic MRA, the project plan would not have to revisit that decision. However, each project plan would be required to contain an analysis of the minimum methods and techniques necessary to accomplish the specific action with the least negative impact to wilderness character.

Under certain circumstances, especially those involving long-duration wildfires, an incident-specific minimum requirements analysis would be required. For large fires or long-duration incidents, fire suppression tactics in wilderness conceivably could include application of foam, water, and/or retardant by ground equipment or aircraft; limited off-road use of swamp buggies outfitted with pumps, hoses and suppression tools; cutting of vegetation in advance of the fire front by tracked or wheeled equipment; and potential use of heavy equipment, such as fireplows or bulldozers. However, in each instance only the minimum tool/technique would be authorized, as directed by the totality of circumstances and consistent with protecting human health and safety. Prior approval by the BICY Superintendent would be required in the form of a signed MRA document.

After major wildfires, Burned Area Emergency Rehabilitation (BAER) would be considered in consultation with regional office and resource specialists. Any BAER plan would itself be accompanied by an MRA document.

### **Fire Management Actions and Components**

Table 1 summarizes actions and program components related to the BICY and FPNWR fire management programs. While not all listed activities are performed by fire management staff, they are related to vegetation management, which is an activity that has bearing on the fire management program. This table also highlights the primary differences between the alternatives.

**Table 1. Comparison of Fire Management Activities for Each Alternative.**

<b>BICY/FPNWR Fire Management Activities and Program Components</b>	<b>Alternative A (No Action Alternative)</b>	<b>Alternative B (Preferred Alternative)</b>
Wildfires could be fully or partially managed for multiple objectives in defined areas under appropriate conditions.	FPNWR	BICY/FPNWR
Direct and indirect attack and confine/contain strategies could be utilized in suppression.	BICY/FPNWR	BICY/FPNWR
Wildfires could continue to be suppressed.	BICY/FPNWR	BICY/FPNWR
Control tactics may include application of foam, water, and/or retardant; off-road use of swamp buggies with suppression equipment; use of wildland fire engines; vegetation cutting by chainsaws and tracked or wheeled equipment; and potential use of heavy equipment such as fireplows or bulldozers, when approved by the BICY Superintendent or FPNWR Refuge Manager.	BICY/FPNWR	BICY/FPNWR
Protection of adjacent private property would be considered in all phases of fire management. Cooperation and coordination would occur with communities and area residents by agencies.	BICY/FPNWR	BICY/FPNWR
MIST would be utilized whenever possible to protect BICY/FPNWR values.	BICY/FPNWR	BICY/FPNWR
Fire management would use minimum requirements process in wilderness.	BICY	BICY
BAER could occur after wildfires.	BICY/FPNWR	BICY/FPNWR
BICY/FPNWR joint fire management efforts and interagency cooperation with neighbors and partner agencies would continue.	BICY/FPNWR	BICY/FPNWR
Prescribed burns could be utilized to achieve identified objectives with approved burn plans.	BICY/FPNWR	BICY/FPNWR
Mechanical equipment in vegetation/fuels management could be used for hazard fuel reduction, maintaining defensible space, protecting infrastructure and private property, restoring cultural landscapes, and fuel breaks.	FPNWR	BICY/FPNWR
Mechanical equipment in vegetation/fuels	BICY/FPNWR	BICY/FPNWR

<b>BICY/FPNWR Fire Management Activities and Program Components</b>	<b>Alternative A (No Action Alternative)</b>	<b>Alternative B (Preferred Alternative)</b>
management could be used to protect sensitive habitat areas and to remove vegetation which has invaded prairies and other areas due to previous disturbance and/or human activities.		
Approved herbicides could be used to control invasive/exotic plants.	BICY/FPNWR	BICY/FPNWR
Approved herbicides could be used to help control cabbage palms.	FPNWR	FPNWR

(Note: if BICY and/or FPNWR are in the alternative column, then that agency unit would be able to perform that activity under that alternative)

### **Mitigation Measures**

The following mitigation measures were developed to minimize the degree and/or severity of adverse effects to BICY/FPNWR resources and would be implemented as needed.

BICY/FPNWR fire managers would ensure that these mitigation measures are included in their respective FMPs.

Fire managers would work with BICY/FPNWR staffs and other agencies to ensure that natural and cultural resource issues and concerns are considered in planned projects and wildfires. These mitigation measures are based on best practices balanced with agency laws and regulations. They may be updated over time as new science becomes available, new species recovery actions are developed, new cultural sites are identified, and/or better approaches and efficiencies are learned.

BICY/FPNWR staff fire management responsibilities in implementing mitigations are:

The *Superintendent/Refuge Manager* has overall responsibility and oversight for all BICY/FPNWR activities and staff; he/she provides general fire program oversight, sets goals, approves restrictions and closures, coordinates relations with neighbors and partner agencies, and approves the FMP and major fire decisions, documents and plans.

BICY/FPNWR *Fire Management Officers (FMOs)*, *Incident Commanders (ICs)*, and *Prescribed Fire Burn Bosses* have delegated responsibility for managing fire management programs, incidents and projects, and for visitor, resident, and staff safety. They coordinate implementation of mitigation measures, evacuations, and other actions with appropriate BICY/FPNWR supervisors, staff, and local emergency management and cooperating agencies.

*Resource Advisors (READs)* are assigned to significant wildfires to prevent and reduce adverse impacts from fire suppression and control actions and to advise in protecting cultural and natural resources, including threatened and endangered species. "Significant wildfires" are usually any fires beyond small, minor, low-complexity, short-duration, initial attack incidents. READs or BICY/FPNWR resource management staff may also be considered and assigned to prescribed fire and vegetation management projects.

The following mitigation measures would help minimize potential effects of BICY/FPNWR fire management activities on resources, other values, staff, and the public. They would be incorporated into the new FMPs, the Wildland Fire Decision Support System (WFDSS), and fire management work at BICY/FPNWR as applicable.



### *General*

- For all wildfires and fire management activities, BICY/FPNWR would select tools, procedures, and equipment that least impact natural and cultural resources, general undeveloped character, and wilderness (BICY). Threats to these values would be balanced with safety, fire, and land management objectives.
- Fire Management Units (FMUs) would be developed by fire managers to enhance efficiencies in wildfire response, habitat types, protection values, geographic areas, or other considerations. These FMUs with their applicable fire management objectives, strategies, and tactics would be detailed in the FMPs and would be updated as conditions, requirements, agreements or understanding change over the years.
- Natural or manmade features such as roads, canals, pre-existing firelines or vegetation change barriers would be utilized whenever possible for wildland fire control lines to minimize the need for line construction and vegetation cutting. This would minimize disturbance (e.g., soils, habitat, cultural sites, vegetation) by mechanical or hand line construction.
- Indirect/confine type strategies would be the preferred strategy for suppressing and managing most wildfires beyond initial attack. Burnouts can help solidify natural and manmade features as barriers to fire spread. Point protection may be utilized in all areas depending on specific values to be protected.
- Fire staff would consider slow burnouts through light fuels supported by flappers and bladder bags, as it is often more efficient and creates less intense head fires.
- Where constructed firelines are necessary, they would be built to the minimum depth and width needed for safe control operations for both prescribed fire and wildfires. Light scraping would minimize ground disturbance. Hand lines would blend with natural features to the extent possible.
- Chainsaw use and bucking, falling, and limbing of live and dead trees would be minimized. Stumps would be flush cut; butt ends of logs would be turned away from trails and public areas.
- Existing roads, designated ORV trails, and boat use on waterways would be utilized by firefighters and equipment for travel as much as possible. Swamp buggies or similar vehicles (e.g., ATVs, UTVs, boats) would be utilized to minimize impacts if off-road travel is required and approved. UTVs and ATVs leave a less permanent mark on the land.
- Fire staff would use swamp buggy tire tracks as firelines when/where conditions are appropriate and upon specific agency approval. BICY rarely constructs firelines but often uses roads, trails, canals and other natural features; BICY would continue to discourage off-trail vehicle use. FPNWR uses maintained and identified burn unit boundaries, which are usually roads or trails, in addition to natural features.
- If off trail use of swamp buggies is needed, such as to catch a spot fire, a single pass would be made where possible to minimize soil disturbance and compression (typically depressions of less than two inches may disappear during the next wet season).
- Equipment operators would be trained to minimize soil and vegetation disturbance, compaction, and displacement. Turning of equipment causes the most damage, so work

would be planned to minimize turning. Untrained or new operators would be accompanied by READs or more experienced operators to recommend low-impact techniques.

- When appropriate, fire staff would seek approval to use mastication equipment to improve ORV fireline trail edges to reduce spotting potential and the need to go off trails. Track-hoes with articulating masticators work well for reducing fuel loadings and creating fire breaks along existing ORV trails and roads. Vegetation reduction would not occur more than 12 feet from centerline of ORV trails.
- Local READs or fire staff who can identify non-flammable plant and tree species would be utilized to focus vegetation/fuel reduction on flammable species. Fuel reduction could then be accomplished more effectively and quickly along roads, canals, and ORV trails. If constructed, firelines would be rehabilitated as soon as possible after fires are out to prevent erosion, unnatural impacts, and negative visual effects. Hand line disturbances would be pulled back over themselves or covered with brush.
- Appropriate weather, fuel, fire behavior, fire management, staffing, and social considerations would be developed for managing wildfires where resource objectives could be a primary objective. These considerations would be outlined in the FMPs.
- BICY/FPNWR fire management programs would use fire effects plots, fire behavior monitoring, resource databases and GIS mapping protocols to determine locations of sensitive species, resource values, and important human/infrastructure values. These would help in predicting and evaluating wildfire and project-specific effects and in developing incident/project objectives and mitigations. Results would also assist in program evaluation and adaptive management.
- All prescribed burns would have a written and approved prescribed fire burn plan as required by the Interagency Prescribed Fire Planning and Implementation Procedures Guide (April 2014). The Guide includes resource, safety, and public mitigation considerations that must be implemented on each prescribed fire project.
- Firefighters would consider MIST to minimize impacts of fire response operations. These tactics would also be utilized for prescribed fire projects whenever possible. See page 91, Incident Response Pocket Guide, January 2014.
- After major wildfires, BAER would be considered in consultation with regional office and resource specialists. To minimize establishment and/or spread of non-native invasive plants, best management practices would be incorporated, such as washing all equipment before and after use and monitoring and follow-up treatments as needed after fuel/vegetation treatments.

### *Air Quality*

- BICY/FPNWR fire management programs would follow Florida Forest Service and State of Florida smoke and burning regulations.
- Coordination with state and adjacent public and tribal lands would occur regarding the total number of wildland fires simultaneously occurring in the area to limit cumulative smoke impacts.

- Fire staff from BICY/FPNWR would utilize agency, public, tribal, and neighbor notification procedures for all prescribed burns, focusing on residents and activities that might be impacted by smoke from the burns.
- Prescribed burns may be postponed when Florida air/smoke regulatory agencies declare air pollution episodes.
- Smoke management tools, such as modeling programs, would be utilized to determine predicted smoke paths and effects for prescribed fires and wildfires managed for resource objectives.
- Coordination with BICY/FPNWR managers and supervisors would occur in advance of prescribed fires to fully consider the effects of smoke on visitors and residents during holidays, periods of heavy public visitation, and/or heavy hunting periods.
- When possible, prescribed burns would be conducted when fuel moistures are relatively low to provide better combustion, more transport and lofting of smoke, and less residual burning.
- Smoke transport winds would be regularly assessed by prescribed fire and wildfire managers to determine smoke impacts to sensitive receptors, travel and transportation corridors, aircraft traffic, boat traffic, and populated areas. Coordination would be accelerated with the appropriate state and local agencies when impacts are expected.
- Signage, closure, and escorted travel would be considered with the appropriate state and local transportation agency if smoke were expected to impact roadways.
- Timing and methods of ignition on prescribed burns would be constantly assessed and reviewed by fire managers to help minimize smoke impacts.
- Prescribed fire Burn Bosses would be trained in smoke reduction techniques.
- On significant wildfires, prescribed fires, and wildfires managed for resource objectives, incident commanders would work with public information officers to regularly update emergency/highway management agencies, Florida Forest Service, and local residents on expected smoke impacts. “Significant wildfires” are any fires beyond small, minor, low-complexity, short-duration, initial attack incidents.
- Prescribed burns would be conducted during appropriate weather and fuel moisture conditions (e.g., prescription windows) when fuels are dry and would be more completely consumed, thus minimizing smoldering; utilizing wind conditions that disperse smoke away from communities; and accelerated mop-up where possible to minimize smoldering. Burning under appropriate conditions would take advantage of favorable air column lift and smoke transport conditions, dispersing smoke more quickly.

***Water Resources (includes wetlands)***

- Water would be the primary agent used for aviation water drops on wildland fires in BICY/FPNWR.
- Use of foam or fire retardant would have Superintendent/Refuge Manager approval before use. When foam or retardant is utilized, it would not be used within 300 feet of surface waters on agency lands unless lives are threatened.

- If water, pumps, and hose lines are utilized on wildland fire operations, appropriate containment systems would be utilized to prevent leaks of gas, oil, or other fluids.
- Helicopters and air tankers would be required to pre-wash their helicopter buckets/tanks in a disinfectant solution before use at BICY/FPNWR to prevent cross-contamination of waters and/or transfer of exotic organisms.
- Equipment with fluid leaks would not be utilized. Refueling, filling, or mixing of gas and other fluids would be avoided in sensitive areas and, when possible, near surface waters. Measures would be taken to prevent spills from hydraulic fluids.
- Helicopter dip sites would be approved by READs before use.
- Staff utilizing herbicide would be trained in approved procedures related to proper handling, storage, transportation, mixing, spill prevention, and application procedures.
- Stream or water crossings by tracked equipment would be minimized. If crossings are necessary (rare), equipment operators would be careful to avoid getting stuck to focus on minimizing disturbance, erosion, and flow changes. Crossings or damage would be promptly restored and rehabilitated in consultation with resource specialists.
- No dozers or tractor plows would be used in BICY/FPNWR without Superintendent/Refuge Manager approval.
- Hydrologic water levels would be used to monitor conditions related to wildland fire, predicted fire effects, wildfire use for resource objectives, and control action efficiencies.
- ORV trail vehicle use would be pre-approved by the Superintendent or Agency Representative.
- Dozer/fireplow use would be considered only if mowing or mastication is not practical.
- READs would focus on protecting sensitive and special habitat areas and cultural resources if equipment use is necessary in wetlands.

***Wildlife, Special Status Species, and Wildlife Habitat***

- Wildland fire would be used to restore, develop, and maintain wildlife habitat, emphasizing an ecosystem-wide approach.
- Species mitigation measures required by FWS as part of formal consultation would not change unless approved by FWS.
- Upon notification of a wildfire, BICY/FPNWR READs would examine maps and information resources to assess and discuss potential wildlife/habitat effects and would have access to fire managers to provide immediate advice on protection of wildlife/habitat values.
- BICY/FPNWR would continue to develop/maintain their GIS databases to quickly provide sensitive species locations and habitats to fire managers for immediate reference in all wildland fire-related activities.
- READs would be consulted when considering managing a wildfire for resource objectives; potential effects on wildlife would be a decision consideration.
- During planning and before initiating treatments or prescribed burns, BICY/FPNWR resource/wildlife specialists would be consulted to determine presence or effects on sensitive

species. Planned mitigation actions would be developed to minimize impacts on species of concern.

- Project work such as mastication, mowing, and brush cutting equipment use would be curtailed as necessary in some areas during prime nesting seasons, Florida panther denning periods, or other sensitive wildlife activity periods upon consultation with resource/wildlife specialists.
- Fire staff would utilize water, pumps, and hose lines when possible for wetlines or to back up smaller firelines to minimize the amount of fireline construction and habitat disturbance.
- The use of large-acreage firing operations, especially in the dry season, would be avoided when possible, as use may have severe impacts on vegetation communities, hydric soils, and wildlife.
- Prescribed burn firing patterns would be considered that allow escape routes for wildlife.
- Helicopter dipping would only be allowed from approved water sources under established conditions to help prevent wildlife disturbance.
- Low-level flights by helicopters would be minimized to lower the risk of bird collisions. Operations may be curtailed or tightly directed by the fire staff, in consultation with resource/wildlife managers, if threatened and endangered species could be impacted.
- READs would be trained to understand and work with fire/incident managers on techniques/tactics that are safe and reasonable to implement, yet protect and benefit wildlife over the long term.
- BICY/FPNWR managers would continue to emphasize and support training for staff to develop needed wildlife subject matter expertise to assist in preserving and understanding wildlife and habitat values and developing effective mitigations during wildland fire operations.
- FPNWR would monitor the annual acreage treated by prescribed fire in pine flatwoods, hammocks, cypress, and mixed swamp woodlands to ensure no more than 4,500 acres are burned annually.
- READs may be assigned to the wildfire incident management team/organization for immediate on-hand expertise. If state or federally listed species are involved, READs who have knowledge of specific recovery plans would be assigned.
- BICY would develop threatened and endangered species-specific fire management handouts for firefighters/incident managers to guide them on the latest tactics/techniques that may protect or enhance threatened and endangered species habitat. These handouts would be retained as an appendix in the FMPs and would be supplemented by real-time advice from READs and resource specialists.
- If dead, sick, or injured threatened and endangered species are encountered, fire managers would immediately contact the appropriate wildlife/rescue agencies for appropriate actions.
- WFDSS objectives would be developed to guide firefighters in protecting specific threatened and endangered species from wildfire management impacts on large incidents.

- If new endangered, threatened, or sensitive species are identified in BICY/FPNWR lands, management would convene local specialists and fire managers with access to the latest science or understanding on those species. The Fire Division in coordination with READs would develop best fire management practices related to that species or habitat and then add new information to FMPs, with the goal of keeping fire management activities operational for the good of fire-dependent threatened and endangered species. The Fire Division in coordination with READs would consult with appropriate wildlife management agencies to keep them abreast of BICY/FPNWR efforts. The Fire Division would update FMP sections annually as new science and information becomes available.
- Mitigation measures required by FWS during formal or informal consultation would be incorporated into FMPs, project plans and documents, and fire management direction at BICY/FPNWR.
- Smoke dispersal and transport data from weather forecasts and smoke modeling tools would be considered to reduce smoke impacts to active nests, species locations, and den sites for threatened and endangered species.
- **Specific mitigation measures for species of concern follow. Additional species-specific fire management measures and considerations would be developed and added to the FMPs as resource specialists continue to coordinate with fire managers.**

#### **Florida Panther**

- Wildfire managers would work with READs to determine Florida panther den locations and develop mitigation measures to minimize disturbance and threat to den areas from wildfires and wildfire management activities.
- Personnel would avoid approaching identified den areas and disturbing the mother and kittens. READs may place flagging or traffic cones around den sites or sensitive areas.
- Where feasible, aircraft would be used to pre-treat denning areas with water to slow fire progression and create unburned vegetation adjacent to the den. Direct drops on the den site would be avoided. Trailing drops in the fuels near the den usually work best.
- Prescribed fire/vegetation management activities would be avoided in close proximity to denning panthers.
- Low-level helicopter use would typically be avoided above/near den sites to avoid disturbing the animals.
- All planned treatments would consider enhancements for panther prey species.
- Prescribed fire and wildfire for resource objectives would be used to reduce hazard fuel loads, reduce effects of unwanted wildfires, restore and maintain natural fire regimes and fire-dependent plant communities, and limit exotic plant invasions within and adjacent to Florida panther habitat.

#### **Florida Bonneted Bat**

- Prescribed fire treatments in potential bat habitat would be implemented with the objective to create an overall burn mosaic pattern that leaves unburned refugia and vegetative cover for use by individual bats. Burn plans would include mitigation



measures to protect known roost locations. Incident Action Plans would identify all known bonneted bat roost locations.

- All members of the burn crew would be briefed prior to prescribed burns on the locations of known roosts and the required mitigation measures.
- Refugia and escape areas would be provided by retaining stumps, snags, cavity trees, and standing woody debris during planned treatments. Old trees and snags with hollows or cavities where bonneted bats are known or suspected to occur would be marked, avoided, and protected from fire.
- If prescribed burns occur in known or suspected roost areas, to protect them from high-intensity fire, vegetation around the base of known or suspected roost sites would be raked and/or cleared for a minimum distance of 10 feet from the trunk to remove fuel loading before conducting prescribed burns. The formation of mounds or rings of concentrated fuels would be avoided when raking. Small trees and shrubs would be removed by hand prior to raking. The objective would be to keep fire intensity low and minimize potential impacts to known roosts. During prescribed fires and wildfire operations, personnel would burn out the immediate area surrounding the base of known roosts in order to protect the roost site from more intense fires.
- These same stumps, snags, cavity trees, and standing woody debris would be protected from wildfire and wildfire activities as practical and possible. If control action burnouts are needed in areas known to support bonneted bat roosts, measures such as night burnouts would be considered to provide for low-intensity fire when safe to do so.
- Known roost sites in prescribed burn units would be monitored for flames; flames would be extinguished.
- If standing trees must be removed due to safety concerns during wildland fire activities, they would be examined before removal to make sure they are not being used as bat roosts. When threatening structures and human life and safety, snags with cavities may need to be removed without examination, especially during wildland firefighting operations or other emergency situations.
- As more information is learned about Florida bonneted bat habitat and roost sites at BICY/FPNWR, these guidelines would be revised to more efficiently protect and preserve their habitat.
- READs would be consulted to consider and plan proposed actions and mitigations; bat habitat improvement would be a priority resource objective on prescribed burns.

### **Red-cockaded Woodpecker**

- Firefighters and fire managers would keep vehicles such as swamp buggies on established ORV trails in red-cockaded woodpecker (RCW) colony areas. Traffic would be minimized as recommended by READs.
- Firefighters would avoid building control lines using wheeled or tracked equipment (e.g., masticators, fire plow) in known RCW colonies. In some cases, work may be needed to protect RCW areas from undesirable fire effects such as high-intensity fire; this work would be considered with active consultation with READs.

- Low-level helicopter hovering above RCW colony areas would be avoided.
- Use of retardant or foam in RCW colony areas would be avoided unless approved by the Superintendent or Refuge Manager. In coordination with READs, aviation water drops may be considered if there is inadequate time for hazard fuel reduction activities in advance of an impact by a high-intensity wildfire.
- If wildfire or control operations threaten a colony, fire staff would utilize tactics to encourage low fire behavior/ground fires in RCW areas. Night burnouts have been particularly successful in the past. Firing on the downwind side of a RCW tree may further reduce fire behavior and heat around known cavities.
- Prepping around RCW trees and protection of stands of old, large pines from high-intensity fire would be employed. Cutting brush accumulation and preventing fire and heat from reaching tree cavities would be the primary technique to prevent unwanted impacts.
- Fire staff would protect individual cavity trees by reducing fuels at the base of cavity trees for a minimum distance of 3 m (10+ feet) from the trunk. The necessary distance would vary depending on fuel types, fuel loads, amount of resin present, cavity heights, and firing technique. Scraping and ground disturbance can be harmful to living trees and would be done lightly or not at all.
- Fire staff would protect active and inactive cavity trees within the burn units if (1) the population consisted of less than 30 potential breeding groups; (2) fire intensity of the prescribed burn would likely result in ignition of an unprotected tree; or (3) potential cavity trees (i.e., pines over 60 years in age, including relict pines) were limited.
- Fire staff would protect only active cavity trees in the burn unit if (1) the population consisted of 30 or more potential breeding groups; (2) the area proposed for burning had been burned in recent years (3–5 years or less) and fuel loads had been reduced to where mostly low-intensity ground fire is expected; and (3) potential cavity trees were not limited.
- Prescribed burn prescriptions would be based on habitat evaluations for RCW clusters prior to implementing burns. Prescriptions would state burn management objectives, such as habitat restoration, fuel reduction, or habitat maintenance, and would include maps with cavity tree locations within the burn unit as well as specific mitigations for protecting cavity trees.

**Wood Stork and Other Wading Birds (including roseate spoonbill, limpkin, piping plover, little blue heron, reddish egret, snowy egret, tri-colored heron, white ibis, Florida sandhill crane, black skimmer, and least tern)**

- The South Florida Natural Resource Center would provide the most current wood stork and wading bird nesting colony locations and specific/general buffer size guidance.
- When possible, burning in close proximity to active wood stork and wading bird colonies would be avoided during the times of colony occupancy.
- To prevent disturbance to active nesting colonies, fuel/vegetation management activities would be avoided during primary nesting seasons within 1,300 feet of an



exposed, active nesting colony or within 700 feet around nesting colonies protected by vegetative cover or where no birds are observed.

- When possible, fire staff would use prescribed fire treatments or wildfires to reduce the effects of unwanted wildfires, maintain natural fire regimes and fire-dependent plant communities, prevent woody plant encroachment, and limit exotic plant invasions within and adjacent to wood stork or wading bird habitat.

**Everglades Snail Kite, Audubon's Crested Caracara, Osprey, Southeastern American Kestrel, Northern Harrier, and Bald Eagle**

- The most current nest locations would be provided by FWS, University of Florida, and South Florida Natural Resource Center to BICY/FPNWR staff.
- To prevent disturbance to active nests, fuel/vegetation management actions would be avoided within 500 feet of an active nest.
- When possible, prescribed fire treatments or wildfires managed for resource objectives would be used to reduce the intensity of wildland fire and unwanted wildfire effects near nest trees, maintain natural fire regimes and fire-dependent plant communities, prevent woody plant encroachment, and limit exotic plant invasions.

**Cape Sable Seaside Sparrow**

- All wildfires that threaten occupied Cape Sable seaside sparrow (CSSS) habitat or CSSS-A undesignated habitat during the breeding season (March 1 to July 15) would be suppressed whenever possible to avoid impacts to breeding birds, eggs, nests, and/or fledglings. Wildfires may be managed for resource objectives during the breeding season following coordination with FWS and utilizing the following thresholds:
  - No more than a combined total of 35 percent of all CSSS subpopulations or CSSS-A undesignated habitat and no more than 20 percent of occupied habitat would be treated with wildland fire annually.
  - No more than 50 percent of any individual CSSS-A undesignated habitat and no more than 20 percent of an individual subpopulation's occupied habitat would be burned annually.
- Areas with an identified CSSS population would not be prescribed burned during the breeding season without advance consultation with FWS and subject to verification by BICY that no sparrows are found within the proposed treatment area.
- Prescribed fire management units containing occupied and/or CSSS-A undesignated habitat scheduled for treatment in a given year would be evaluated to determine woody vegetation presence, fire history, and fuel loading.
- Occupied habitat is defined as an area within 1 kilometer (0.6 miles) of any documented occurrence of a CSSS within the most recent three years, excluding pinelands and other unsuitable vegetation communities where CSSS do not occur. Occupied habitat would be delineated annually prior to any fire management activities in CSSS habitat.
- BICY would continue to work with FWS to improve fire management strategies based on the latest data on sparrow population numbers, demographics, and habitat

conditions. BICY fire management activities that affect CSSS habitat would follow the most updated BICY and FWS CSSS fire management strategy.

- When possible, fire staff would use prescribed fire treatments to reduce the effects of unwanted wildfires, maintain natural fire regimes, reduce hazard fuel loads, prevent woody encroachment, and limit exotic plant invasions within and adjacent to CSSS habitat.
- The locations and percent of occupied habitat to be burned annually and the optimal fire frequency would be established on an annual basis during the CSSS fire management meetings with BICY, Everglades National Park, FWS, and other appropriate partners. The annual fire management strategies would be developed based on the data available on population and subpopulation status, burn severity and recovery rates of vegetation, and reoccupation by CSSS of previously burned habitat. This information with the multi-year fuel treatment plan would be used as the basis for proposing areas to be burned.

### **Eastern Indigo Snake**

- Prescribed fire treatments or wildfires managed for resource objectives would be implemented in fire-dependent prairies adjacent to mangrove areas as necessary to prevent unwanted wildfire impacts to primary mangrove habitat that could be used by the eastern indigo snake.
- Prescribed fire treatments or wildfires managed for resource objectives in potential eastern indigo snake habitat would be implemented with an objective to create an overall burn mosaic pattern that leaves unburned refugia and vegetative cover for use by eastern indigo snakes.
- Firefighters would be instructed not to harm or kill any snakes. Identification information would be provided to firefighters. Where snakes bearing a resemblance to eastern indigo snakes are encountered, operations in that area would be avoided or would cease until the snake has left the area.
- Debris piles created from fuel management activities in eastern indigo snake areas would be promptly removed to prevent eastern indigo snakes from inhabiting them. Piles could create den attraction areas for snakes and would likely burn intensely in wildland fires.
- BICY/FPNWR fire management staff would contact the FWS South Florida Ecological Services Field Office and the chief biologist if a dead eastern indigo snake were discovered.

### **American Crocodile, West Indian Manatee**

- Because these species are found in canal, river, and estuarine systems, effects from BICY/FPNWR wildland fire activities are unlikely. When resource specialists notify fire managers of their presence in a water area adjacent to a wildfire or planned prescribed fire, specific mitigations may be implemented, such as no boat traffic, limits on helicopter bucket filling from surface waters, and placement of water pumping stations.

### **Big Cypress Fox Squirrel**

- When possible, fire staff would use prescribed fire treatments or wildfires managed for resource objectives to improve the habitat of the Big Cypress fox squirrel, a fire-dependent species. Fire-related objectives for the fox squirrel include utilizing low-intensity fire to maintain habitat, reducing the effects of unwanted wildfires, maintaining natural fire regimes and fire-dependent plant communities, and limiting exotic plant invasions within Big Cypress fox squirrel areas.
- GIS data would be used to inform fire managers when fire activities or wildfires were moving toward high-density Big Cypress fox squirrel habitat.

#### **Everglades crabgrass**

- Everglades crabgrass is a fire-dependent species that may thrive after a wildland fire. When possible, fire staff would use prescribed fire treatments or wildfire managed for resource objectives to mimic the effects of historic fire intensities, reduce the effects of unwanted wildfires, restore and maintain natural fire regimes and fire-dependent plant communities, prevent woody plant encroachment, and limit exotic plant invasions within and adjacent to Everglades crabgrass habitats, which include pine rockland, marl prairie finger glade habitat, and the pineland-prairie ecotone.
- When possible, fire staff would avoid placing fire control lines or staging areas within known Everglades crabgrass populations.
- Prescribed fire treatments and wildfires managed for resource objectives would have an objective to create burn mosaic patterns that leave unburned areas of Everglades crabgrass within the burn area. This would prevent the burning of the entire Everglades crabgrass population in a specific area and may provide additional seed source for recovery after the burn.

#### **Florida Prairie Clover**

- Florida prairie clover is a fire-dependent species that may thrive after a wildland fire. When possible, fire staff would use prescribed fire treatments or wildfire managed for resource objectives to mimic the effects of historic fire intensities, reduce the effects of unwanted wildfires, restore and maintain natural fire regimes and fire-dependent plant communities, prevent other woody plant encroachment, and limit exotic plant invasions within and adjacent to pine rockland habitat and the pineland-prairie ecotone between pineland and hammock.
- When possible, fire staff would avoid using vehicles or placing fire control lines or staging areas within known Florida prairie clover areas, pine rockland habitat, and the pineland-prairie ecotone between pineland and hammock.
- Prescribed fire treatments and wildfires managed for resource objectives would have an objective to create burn mosaic patterns that leave unburned areas of Florida prairie clover within the burn area. This would prevent the burning of the entire population in a specific area and may provide additional seed source for recovery after the burn.

#### **Other Threatened and Endangered Plant Species**

- As more knowledge is accumulated for other federally and state listed plant species, their known populations would be added to the BICY/FPNWR GIS database. New or

additional fire management mitigations may be developed to assist in population maintenance and recovery.

- A fire management objective for prescribed fire and wildfire managed for resource objectives in known threatened and endangered plant species population areas would be to utilize fire within the range of historic natural fire intensities to help promulgate fire-dependent species.
- An objective for prescribed fire treatments and wildfires managed for resource objectives would be to create burn mosaic patterns that leave unburned areas of threatened and endangered plant species within the burn area.

***Non-Native Species (plant or animal)***

- Prescribed fire, wildfire management, and non-fire treatments would be utilized to support exotic plant and animal control efforts, restore and maintain native plant communities, and reduce hazard fuel accumulations.
- Vegetation would be removed, cut or manipulated along firelines to the minimum width necessary to minimize disturbances that often promote invasive species.
- Fire staff would minimize cutting of live trees, burned trees, and snags. Cutting would be limited to situations necessary to prevent fire spread or that pose a danger to firefighters to minimize changes that promote invasive species.
- Managing wildfires for resource objectives may be rejected during intense drought/extreme fire risk periods. The objective would be to avoid high-severity, stand-replacing fire behavior beyond the natural range of variation that may create opportunities for invasive species.
- Mowing or mastication may be utilized for firelines to avoid scraping or exposing soils, providing fewer opportunities for establishment of invasive plants.
- BICY/FPNWR would develop equipment washing procedures/instructions in FMPs to prevent spread of exotic vegetation.
- Fire staff would rehabilitate firelines after fires are out to prevent erosion, visual effects, and establishment of invasive plants as advised by READs.
- Fire and resource specialists would do post-wildfire, post-treatment monitoring to check for establishment of new invasive species populations. If found, they would develop invasive control/treatment plans as necessary.
- Firefighters would utilize MIST to minimize soil disturbance related opportunities for invasive species establishment.
- Prescribed fire would utilize prescriptions in most cases that minimize widespread, intense, and long-duration surface burning on soils to prevent opportunities for invasive plant species establishment.
- Equipment operators would be trained to minimize soil and vegetation disturbance, compaction, and displacement.
- Mechanical equipment (e.g., tracked vehicles, dozer plows) would rarely be used at BICY/FPNWR and only with specific permission of the Superintendent or Refuge Manager.

### ***Archeological and Ethnographic Resources***

- Staff would identify known cultural and ethnographic sites in advance of wildfire, prescribed fire, or fuels treatment activities whenever possible in order to consider avoidance and mitigation strategies. Since wildfire has occurred regularly in the Big Cypress ecosystem for centuries, many cultural and ethnographic sites have had fires burn through or by them many times. The greater risk may be from firefighter actions than from fire.
- When new wildfires escape initial attack, informal consultation would be immediately initiated with appropriate local tribal officials. If sites at risk are identified, BICY/FPNWR would consider safe mitigation strategies in consultation with tribal officials.
- BICY/FPNWR would educate fire personnel about the significance of cultural and ethnographic sites, how to identify obvious sites, and appropriate actions and notifications to be made if new sites were encountered.
- Firelines and ground disturbance would be avoided in cultural site areas.
- Tribal cultural resource specialists would be consulted as necessary on incidents to protect ethnographic and cultural sites.
- In collaboration with cultural resource specialists, fire staff would utilize defensive and protection tactics to prevent damage to historic, cultural, archeological, ethnographic, or historic landscape sites.
- BICY/FPNWR would collaborate with affiliated tribes to prevent damage to ethnographic resources, even if unrecorded, before planned projects.
- BICY/FPNWR cultural and historic site base maps and cultural resource specialists would be available to fire managers and incident commanders to allow them to avoid impacts to known cultural sites.

### ***Wilderness***

- For all BICY fire management activities in eligible or proposed wilderness, the MRA process would be used to determine the appropriate action in wilderness, its impacts, and any site-specific mitigation measures. General MRA procedures and guidance would be described in the BICY FMP, but incident-specific considerations would be developed for long-duration fires or projects. See NPS Reference Manual 41, “Wilderness Minimum Requirements for Wildland Fire”.
- Typical tools, procedures, and methods that would be utilized during initial response to wildfires in wilderness would be specified in the BICY FMP, as identified in the Minimum Requirements Decision Guide.
- When wilderness is impacted by a long-duration wildfire (one that would last for more than a couple of operational periods), the BICY FMP would outline how incident planning would consider tools and techniques that may be less intrusive than those used during the initial response period. A new MRA may be needed in lieu of the pre-planned response.
- Prior to proposed BICY fire management project or restoration activities in wilderness, the MRA process would be utilized for specific fire management wilderness activities. See NPS Reference Manual 41, “Wilderness Minimum Requirements for Wildland Fire”.
- Firefighters would emphasize and utilize MIST in wilderness.

- Locations of eligible and proposed wilderness and NPS wilderness management strategies would be conveyed to READs assigned for all wildfires in or near wilderness.
- Firefighter tactics and actions in wilderness would be selected that minimize wilderness-related rehabilitation requirements.
- Natural or manmade features or vegetation change barriers would be utilized whenever possible for fire control lines to minimize the need for fireline construction and to minimize vegetation cutting in wilderness. Indirect/confine type strategies would be the preferred strategy for most wilderness wildfires.
- For wildfires, wilderness character would be given more weight than efficiency and convenience.
- Prescribed fire may be considered due to the buildup of hazard fuels in wilderness; utilizing first-entry wildfire for resource objectives under high-energy conditions could lead to stand-replacing, high-severity fire beyond the natural range of variation and degrade wilderness character.

### *Visitor Use and Experience*

- BICY/FPNWR would continually emphasize the safety of fire staff and the public as the highest priority in all fire management activities, and that sometimes drives fire-related decisions.
- BICY would develop/utilize a public evacuation plan that would include processes to evacuate recreational users from backcountry areas. Visitors that may be in the path of a wildfire would be located and escorted out of the risk area.
- Most of FPNWR is closed to the public; FPNWR would include evacuation procedures for their hiking area and staff/volunteers in their FMP.
- Initial attack staff would determine the proximity of wildfires to visitors, adjacent landowners, and communities. They would coordinate with rangers/law enforcement staff and local agencies to inform them of the potential hazard and evacuate as necessary.
- The Superintendent/Refuge Manager would authorize temporary closure of risk areas to the public as necessary.
- To prevent exposure to hazards where fire management activities are underway, visitors would be kept out of the immediate vicinity of mastication, tree felling, low-level aviation operations, prescribed fires, and other special equipment use.
- BICY/FPNWR would monitor fuel, weather, and fire condition parameters and may limit public access and activities when extreme conditions develop, as designated in Preparedness Level planning (included in the FMPs).
- Fire staff would protect in-holding camps, visitor recreational facilities, and tribal sites from damage by wildland fire.
- Fire staff would minimize disruption to public travel, landowner access, and recreational use by smoke and fire balanced with fire management and safety objectives.
- BICY/FPNWR neighbors, visitors, local residents, and adjacent communities would be notified of all fire management activities that have the potential to impact them.



- Fire staff would ensure public notification procedures occur for all BICY/FPNWR prescribed burns. For long-duration wildfires, regular media releases would inform locals and visitors about the expected impacts of the fire, especially related to smoke, closures, or restrictions. Signs or notices may be posted at appropriate places to inform incoming visitors and recreational users of the fire situation. Detailed actions related to local residents may be described in specific burn plans.
- BICY/FPNWR fire program outreach and media releases would continue to emphasize the importance of fire processes to the local ecosystem and promote the long-term benefits to fire-dependent species, hunting, fishing, other recreation activities, and related local economies.
- Planned fire management equipment use in non-emergency activities would consider the effects on the natural ambient soundscape during the project planning phase.
- As burned areas are opened to visitors after a fire, signs would be posted informing the public of potential hazards in the burned areas (snags, stump holes, etc.).
- After fires, trails or ORV routes damaged by fire or fire management activities would be marked and rehabilitated to reopen for public use as soon as practical.
- Since BICY/FPNWR contains such a mix of fire-dependent communities, interpretive staffs would continue to develop their understanding of fire to their diverse habitats in order to convey those complexities to visitors and residents.
- ORV use off designated ORV trails would be pre-approved by the Superintendent or Agency Representative.

***Land Use (includes tribal uses)***

- All fire management activities, including wildfires managed or partially managed for resource objectives, would fully consider risk and effects to private property, retained rights properties, and nearby communities. This consideration would occur on an ongoing basis for the duration of the activity or incident.
- For new wildfires, initial attack staff would determine the proximity and threat of fire to visitors, adjacent landowners, and communities. They would inform law enforcement and local agencies of the potential hazard and arrange evacuations if necessary.
- Defensible space planning and hazard fuel reduction would be an ongoing and continuous consideration for BICY/FPNWR buildings and infrastructure.
- BICY/FPNWR would continue to coordinate and emphasize relationships with adjacent tribal fire management organizations. This coordination would identify specific values on BICY/FPNWR lands that are important to tribal members so those values may be considered in managing wildfires for resource objectives and other fire management projects.
- BICY/FPNWR would work with tribal fire management organizations to allow cross-boundary wildland fires where objectives align between adjacent reservation lands and BICY/FPNWR.
- When necessary, BICY/FPNWR would consult with tribal cultural resource specialists on incidents to consider effects on tribal lands and values.

- BICY/FPNWR would encourage defensible space projects to protect tribal communities or settlements that may be at risk from wildland fire.
- BICY/FPNWR would proactively work with state and private agencies managing lands or resources in or adjacent to BICY/FPNWR.
- BICY/FPNWR would encourage use of wildland fire on the landscape and continue to improve an interagency approach to fire and resource management in south Florida.

### ***Socioeconomics***

- BICY/FPNWR managers would consider the short- and long-term effects of fire management operations and projects on local outfitters, recreation tourism, and visitation businesses.
- BICY/FPNWR fire program outreach would continue to emphasize the importance of fire processes to the local ecosystem and promote the long-term benefits to fire-dependent species, hunting, fishing, other recreation activities, and related local economies.
- As federal procurement and contract regulations allow, BICY/FPNWR would utilize local businesses to the extent allowed for wildfire logistics support and vegetation/fuels projects.
- BICY/FPNWR would consider targeted outreach to local outfitters and businesses to inform them about positive objectives in wildfire management and vegetation/fuels treatments that they may want to relay to their customers.

### **Alternatives Considered and Dismissed**

BICY/FPNWR considered multiple alternatives for fire program management; however, the following were dismissed from further analysis. These alternatives were determined not to meet the fire management goals of either agency or the purpose and need and were thus not analyzed in this EA.

***Alternative 1*** emphasized an aggressive suppression response to all wildfires that would minimize burned acreage using aggressive attack whenever possible. Vegetation/fuels management treatments would continue as limited by available funding. Wildfires would not be managed for resource objectives. This alternative was dismissed due to safety and risk issues, and it would not meet the fire management goals of either agency. Frequent suppression response favoring aggressive attack would likely put firefighters at risk in the unforgiving vegetation and environment of south Florida. Initial attack success would not likely increase, as there would not be an increase in fire staff and firefighting resources to take these more aggressive suppression actions. A larger firefighter staff, more equipment, more facilities, and more aerial support would be required to facilitate more aggressive suppression response. Funding for these increases would be extremely unlikely.

Initially, fewer acres might be burned by wildfire, resulting in more unburned acres annually for a few years. This would contribute to the buildup of hazard fuels and create an overall increase in area wildfire risk. This would be contrary to the ecosystem's evolved need for fire and burning in fire-dependent habitats.

There would be no expected increase in funding or staff in fuels management to treat more acres by prescribed burning and other treatments, which would also contribute to a net increase in hazard fuels.

Over time, this would lead to more severe, high-intensity fires that would be difficult to control and would likely result in loss of critical ecosystem components, infrastructure, and private property. Aggressive suppression response is already allowed at both BICY and FPNWR as provided under National Fire Policy, so restricting agency response to this as the primary response would not contribute to meeting BICY/FPNWR management goals and objectives.

**Alternative 2** involved full suppression for all wildfires and no fuels treatments. This alternative was dismissed because it would not meet the resource management needs of either BICY or FPNWR, protect wilderness values, protect infrastructure or highway corridors, and meet the common fire management goals of both agencies. Over time this could lead to more severe and intense fires which would be difficult to control, likely resulting in loss of critical ecosystem components, infrastructure, and private property.

**Alternative 3** depended on full suppression and mechanical treatments as the primary technique to modify vegetation/fuels for both ecosystem restoration and hazard fuels work. Depending on mechanical treatment, which utilizes wheeled or tracked equipment for much of the work, as the primary fuels treatment method would be unrealistic in the wet environment found in much of BICY and FPNWR. It would also be inadequate to keep up with the escalating level of hazardous vegetation/fuels, and the cost would be higher than prescribed burning.

Mechanical treatments alone would not meet the resource management needs of either BICY or FPNWR. They would tend to disturb soils, wetlands, and possibly allow the introduction of more invasive vegetation. Mechanical treatments in wilderness, if allowed, would degrade wilderness character. This alternative would not meet the common fire management goals of the agencies and could lead to more severe and intense fires which would be difficult to control and likely result in loss of critical ecosystem components, infrastructure, and private property.

**Alternative 4** would utilize grazing as the primary vegetation/fuels management treatment for BICY and FPNWR along with full, aggressive suppression of all wildfires. Widespread livestock grazing could create negative habitat and watershed effects, which is not compatible with BICY and FPNWR management objectives and various management plans. While grazing may reduce palatable grazing vegetation in accessible areas, grazing would not reduce woody vegetation that contributes to hazard fuels, so the fire hazard reduction would be site-specific and not widespread.

Livestock grazing could have profound negative impacts on threatened and endangered species management. Grazing at any level would require additional resources such as staff for permit management and fence and infrastructure installation; such increases are unlikely. This alternative would likely result in loss of critical ecosystem components. Grazing with full suppression would not meet the resource or fire management needs of either BICY or FPNWR or protect wilderness.

**Alternative 5** would turn BICY and FPNWR fire management responsibilities over to another agency. This would be unlikely to lead to better fire and fuels management, as funding is not available to pay another agency for its increased wildfire response and fuels management responsibilities.

This alternative would conflict with BICY and FPNWR missions, objectives, and basic management requirements and would be unlikely to maintain and enhance natural and cultural resource values. Inadequate wildfire response could likely result in loss of critical ecosystem components, infrastructure, and private property.

**Alternative 6** would utilize wildfire managed for resource objectives as the primary tool to achieve the landscape and resource objectives of BICY and FPNWR. This alternative was dismissed because

treating fuels by wildfire primarily depends on random natural ignitions. Existing hazard fuels, some adjacent to private and government infrastructure, could continue to increase and remain untreated, increasing risk over time. This alternative would compromise safety of firefighters, residents, landowners, and visitors by using wildfires to manage all hazard fuels without options of utilizing other treatment methods.

A lack of planned vegetation management could cause fuels to build up in critical areas and eventually result in uncontrollable, intense fires that would be difficult to manage and could result in loss of critical ecosystem components, infrastructure, and private property. This alternative would not serve the resource or fire management needs and goals of BICY or FPNWR or protect wilderness.

**Alternative 7** depended primarily on vegetation management through freelance burning by permitted private property individuals igniting fires from private property as the main vegetation management strategy. It would allow ignitions under permit by private individuals at their time and place to ignite fires. Drawbacks would include threats to inholdings and other private and government property infrastructure and safety risk. Another drawback would be the probability of creating large uncontrolled fires, which would have to be suppressed by firefighting agencies with a major risk to firefighters and significant fiscal costs. The treatments that would occur through these techniques would not treat the majority of the acres or the correct acres needing fire at BICY and FPNWR.

The lack of vegetation management planning and treatments could cause fuels to build up in other areas and result in uncontrollable, severe fires that could end with loss of critical ecosystem components, infrastructure, and private property. This alternative would not serve the resource or fire management needs and goals of BICY or FPNWR or protect wilderness.

**Alternative 8** would significantly increase prescribed fire to keep up with ecosystem burning needs. This would require BICY and FPNWR to do much more prescribed burning than they have done in recent years. However, this has already been the goal for BICY and FPNWR for a decade; it has been difficult to achieve due to funding, staffing, and limited prescription/weather windows. Lack of implementation could lead to basic management requirements not being met. Part of this EA process is intended to help BICY and FPNWR develop more flexibility and management techniques to potentially increase needed burn acreages. This alternative would not increase flexibility given current budget direction, it would not do enough to protect natural and cultural resource values, and it could eventually lead to more widespread, intense fires that could result in loss of critical ecosystem components, infrastructure, and private property. This alternative would not serve the resource or fire management needs and goals of BICY or FPNWR or protect wilderness.

## Alternative Summaries

Table 2 compares the ability of these alternatives to meet the project objectives (the objectives are identified in Chapter 1).

**Table 2. Summary of the Proposed Project Objectives and Alternatives.**

Objectives	Alternative A No Action Alternative	Alternative B Preferred Alternative
Firefighter and public safety is the first priority in all wildland fire management activities.	No, continued retention and buildup of hazard fuels from lack of managing wildfires for resource objectives and failure to burn enough prescribed fire acres would increase risk of larger	Yes, ability to use the full range of fire management tools as described above would decrease hazard fuels, allow the development of defensible space and fuel breaks to enhance point protection

Objectives	Alternative A No Action Alternative	Alternative B Preferred Alternative
	and/or intense wildfires. The lack of efficient fuel breaks or defensible space at BICY would reduce ability of firefighters to do point protection of human, cultural, and natural values. All this could contribute over time to less effective suppression that could expose firefighters and the public to elevated risk.	abilities, and decrease the number of large and intense wildfires over time. This would increase the likelihood of firefighters to control wildland fires safely and decrease health and safety risk for visitors, private residents, and NPS employees.
Facilitate the protection of private property, infrastructure and federal facilities, critical transportation corridors, recreational values, and other special values within and adjacent to BICY and FPNWR.	No, lack of managing wildfires for resource objectives would lead to fewer acres treated over time, which would lead to greater buildup of hazard fuels. Increased hazard fuels would result in uncontrollable wildfires in some areas that would pose elevated risk to private property, infrastructure and federal facilities, critical transportation corridors, recreational values, and other special values within and adjacent to BICY. The lack of efficient fuel breaks or defensible space at BICY by mechanical fuel reduction work would reduce ability of firefighters to do point protection of private and federal infrastructure and other special values.	Yes, this alternative would plan and implement additional fire management activities that would help protect BICY/FPNWR private and federal infrastructure and other special values. Additional fire management actions, such as utilizing wildfires for resource objectives, would help reduce hazard fuel loadings. BICY would gain the ability to utilize mechanical for additional fuel breaks and defensible space, which would provide benefits for structure and infrastructure protection. Both agencies would decrease the potential for uncontrollable wildfires that pose risk to structures, infrastructure, and other special values over time.
Enhance the protection of natural and cultural resources with fire management activities.	No, the inability to manage wildfires for resource objectives would lead to increased hazard fuels and more uncontrollable wildfires over time, which would threaten natural and cultural resources at BICY. Out of season timing of prescribed burns may hinder recovery and restoration of fire-dependent habitat, which would threaten natural system values. BICY limits on mechanical equipment for hazard fuel reduction and defensible space could limit the protection of cultural resources.	Yes, this alternative considers fire management tools for vegetation restoration and hazard fuel reduction, which would enhance the protection of cultural and natural resources. Managing wildfires for resource objectives would help reduce hazard fuels over larger areas with appropriate timing for fire-dependent communities, which would reduce the risk to natural resources over time. Mechanical equipment could be used for a full variety of reasons to protect natural and cultural resources.
Use wildland fire response strategies, prescribed fire, and vegetation management activities where and when appropriate to reduce hazard fuels and meet BICY/FPNWR natural resource objectives.	No, the inability to manage wildfires for resource objectives and limits on mechanical equipment use for hazard fuel reduction and defensible space would not allow BICY the full selection of wildland fire response and vegetation management strategies needed to meet natural resource objectives.	Yes, this alternative would allow for the use of wildfires managed for resource objectives, prescribed fires, and mechanical equipment for vegetation/fuel management activities where and when appropriate to reduce hazard fuels, which would help BICY/FPNWR meet natural resource objectives.
Encourage and support monitoring and research	No, this alternative would not fully support the current scientific	Yes, implementing the proposed fire management tools and methodologies

<b>Objectives</b>	<b>Alternative A No Action Alternative</b>	<b>Alternative B Preferred Alternative</b>
to advance the understanding of local fire behavior, fire effects, ecology, and fire management while using adaptive management to update and improve fire management activities.	understanding of fire-adapted ecosystems as needing wildfires managed for resource objectives. Since this strategy could not be used at BICY, it would hinder the understanding of local fire effects and ecology. It would also prevent BICY from fully implementing adaptive management.	would help advance the understanding of local fire behavior, fire effects, ecology, and fire management and would support the current scientific understanding of fire-adapted ecosystems.
Promote public education and understanding of fire processes and management.	Yes, public education and understanding of fire processes and management would continue to be promoted.	Same as Alternative A
Conduct fire management activities in an efficient, cost-effective manner and to ensure progress toward BICY/FPNWR management goals and objectives.	No, the inability to manage wildfires for resource objectives is an inefficient strategy that could lead to increased costs to manage large, uncontrollable wildfires over time due to the buildup of hazard fuels. Preventing natural seasonal timing of wildfires managed for resource objectives would lead to increased deterioration of fire-adapted communities. These negative effects would hinder BICY in meeting ecosystem management objectives.	Yes, managing wildfires for resource objectives is an efficient, cost-effective method to provide ecosystem services, thus allowing BICY/FPNWR to progress toward their management goals and objectives.
Promote an interagency ecosystem approach for fire management activities that includes federal, tribal, state, and local agencies.	Yes, cooperation and coordination would occur with community and area residents. In addition, BICY/FPNWR joint fire management efforts and interagency cooperation with neighbor and partner agencies would continue.	Same as Alternative A
Does the alternative meet project objectives?	No	Yes

Table 3 summarizes the anticipated environmental impacts for Alternatives A and B. Only those impact topics that have been carried forward for further analysis are included in this table. Chapter 4 provides a more detailed explanation of these impacts.

**Table 3. Environmental Impacts Summary by Alternative.**

<b>Resource Topic</b>	<b>Alternative A No Action</b>	<b>Alternative B Preferred Alternative</b>
Air Quality	Adverse, negligible to moderate, localized, and short-term impacts as well as long-term, beneficial impacts. Cumulative effects would be adverse, minor, short-term, and localized.	Short-term, localized, and negligible to moderate adverse impacts as well as indirect, long-term, and beneficial effects. Cumulative effects would be minor, short-term, adverse, and localized.



Resource Topic	Alternative A No Action	Alternative B Preferred Alternative
Vegetation Resources (including invasives)	Minor to moderate, beneficial, long-term, localized impacts. Cumulative effects would be moderate, long-term, beneficial, and localized.	Greater degree of minor to moderate, beneficial, long-term, localized impacts than Alternative A. Cumulative effects would be moderate, long-term, beneficial, and localized.
Water Resources (including wetlands)	Short-term, adverse, minor impacts as well as short-term, beneficial, minor impacts. Cumulative effects would be adverse and beneficial, minor, short- and long-term.	Short-term, adverse, minor impacts as well as short-term, beneficial, minor impacts. Cumulative effects would be adverse and beneficial, minor, short- and long-term.
Wildlife	Minor to moderate, beneficial, long-term, and localized impacts. Cumulative effects would be beneficial, minor, long-term, and localized.	Minor to moderate, beneficial, long-term, and localized impacts. Cumulative effects would be beneficial, minor, long-term, and localized. Although impacts are similar to Alternative A, Alternative B would have increased beneficial impacts as well as the potential for increased short-term, adverse impacts.
Special Status Species	Wide range of impacts, as described for individual species in the analysis. Although most impacts would be beneficial, some adverse impacts would be unavoidable. Cumulative effects would be generally beneficial in the zone of analysis. The contribution of Alternative A to these impacts would be noticeable.	Greater beneficial impacts than Alternative A, however, some adverse impacts would be unavoidable. Cumulative effects would be generally beneficial in the zone of analysis. The contribution of Alternative B to these impacts would be noticeable.
Wilderness	<u>Untrammeled quality</u> : Adverse, minor to moderate, localized impacts. <u>Natural quality</u> : Short- to long-term, beneficial and adverse impacts. <u>Undeveloped quality</u> : Short-term, negligible to moderate, adverse impacts. <u>Opportunities for solitude or primitive and unconfined recreation quality</u> : Short-term, adverse, and negligible to moderate impacts. Overall, Alternative A would result in short- to long-term beneficial effects to wilderness character and negligible to moderate, short-term, adverse effects.	<u>Untrammeled quality</u> : Adverse, minor to moderate, localized impacts. <u>Natural quality</u> : Short- to long-term, beneficial and adverse impacts. <u>Undeveloped quality</u> : Short-term, negligible to moderate, adverse impacts. <u>Opportunities for solitude or primitive and unconfined recreation quality</u> : Short-term, adverse, and negligible to moderate impacts. Overall, Alternative B would result in short- to long-term beneficial effects to wilderness character and negligible to moderate, short-term, adverse effects.
Archeological Resources	Long-term, minor to moderate, beneficial to adverse and localized impacts. Cumulative effects would be adverse, minor, long-term, and localized.	Long-term, minor to moderate, beneficial to adverse and localized impacts. Cumulative effects would be adverse, minor, long-term, and localized.
Ethnographic Resources	Long-term, minor, adverse and localized impacts as well as beneficial, minor to moderate, long-term, and localized impacts. Cumulative effects would be adverse, minor, long-term, and localized.	Adverse, minor, long-term impacts as well as beneficial, minor to moderate, long-term, and localized impacts. Beneficial impacts would be greater than Alternative A. Cumulative effects would

<b>Resource Topic</b>	<b>Alternative A No Action</b>	<b>Alternative B Preferred Alternative</b>
		be long-term, minor, and adverse.
Visitor Use and Experience	Adverse, negligible to moderate, short-term and localized impacts. Cumulative impacts would be adverse, short-term, minor to moderate as well as long-term and beneficial.	Adverse, short-term, negligible to minor, localized impacts in the immediate area of treatment during the treatment period. Indirect, minor to moderate, beneficial, long-term, and localized impacts from fuel management activities. Cumulative effects would be short-term, adverse, and negligible to minor as well as beneficial, long-term, and minor.
Socioeconomic	Short-term, negligible to minor, and beneficial impacts. Cumulative effects would be short-term, minor, beneficial impacts as well as short-term, negligible, and adverse.	Short-term, negligible to minor, and beneficial impacts with potential for short-term, negligible, adverse impacts associated with disruptions to visitor use and corresponding visitor spending in BICY and the local communities. Beneficial impacts would be greater under Alternative B compared to Alternative A. Cumulative effects would be the same as Alternative A.
Land Use (including Tribal uses)	Short-term, negligible to minor, adverse impacts and long-term beneficial impacts. Cumulative effects would be long-term, negligible, and beneficial.	Short-term, negligible to minor, adverse impacts and long-term beneficial impacts. Cumulative effects would be long-term, beneficial and short-term, negligible to minor and adverse.
Human Health and Safety	Short- to long-term, minor to moderate, adverse, localized impacts. Cumulative impacts would be minor, short- to long-term, adverse, and localized.	Short- and long-term, beneficial, and minor to moderate impacts as well as negligible to minor, adverse, and localized impacts. Cumulative effects would be beneficial, minor, long-term, and localized.

## CHAPTER 3—AFFECTED ENVIRONMENT

This chapter describes the existing environmental conditions (“Affected Environment”) in the areas potentially affected by the alternatives. The impact topics discussed in this chapter are those that were selected for analysis as described in Chapter 1. Information for this chapter was gathered from several sources, including but not limited to the following documents:

- General Management Plan (GMP) for the original BICY Preserve (NPS 1991)
- BICY Addition GMP (NPS 2010a)
- Florida Panther National Wildlife Refuge Comprehensive Conservation Plan (2000)
- The Big Cypress National Preserve Resource Inventory and Analysis (Duever et al. 1986)
- Fire and Resource Management at BICY (Burch 2003)
- Fire in South Florida Ecosystems (Wade et al. 1980)
- Long-term Study of Fire Season and Frequency in Pine Forest and Associated Cypress Wetlands, Big Cypress National Preserve: Project Description and Preliminary Data (Snyder 2000)
- Plant Community Mapping of the Florida Panther National Wildlife Refuge (Preston 1994)

### Climate Change

Due to climate change, south Florida has experienced an average sea level rise of about 1.5 inches per century (Miami-Dade CCATF 2008). The Third National Climate Assessment estimated sea levels will rise between 1 to 4 feet by 2100 in Florida (Melillo et al. 2014), and the Intergovernmental Panel on Climate Change (2014) estimated a rise between 0.8 feet to 3.2 feet.

The Miami-Dade Climate Change Advisory Task Force (CCATF; 2008) stated that global warming would result in changes to the natural environment such as temperature patterns, rainfall and severe weather, biologic community distribution, increased extinction rates, disease and pest distribution, and sea level rise. Sea level rise is a key concern, with the likelihood that sea level would rise an additional 1.5 feet in the next 50 years with a cumulative total of 3 to 5 feet within a century (Miami-Dade CCATF 2008). The predicted sea level rise combined with the low elevation in BICY/FPNWR could significantly alter the freshwater wetland areas (e.g., marshes), including vegetation composition.

The South Florida Water Management District (SFWMD) climate change and sea level rise models predict a 7% increase in evapotranspiration and a 10% decrease in precipitation (Florida Atlantic University 2013). The area would experience a freshwater level decrease of 0.5 to 3 feet and a decrease in duration of surface water from 10–50% across the Everglades area. This scenario could lead to drought conditions with decreased freshwater input and increased fire activity in the region, which could have an overall negative impact on vegetation communities and associated wildlife. It is likely that vegetation types and associated fauna would shift, including a loss of hammocks, due to decreased hydroperiod change. In addition, there are potential future changes in plant communities from predicted climate change, as individual plant species respond to large- and small-scale changes in temperature and precipitation, the fertilizing effect of increased carbon dioxide, and changing patterns of inter-specific competition (Shafer et al. 2001). The spread of non-native plant species could be accelerated in response to future climate changes, particularly in those areas where native plant species are unable to adapt to climate change.

Both prescribed fires and wildfires could result in temporary increases in emissions of greenhouse gases from firefighting equipment; however, these emissions would be less compared to carbon emissions from the fires. Implementing prescribed fires and fuels management would produce lower

carbon emissions compared to wildfires (Mitchell et al. 2014). Studies in the western U.S. reported quantitative estimates with prescribed fires reducing carbon emissions by 18–25% and up to 60% in specific forest systems (Wiedinmyer and Hurteau 2010). There are no studies of carbon emissions comparing wildfires managed for suppression versus resource objectives. However, wildfires managed for resource objectives are implemented under similar conditions to prescribed fire conditions. Wildfires managed for resource objectives would be expected to produce similar carbon emissions as prescribed fires.

Currently, the climate change and sea level rise models are not sufficiently precise to address increases in temperature and water stress over the short duration of the planning period for the FMP and the small scale of the Preserve and Refuge. Therefore, the potential impacts of climate change on the Preserve and Refuge resources are not analyzed in detail in Chapter 4 for each impact topic because of the uncertainty and variability of the predicted outcomes. Furthermore, the global and regional levels of climate change are beyond the control of the Preserve and Refuge, and impacts would not differ between the alternatives. Alternatives that improve resiliency of natural resources to climate change, such as fire management actions that reduce hazard fuels and vegetation treatments that promote native plants and wildlife under the proposed action, would be expected to provide ecosystem adaptability and greater beneficial impacts compared to alternatives that improve natural resources to a lesser degree.

## **Natural Resources**

### **Air Quality**

The Clean Air Act of 1963 (42 U.S.C. 7401 *et seq.*) established federal programs that provide special protection for air resources and air quality related values associated with NPS and FWS units. Specifically, Section 118 of the Clean Air Act requires a park unit to meet all federal, state, and local air pollution standards. BICY and FPNWR are designated as Class II areas under the Clean Air Act, which means emissions of particulate matter and sulfur dioxide are allowed up to the maximum increase in concentrations of pollutants over baseline concentrations as specified in Section 163 of the Clean Air Act. In addition, the Clean Air Act gives the federal land manager the responsibility to protect air quality related values (i.e., visibility, plants, animals, soils, water quality, cultural resources, and visitor health) from adverse pollution impacts. The adjacent Everglades National Park is a Class I area. Both BICY and FPNWR are currently within a designated attainment area, meaning that they are in compliance with national ambient air quality standards for criteria pollutants.

The behavior of smoke in the mostly subtropical weather patterns of south Florida and the proximity to the metropolitan Miami-Fort Lauderdale (east) and Naples-Fort Myers (west) areas create a potential for air pollution and public health and safety problems. There are also smaller communities located nearby, such as Everglades City and several Native American communities. Interstate 75 and US 41 (Tamiami Trail) are two major transportation routes that are of concern with every ignition within or adjacent to BICY/FPNWR. State Road (SR) 29 along the western boundary of BICY and eastern boundary of FPNWR is also considered when evaluating wildfire response or impacts from prescribed fire.

Open burning, including prescribed burning, is regulated under Section 590.125 of the Florida Statutes by the Florida Forest Service. As part of the approval process, all applicants must provide a written burn plan or prescription that evaluates the anticipated impacts of the prescribed burn on smoke-sensitive areas. Prior to any prescribed fire, BICY/FPNWR would acquire the necessary authorization for burns and would also follow state and local requirements for reporting on smoke emissions from wildfires. In addition, prescribed burn managers would develop mitigation measures

to minimize impacts on public safety when winds have the potential to carry significant smoke that could impact traffic corridors, communities, and visitor safety.

As future developments encroach upon FPNWR and BICY, community planners, site developers, and new residents must understand that there may be significant smoke impacts from wildland fire to these new communities. FPNWR and BICY will continue to coordinate with the appropriate authorities to mitigate smoke impacts on developments that encroach upon these wild lands.

### **Vegetation**

There are five major vegetation communities at BICY—cypress, prairie, mangrove forests, pinelands, and hardwood hammocks (NPS 2010a) and four major vegetation communities at FPNWR—cypress, prairie, pinelands, and hardwood hammocks (FWS 2000). Cypress is the dominant vegetation community, covering approximately 50% of BICY and 60% of FPNWR. The minor changes in elevation in BICY bring about different plant communities. Marshes, cypress strands and domes, and cypress savannas cover the lowest elevations. Prairies typically cover the middle elevations, while the higher elevations are covered with pinelands and hammocks. Disturbed areas are intermixed throughout the Preserve and Refuge and can be found within all vegetation communities. When discussing elevation differences in south Florida, a few feet is all that is required to drastically change vegetation communities.

#### ***Cypress and Mixed Hardwood Swamps***

The dominant trees in BICY and FPNWR are bald cypress (*Taxodium distichum*) and pond cypress (*T. ascendens*). Most of the larger cypress trees have been removed by historic period logging, and only a few large trees remain.

In south Florida, cypress forests can be divided into four categories—cypress strands, cypress domes, mixed hardwood swamps, and sloughs. Cypress has been found to have very fire-resistant bark due to its insulating properties (Hare 1965). Wade et al. (1980) suggested historical fire frequencies ranging from 100 to 200 years in dense cypress sloughs. Myers and Ewel (1990) estimated a 20-year fire frequency in cypress forests. Fires that penetrate the denser stands of cypress only occur during extreme drought conditions but are still important in maintaining cypress as the dominant species in these communities. Without fire, cypress forests would be replaced by hydric hardwoods because fires help limit hardwood undergrowth and competition (Burch 2003).

Cypress strands are linear strands of cypress that follow water features and are dominated by bald cypress occurring in deep mineral soil depressions. Strands are generally larger than domes and so are more biologically diverse. Cypress strands are dominated by cypress as well as other mixed hardwoods such as red maple (*Acer rubrum*), pop ash (*Fraxinus caroliniana*), and willow (*Salix* spp.). The shrub layer is sparse but may include scattered dahoon holly (*Ilex cassine*), myrsine (*Rapanea punctata*), or swamp dogwood (*Cornus foemina*). Ground cover may be nearly absent because hydroperiods are often long, or it may be ephemeral and appearing during the dry season; swamp fern (*Blechnum serrulatum*) is a common ground cover that is dominant in strands.

Cypress domes are small, relatively discreet areas of freshwater swamp dominated by bald cypress in BICY and by pond cypress in FPNWR. These areas are often circular and surrounded by marl prairies or herbaceous marsh community with scattered trees. Domes occupy mineral soil depressions underlain by marl and limestone bedrock. The domed shape of these communities is produced by taller cypress trees growing near the center of the community, where moisture is abundant even during dry periods, and progressively shorter trees occurring near the peripheral areas. Hardwood species are similar to those found in the cypress strands.



Mixed hardwood swamps are wetlands co-dominated by cypress trees and hardwoods. Common co-dominate hardwoods include red bay (*Persea borbonia*), cabbage palm (*Sabal palmetto*), pop ash, pond apple (*Anona glabra*), swamp bay (*Persea palustris*), or laurel oak (*Quercus laurifolia*). Bromeliads such as airplants (*Tillandsia* spp.) and the state-endangered Fuch's bromeliad (*Guzmania monostachia*) and orchids such as ghost orchids (*Polyradicion lindenii*) and epidendrums (*Epidendrum* spp.) are commonly found on the trunks and branches of trees in this vegetation community. Epiphytic ferns such as shoestring fern (*Vittaria lineata*) and golden polypody (*Phlebodium aureum*) are common on the trunks of cabbage palms. These swamp communities are usually diverse and may represent a stage of community succession later than a bald cypress-dominated community. Burch (2003) estimated the fire frequency at 50–100 years. The edges of these communities may experience more frequent burns, and areas closer to the hydric interior should experience less frequent fires.

Sloughs are sinuous, elongated natural drainage channels that are inundated most of the year and are typically the deepest drainageways within swamps and marsh systems. The vegetation structure is varied, with sloughs dominated by aquatic plants, emergent plants, and/or low or sparse trees. Aquatic plants include white water lily (*Nymphaea odorata*), water hyssop (*Bacopa caroliniana*), and ludwigia (*Ludwigia repens*). Common trees include willow and pop ash with or without emergent and floating aquatic plants. During severe droughts, surface sediments dry out and ground fires may develop, but generally sloughs are wet most of the year and have historically served as fire breaks for communities bordering the sloughs. When fires do occur, depressions are formed in the organic soils, and they fill with water to become ponds. Ponds and sloughs provide important habitat for alligators.

### ***Prairies and Marshes***

Prairies are treeless areas dominated by mixed grasses, sedges, and other herbaceous plants. There are two types of prairies found in BICY and FPNWR—herbaceous wet and dry prairies and cypress prairies. Prairies will burn during periods of drought and when sufficient fuel is present. Burch (2003) estimated a natural fire frequency of 3–5 years. Fire maintains prairies by eliminating invading trees and shrubs, but many cypress trees survive these often fast-moving but relatively low-intensity fires. An adverse effect of fire suppression has increased the time between fires, allowing vegetative fuels to build up on the cypress prairies. These fuels feed fires that may burn more intensely than the natural 3-5 year fire frequency, injuring and killing more cypress trees.

Wet prairies are seasonally inundated short-grass communities characterized by 70 days of inundation to eight inches. Graminoids such as muhly grass (*Muhlenbergia capillaris*), blue maidencane (*Amphicarpum muhlenbergianum*), or south Florida bluestem (*Schizachyrium rhizomatum*) often dominate these prairies. These prairies often occur on frequently flooded fine sands or calcium carbonate marls. Dry prairies are seasonally inundated short-grass communities characterized by 50 days of inundation to two inches. Common plants include broomsedge (*Andropogon* spp.), lopsided Indian grass (*Sorghastrum secundum*), festal grass (*Setaria gracilis*), sand cordgrass (*Spartina bakeri*), and saw palmetto (*Serenoa repens*).

Cypress prairies are transitions between short-grass prairies and cypress-dominated swamps and typically contain elements of both. This prairie is characterized by dwarf cypress trees with grasses such as muhly grass, or saw grass (*Cladium jamaicense*) as the understory. The cypress prairie is inundated most of the wet season. Fire return intervals are estimated to be 24 years (Snyder 2000).

Both freshwater and saltwater marshes can be found in BICY with freshwater more prevalent; only freshwater marshes are present in FPNWR. Marshes are wetland communities that are typically



dominated by grasses or sedges. These vegetation communities are inundated nearly year-round and have thick organic mantle on the surface.

### ***Mangroves***

Mangrove forests are intertidal wetlands dominated by hardwood trees that are tolerant of coastal, saline conditions. The dominant trees species are red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*), and white mangrove (*Laguncularia racemosa*) with buttonwood (*Conocarpus erectus*). These trees often form dense forests on much of the coast in south Florida and form scattered tree islands farther inland where surface waters become brackish. The distribution of mangrove forests in BICY depends on water depth and salinity.

Mangrove forest soils vary in salinity, depending on the distance from the coast and seasonal runoff from adjacent inland freshwater. This vegetation community seldom burns, as it is an intertidal wetland community; the vegetation is often immersed at the roots and the trees contain high water content. However, the inland margins of the mangrove forest adjacent to brackish marsh communities may burn with upstream prairie fires (Burch 2003). Mangrove forests usually have little to no ground cover, so that fires stop at the interface, but trees at prairie margins may be killed by the fires' heat.

### ***Pinelands***

Pinelands occur in areas that are slightly higher than most wetlands, so their substrates are inundated less frequently. The dominant species are Florida slash pine (*Pinus elliottii* var. *densa*) with cabbage palm and saw palmetto as dominants in the understory in FPNWR. In BICY, the understory is dominated by saw palmetto. The saw palmetto is typically so dense that groundcover does not become well established unless the pinelands burn frequently.

Slash pine forested communities that occur on limestone outcrops are called pine rockland communities. These areas also develop a saw palmetto shrub layer, but the saw palmettos are usually not as dense as in the pine and palmetto communities. This allows the establishment of other shrubs and ground cover, resulting in more diversity than pine and palmetto communities occurring on sandy substrates. Pine rockland communities often contain plants that are associated with the Atlantic coastal ridge communities.

The pine and palmetto and pine rockland communities are typically mesic communities but frequently include extensive ecotonal (transitional) areas that are adjacent to wetlands. These ecotonal communities have brief or infrequent hydroperiods and contain elements of the adjacent wetlands. Saw palmettos may not adapt well to hydric conditions and are not as common in areas that are saturated or inundated often. Slash pines, however, tolerate more hydric conditions, so that in areas with short hydroperiods, slash pines commonly live without the saw palmetto understory. In these areas, the open pine canopy allows sunlight to penetrate, and graminoids commonly found in prairies are supported.

Several ecotonal communities can be found in pinelands. These ecotonal communities occur in areas with subtle topographic differences, so that differences in the communities may occur because of differences in soil type, hydrology, small elevation differences, or fire history.

Pine needles, grasses, and other combustible materials accumulate relatively quickly in pinelands, and pinelands would typically burn at frequent intervals. Burch (2003) estimated a natural fire frequency of 7–20 years. Pinelands are fire-dependent, and prescribed fires maintain the habitat viability by preventing hardwood succession. If fires are suppressed, pinelands eventually succeed to hardwood-dominated stands.

### ***Hardwood Hammocks***

This vegetation community occurs on slightly elevated areas with mesic and hydric hardwood hammocks scattered throughout BICY/FPNWR. Hammocks are typically small areas (2.5 acres or less) that are surrounded by other vegetation communities; in the Big Cypress region, the surrounding community is usually wetland swamp or prairie. Hardwood hammock vegetation communities are dense forests dominated by hardwood trees with cabbage palms and saw palmettos. Epiphytes are common, especially on the branches of oak trees, where resurrection fern (*Polypodium polypodioides*), many bromeliads, and several uncommon orchids grow. Because soils remain moist most of the year, hardwood hammocks rarely burn but are susceptible to fire during extended droughts. Following a fire, the species composition of recolonized hammocks often changes significantly (Duever et al. 1986). Duever et al. (1986) conservatively estimated the natural fire frequency of 50 years or more.

Many of the hammocks are located on archeologically important shell mounds that were created by the Calusa Indians. The shell mounds support a diversity of hardwood species such as gumbo limbo (*Bursera simaruba*), mastic (*Mastichodendron foetidissimum*), and poison wood (*Metopium toxiferum*). Hardwood hammocks are characterized by maple and laurel oak (*Quercus laurifolia*) on lower elevation areas and with live oak (*Q. virginiana*) and cabbage palm on higher elevation areas. Cabbage palm hammocks are usually not especially diverse and have few trees other than cabbage palms forming the tree canopy. Shrubs are uncommon, and ground cover is sparse. Vines and epiphytes may occur on the palm trunks, but these are also usually sparse.

### ***Non-native Species***

Thousands of non-native plants have been introduced to south Florida for ornamental plantings, agriculture, and other human uses. Due to the relative youth of the south Florida landmass and the semitropical climate, it is thought that the region is particularly susceptible to invasion by exotic plant species (Duever et al. 1986).

The Florida Exotic Pest Plant Council keeps an updated list of the 137 Category I and Category II non-native plants in Florida, which represents about ten percent of the more than 1,400 non-native plant species that have been introduced into Florida and subsequently established outside of cultivation (Florida Exotic Pest Plant Council 2015). Category I non-native plants are those invasive non-natives that are altering native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives (Florida Exotic Pest Plant Council 2015). Category II non-native plants are those invasive non-natives that have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by Category I species; these species may become ranked Category I if ecological damage is demonstrated (Florida Exotic Pest Plant Council 2015). Many of these plants are reported in BICY and FPNWR, but most are restricted to early successional stages on disturbed sites, and only a few pose a long-term threat to native communities. Of these, five species—melaleuca (*Melaleuca quinquenervia*), Brazilian pepper (*Schinus terebinthifolius*), water hyacinth (*Eichhornia crassipes*), hydrilla (*Hydrilla verticillata*), and Old World climbing fern (*Lygodium microphyllum*)—are fairly common in BICY and four species are common in FPNWR—melaleuca, Brazilian pepper, Old World climbing fern, and cogon grass (*Imperata cylindrica*).

Australian-pine (*Casuarina* spp.) was also identified as a non-native invasive species of concern in BICY; however, in the last two decades it has been eradicated. All known Australian-pine plants have been eliminated from BICY except for those on private property. Crested floatingheart (*Nymphoides cristata*), a relatively new non-native for south Florida, was discovered in BICY in

August 2006. Infestations are restricted to about four miles of canal along Tamiami Trail and two strand swamps south of the trail (NPS 2010b). Evidence suggests that this species was introduced to BICY through the transfer of seeds attached to a net or other fishing gear. Invasion of the adjacent swamps likely occurred from water flowing through culverts in the area. Water-lettuce (*Pistia stratiotes*) and common air-potato (*Dioscorea bulbifera*) are also known to be present.

The non-native plant control program is carried out by NPS/FWS contractors, volunteers, and maintenance and resource management staff. BICY/FPNWR staff are active participants in the Florida Exotic Pest Plant Council, an interagency task force organized to share technical information on the control of non-natives, monitor the distribution of non-natives in south Florida, and collaborate on comprehensive control strategies. Non-native plant control for BICY is completed under the South Florida and Caribbean Parks Exotic Plant Management Plan and Environmental Impact Statement (NPS 2010b).

**Melaleuca** grows well on prairies and open, moist pinelands and is slower to invade water vegetation communities such as cypress strands and domes. Melaleuca is extremely fire tolerant. The spongy inner bark insulates the trunk while the papery outer bark and oil-rich leaves readily carry fire. Following a fire, melaleucas will both release seeds and re-sprout, and fires create excellent conditions for melaleuca seed germination and seedling survival. Hence, fire in a mature melaleuca stand can encourage the non-native to spread. Melaleuca is controlled through two primary methods: (1) hand pulling—manually pulling the plants when they are small enough, and (2) stump cutting/girdling—brushing or spraying herbicide on freshly cut stump surfaces. Both techniques are labor-intensive, and trained personnel are required to handle the herbicides. Once mature, seed-bearing trees have been killed, prescribed fire or cutting may be used to help control seedlings and sprouts and encourage fire-adapted native species.

**Brazilian pepper** is primarily found on disturbed, well-drained sites. Fire has variable effects on pepper plants. Seedlings are killed by fairly frequent fires; however, in more mature stands trees may be top-killed by fires but can re-sprout and reoccupy a burned area. Intense fires on upland sites tend to eliminate competing vegetation and prepare good seedbed conditions. Like melaleuca, Brazilian pepper occurs in dense, pure stands. However, unlike melaleuca, dense Brazilian pepper stands are almost always confined to areas with substrate disturbance (roadsides, canal banks, abandoned homesites, or camps—typically areas in which fill has been placed to create dry land). As some upland areas mature toward hardwood hammock vegetation, Brazilian-pepper will decline in importance. However, in most upland areas the natural fire cycle is likely to maintain Brazilian-pepper as a component of the understory indefinitely. Fire and hydrological cycles seem to prevent Brazilian pepper from invading undisturbed prairies, marshes, and other more moist types of environments.

**Waterhyacinth and hydrilla** have invaded the Preserve's canal systems and excavated ponds, where they often form dense mats. Neither species can invade seasonally dry wetlands, and both species appear to be restricted to permanent water in canals and ponds.

**Old World climbing fern** is rapidly becoming a significant problem species throughout south Florida due to its invasive nature. This species invades trees and shrubs and may form dense horizontal and vertical growth, which intensifies fire risk to native vegetation. The fern creates a “ladder fuel” that may increase fire intensity and canopy fires in vegetation where it would not normally occur, thus increasing native tree and shrub mortality.

Both BICY and FPNWR have invasive control programs and monitor unburned and previously burned sites for establishment of invasives. If invasives are discovered, actions are prioritized to

control or remove threat populations. On well-established invasive sites, fire is sometimes used to burn stands of invasives, then treatment by herbicide, mechanical, and additional fire can lead to successful control and re-establishment of natives.

### ***Fire Ecology***

The natural vegetation communities of BICY and FPNWR are dynamic with boundaries of communities shifting over time. The two major influences on vegetation distribution are fires and hydroperiods; other factors are frost and hurricane damage. Of these influences, only fire may be used as a practical management tool in natural areas.

All natural vegetation communities in the area are affected by fire, with many being dependent on fire for their perpetuation. Many plants in fire-dependent communities, such as prairies and pinelands, are highly flammable, thus fires spread rapidly in these communities. South Florida has the highest incidences of lightning out of any region in the nation and has a long history of human-caused fires (Wade et al. 1980). Lightning-caused fires peak during the latter part of the dry season just before the summer rains. Human-caused fires tend to be more frequent in the dry winter months.

Fire-dependent communities require surface fires to eliminate competing vegetation, stimulate growth or seed production, create seedbed conditions, and release nutrients. Although periodic surface fires tend to maintain fire-dependent communities, extreme fire conditions can dramatically alter plant, and consequently animal, distribution. When the fire cycle is retarded, organic materials accumulate and create hazard fuel levels that can threaten even fire-tolerant species. Prolonged droughts or human-caused drainage can dry out the organic soils of many plant communities and, when coupled with hazard fuel accumulations, can result in intense fires that consume organic soil materials. Peat fires, as such fires are called, can literally burn the soil out from under established vegetation, radically changing the plant composition. Peat fires tend to lower the surface level of the burned area, thereby extending the hydroperiod and affecting the replacement vegetation. The pond in the middle of a cypress dome, for instance, may be enlarged by a peat fire. In an extreme example, a hardwood hammock on deep organic soil may be completely burned and replaced by an open pond.

### **Water Resources**

The Preserve and Refuge lie within the Big Cypress Swamp physiographic region of southwest Florida. This physiographic region is a source of recharge for the shallow aquifers of south Florida and much of Everglades National Park. BICY and FPNWR are influenced by upstream inputs from external surface flow.

### ***Hydrology***

Surface water is typically characterized as a “sheet flow” flooding regime, which means that the landscape becomes covered with a shallow, continuous expanse of water during the wet season. The shallow water flows slowly towards the coast, with water movement being nearly imperceptible due to the almost flat terrain in both BICY and FPNWR. During the peak of the wet season, as much as 90 percent of the area may be inundated to depths ranging from a few inches to more than 3 feet at the peak of the wet season (FWS 2000, NPS 1991). In BICY, marsh, prairie, and cypress areas have water depths of 1 to 3 feet, while pinelands and hammock vegetation communities have little to no water. During the drydown, water is retained in the deepest depressions formed by low spots in the bedrock, canals, and deepest parts of the cypress strands.

In BICY, water flows generally follow bedrock undulations, which are oriented in a northeast-southwesterly direction and range in relief from 1 foot to 10 feet. These low areas control surface

flows because the water table is below the crests of the undulations most of the time. In FPNWR, water flows from north to south with water from the Corkscrew Regional Ecosystem Watershed and the Okaloacoochee Slough wetlands flowing through the Refuge. These wetlands help to control surface flows, as they retain water from major rainfall events, providing flood protection. These wetlands also filter and cleanse these waters before they enter the aquifer, which is a drinking water source.

Major physical alterations of the landscape and associated water management practices have greatly modified the volume, timing, distribution, and quality of surface water in south Florida. Since the 1880s, development was assisted by large-scale drainage of wetlands, canal and levee building, road construction, agriculture, residential and commercial development, and operation of pumps and flood gates. Today, many portions of the watershed are drier or wetter for longer periods than before such development and have poorer water quality related to agricultural and urban runoff. Channelization is also a concern at the southern boundary of BICY, where fresh water and salt water mix and changes in salinity may change the vegetation composition.

BICY and FPNWR are underlain by a shallow, surficial aquifer (consisting of unconsolidated sand and gravel), which serves as the main source of fresh water in Collier County. The aquifer lies in a porous limestone formation that is approximately 130 feet thick on BICY's western boundary and generally diminishes in thickness to the east and disappears in the vicinity of Forty-Mile Bend. Throughout much of BICY/FPNWR, the limestone of this shallow, unconfined aquifer is within 10 feet of the surface. Groundwater travels relatively quickly through the formation and is recharged quickly by fresh surface water flows. Where limestone or other porous aquifers are near the coast, salty seawater can begin to move inward and infiltrate freshwater aquifers. This is particularly problematic where fresh groundwater is pumped to provide urban water supplies. Rapid development in south Florida has resulted in saline marine groundwater moving inward more than 15 miles in some places (USGS 2001). During the rainy season, groundwater levels are high. By April, the usual ends of the dry season, water levels normally reach their annual lows.

### ***Wetlands***

The Preserve and Refuge have been mapped by FWS as part of the National Wetlands Inventory. Most of BICY and FPNWR are classified as wetlands; exceptions are scattered hardwood hammocks, pinelands, and artificially filled areas. Seven types of wetlands occur in BICY and four wetland types occur in FPNWR, with the majority of them being seasonal wetlands. Cowardin classifications present in BICY and FPNWR include periphyton communities, marshes, sloughs, prairies, open cypress domes, lakes, lake shorelines, and drainage canals/ditches. Most of the wetland area is seasonal except for the freshwater ponds and riverine areas.

### ***Water Quality***

The waters of BICY and FPNWR are currently designated as Outstanding Florida Waters. This is a state designation delegated by EPA under the Clean Water Act and is intended to protect existing, high-quality waters. The Big Cypress Swamp is also designated as an Area of Critical State Concern by Florida state statute (Chapter 380.05). This designation provides the state's Department of Community Affairs with oversight on local development projects and comprehensive planning within the designated area (Collier County).

Concentrations of nitrogen, phosphorus, total organic carbon, and persistent pesticides, which often serve as indicators of pollution, are generally similar to concentrations in nearby, relatively uninhabited areas, and concentrations are considerably less than those of nearby urbanized areas.



Water quality changes occur seasonally and diurnally in Big Cypress and are related to the natural hydrologic and biologic regimes. The seasonal recession of water levels triggers physical, chemical, and biological changes in water quality. During low water, diurnal fluctuations in dissolved oxygen are greatest as a result of the high concentration of organisms in the remaining water. During the day plants produce excess oxygen by photosynthesis. During the night, dissolved oxygen decreases as photosynthesis ceases and respiration demands are met. Fish kills sometimes occur during periods of low dissolved oxygen; they have been observed in the spring in the Tamiami Canal about 10 miles west of Forty-Mile Bend, and often they spread both east and west for several miles. The low nutrient, high-quality water in the Addition is vulnerable to degradation from contaminants. Because the water is of such high quality, even small amounts of contaminants can result in relatively large adverse effects. External sources of pollution primarily include nutrient-enriched runoff from upstream agricultural and urban activities, especially in the north. Internal contaminant sources include NPS developments, inholdings, operation of boats and vehicles within the original Preserve, and oil and gas operations. Today, water quality in some locations is dramatically different than before 1900. Surface water entering the Addition is nearly completely controlled, and having drained from agricultural and developed areas, is laden with nutrients, dissolved solids, and trace amounts of pesticides and herbicides (SFWMD 1992). The Refuge is expected to have similar water quality impacts.

BICY collects water quality samples every other month at 20 stations located throughout the original Preserve and the Addition. FPNWR also collects water quality data. The objective of this water monitoring program is to provide a long-term record for assessing ambient water quality conditions and contamination threats. The South Florida Water Management District (SFWMD) maintains water-quality monitoring programs in lands upstream and adjacent to the Addition. The most important parameters of interest for tracking long-term water quality conditions include total phosphorus, nitrate, sulfate, and pesticides.

### **Wildlife**

Both BICY and FPNWR are known for their diversity and abundance of wildlife. A total of 200 bird species, over 70 fish species, 72 species of reptiles and amphibians, and 37 mammal species (13 of which are game species) have been documented in BICY (NPS 2015a). At least 126 bird species, over 13 families of fish, 22 mammal species, and 64 reptiles and amphibian species have been documented in FPNWR (FWS 2000). The distribution, abundance, and diversity of species within BICY/FPNWR vary by season and variety of habitats present.

### ***Non-native Species***

Non-native species impact natural systems through unchecked predation on native wildlife, digging/rooting behavior, or consuming and killing of native plant species. In many cases, non-native wildlife has no natural predators and can displace native species and multiply rapidly. More than 100 non-native animal species have been introduced into south Florida (Duever et al. 1986). Sixty of these species are believed to have established breeding populations. At least 22 non-native species have been collected in BICY, 18 of which are known to have breeding populations, such as the feral hog (*Sus scrofa*), armadillo (*Dasypus novemcinctus*), several fish (e.g., walking catfish (*Clarias batrachus*), black acara (*Cichlasoma bimaculatum*), spotted tilapia (*Pelmatolapia mariae*), and oscar (*Astronotus ocellatus*)), several insects (e.g., fire ants (*Solenopsis* spp.) and lovebugs (*Plecia nearctica*)), and numerous species of herpetofauna.

The increasing number of non-native snakes found in south Florida has been causing concern among biologists, with the Burmese python (*Python bivittatus*) being the most commonly observed. The



Burmese python is native to India and southeast Asia and has flourished in the subtropical climate of south Florida. Twenty-nine non-native snakes were discovered in BICY in 2011, an increase from previous years. In nearby Everglades National Park, as of 2007 more than 624 Southeast Asian snakes have been found since 2000. In 2006 and 2007, more than 418 snakes were captured and/or removed from the Everglades.

### **Special Status Species**

Under the ESA, the NPS/FWS have the responsibility to address impacts to federally listed, candidate, and proposed species. The terms “threatened” and “endangered” describe the official federal status and certain species in BICY/FPNWR as defined by the ESA. The term “candidate” is used officially by FWS to describe species for which sufficient information exists on biological vulnerability and threats to support a “proposed rule to list,” but issuance of the proposed rule has not been completed. NPS and FWS policies dictate that federal candidate species, proposed species, and state species of concern are to be managed to the greatest extent possible as federally listed endangered and threatened species.

Thirty-five animal species could occur in BICY that are protected at the federal or state level or are recognized as rare. Of these, 11 are listed as either federally threatened or endangered and reside in BICY and/or FPNWR (Table 5). There are 17 state listed species of special concern. These species are listed by the Florida Fish and Wildlife Conservation Commission and warrant special attention because they have experienced long-term population declines and are vulnerable to exploitation or environmental changes.

For the purposes of this analysis, a list of federally and state listed species was obtained from the following sources: 1) federally listed species that may occur in or near BICY/FPNWR was obtained from the USFWS IPAC website (<http://ecos.fws.gov/ipac/>) on June 4, 2015 (Consultation tracking numbers 04EF2000-2015-SLI-0196 and 04EF2000-2015-SLI-0197); 2) BICY official species list from NPSpecies; and 3) state listed species that may occur in or near BICY/FPNWR. Species that were eliminated from detailed analysis in this EA include: 1) species that were extirpated or are not believed to occur within BICY/FPNWR; and 2) species that occur in areas that would not be affected by fires, such as estuarine areas, mangroves, and hardwood hammocks. Tables 4 and 5 summarize federal and state special status species that are known to occur within BICY and/or FPNWR. There were nine animal species and three plant species retained for analysis.

### ***Listed or Candidate Plants***

As shown in Table 4, there are three species of plants that are listed as candidate species for federal listing. The state of Florida lists 104 species that occur in BICY and/or FPNWR as threatened or endangered, including the three listed as federal candidate species, along with three more that are listed as commercially exploited (Table 4). These plant species warrant attention because they have had long-term population declines and are vulnerable to exploitation or environmental changes. Most are members of fire-dependent plant communities.

**Table 4. Threatened and Endangered Listed Plant Species for BICY and FPNWR<sup>1</sup>.**

Name	Status <sup>2</sup>	
	Federal	State
Everglades palm ( <i>Acoelorrhaphe wrightii</i> )		T
Golden leather fern ( <i>Acrostichum aureum</i> )		T

Name	Status <sup>2</sup>	
	Federal	State
Brittle maidenhair ( <i>Adiantum tenerum</i> )		E
Sensitive joint-vetch, meadow joint-vetch ( <i>Aeschynomene pratensis</i> )		E
White colic-root, bracted colic-root ( <i>Aletris bracteata</i> )		E
Pineland-allamanda, pineland golden trumpet ( <i>Angadenia berteroi</i> )		T
Eared spleenwort ( <i>Asplenium erosum</i> )		E
Bird's-nest fern, wild birdnest fern ( <i>Asplenium serratum</i> )		E
Pinepink ( <i>Bletia purpurea</i> )		T
Fakahatchee bluethread ( <i>Burmannia flava</i> )		E
Manyflowered grasspink ( <i>Calopogon multiflorus</i> )		E
Spicewood, pale lidflower ( <i>Calyptanthus pallens</i> )		T
Leafless bentspur orchid ( <i>Campylocentrum pachyrrhizum</i> )		E
Narrow strap fern, narrow-leaved strap fern ( <i>Campyloneurum angustifolium</i> )		E
Tailed strap fern ( <i>Campyloneurum costatum</i> )		E
Powdery strap airplant ( <i>Catopsis berteroniana</i> )		E
Florida strap airplant ( <i>Catopsis floribunda</i> )		E
Southern Florida sandmat, rockland sandmat ( <i>Chamaesyce pergamena</i> )		T
Porter's sandmat ( <i>Chamaesyce porteriana</i> )		E
Satinleaf ( <i>Chrysophyllum oliviforme</i> )		T
Coffee colubrina, greenheart ( <i>Colubrina arborescens</i> )		E
Butterflybush, Curacao bush ( <i>Cordia globosa</i> )		E
Quailberry, Christmasberry ( <i>Crossopetalum ilicifolium</i> )		T
Pepperbush ( <i>Croton humilis</i> )		E
Florida tree fern, red-hair comb fern ( <i>Ctenitis sloanei</i> )		E
Blodgett's swallowwort ( <i>Cynanchum blodgettii</i> )		T
Cowhorn orchid, cigar orchid ( <i>Cyrtopodium punctatum</i> )		E
Florida prairie clover ( <i>Dalea carthagenensis</i> var. <i>floridana</i> )	C	E
Caribbean crabgrass		T

Name	Status <sup>2</sup>	
	Federal	State
( <i>Digitaria filiformis</i> var. <i>dolichophylla</i> )		
Florida pineland crabgrass, Everglades crabgrass, twospike crabgrass ( <i>Digitaria pauciflora</i> )	C	E
Guiana-plum ( <i>Drypetes lateriflora</i> )		T
Clamshell orchid, cockleshell orchid ( <i>Encyclia cochleata</i> )		E
Florida butterfly orchid ( <i>Encyclia tampensis</i> )		C
Dingy-flowered star orchid ( <i>Epidendrum anceps</i> )		E
Acuna's star orchid ( <i>Epidendrum blancheanum</i> )		E
Umbrella star orchid ( <i>Epidendrum floridense</i> )		E
Night-blooming epidendrum, night-scented orchid ( <i>Epidendrum nocturnum</i> )		E
Stiff-flower star orchid ( <i>Epidendrum rigidum</i> )		E
Sanibel Island love grass ( <i>Eragrostis tracyi</i> )		E
Southern guará, Southern beeblossom ( <i>Guara angustifolia</i> )		E
Beach verbena, coastal mock vervain ( <i>Glandularia maritima</i> )		E
Wild cotton, upland cotton ( <i>Gossypium hirsutum</i> )		E
Fuchs' bromeliad, West Indian tufted airplant ( <i>Guzmania monostachia</i> )		E
Snowy orchid ( <i>Habenaria nivea</i> )		T
Needleroot airplant orchid ( <i>Harrisella porrecta</i> )		T
Poeppig's rosemallow ( <i>Hibiscus poeppigii</i> )		E
Hanging club-moss ( <i>Huperzia dichotoma</i> )		E
Delicate violet orchid ( <i>Ionopsis utricularioides</i> )		E
Rockland morningglory ( <i>Ipomoea tenuissima</i> )		E
Pineland clustervine ( <i>Jacquemontia curtisii</i> )		T
Skyblue clustervine ( <i>Jacquemontia pentanthos</i> )		E
East coast lantana, Florida shrubverbena ( <i>Lantana depressa</i> var. <i>sanibelensis</i> )		E
West coast lantana, Sanibel shrubverbena ( <i>Lantana depressa</i> var. <i>sanibelensis</i> )		E
Catesby's lily, pine lily ( <i>Lilium catesbaei</i> )		T
Small's flax ( <i>Linum carteri</i> var. <i>smallii</i> )		E

Name	Status <sup>2</sup>	
	Federal	State
Pantropical widelip orchid ( <i>Liparis nervosa</i> )		E
Nodding club-moss ( <i>Lycopodiella cernua</i> )		C
Hidden orchid ( <i>Maxillaria crassifolia</i> )		E
Pineland blackanthers ( <i>Melanthera parvifolia</i> )		T
Climbing vine fern ( <i>Microgramma heterophylla</i> )		E
Twinberry, Simpson's stopper ( <i>Myrcianthes fragrans</i> )		T
Giant sword fern ( <i>Nephrolepis biserrata</i> )		T
Wild basil, wild sweet basil ( <i>Ocimum campechianum</i> )		E
Florida dancinglady orchid ( <i>Oncidium ensatum</i> )		E
Hand fern ( <i>Ophioglossum palmatum</i> )		E
Erect pricklypear ( <i>Opuntia stricta</i> )		T
Royal fern ( <i>Osmunda regalis</i> var. <i>spectabilis</i> )		C
Pineland passionflower ( <i>Passiflora pallens</i> )		E
Comb polypody ( <i>Pecluma ptilodon</i> var. <i>caespitosa</i> )		E
Cypress peperomia ( <i>Peperomia glabella</i> )		E
Yerba linda ( <i>Peperomia rotundifolia</i> )		E
Southern fogfruit ( <i>Phyla stoechadifolia</i> )		E
Yellow butterwort ( <i>Pinguicula lutea</i> )		T
Ghost orchid, palmplolly ( <i>Polystachya lindenii</i> )		E
Greater yellowspike orchid ( <i>Polystachya concreta</i> )		E
Bahama ladder brake ( <i>Pteris bahamensis</i> )		T
Swartz's snoutbean ( <i>Rhynchosia swartzii</i> )		E
Royal palm, Florida royal palm ( <i>Roystonea regia</i> )		E
Leafless beaked lady's-tresses ( <i>Sacoila lanceolata</i> var. <i>paludicola</i> )		T
Ray fern ( <i>Schizaea pennula</i> )		E
Florida Keys nutrush ( <i>Scleria lithosperma</i> )		E
Everglades bully	C	E

Name	Status <sup>2</sup>	
	Federal	State
( <i>Sideroxylon reclinatum</i> subsp. <i>austrorloridense</i> )		
Mullein nightshade ( <i>Solanum donianum</i> )		T
Everglades Keys false buttonweed ( <i>Spermacoce terminalis</i> )		T
Texas ladiestresses ( <i>Spiranthes brevilabris</i> )		E
Lacelip lady's-tresses ( <i>Spiranthes laciniata</i> )		T
Longlip lady's-tresses ( <i>Spiranthes longilabris</i> )		T
Southern lady's-tresses ( <i>Spiranthes torta</i> )		E
West Indian mahogany ( <i>Swietenia mahagoni</i> )		T
Broad halbard fern ( <i>Tectaria heracleifolia</i> )		T
Curtiss' hoarypea ( <i>Tephrosia angustissima</i> var. <i>curtissii</i> )		E
Lattice-vein fern ( <i>Thelypteris reticulata</i> )		E
Reflexed wild-pine, northern needleleaf ( <i>Tillandsia balbisiana</i> )		T
Stiff-leaved wild-pine, cardinal airplant ( <i>Tillandsia fasciculata</i> var. <i>densispica</i> )		E
Banded wild-pine, twisted airplant ( <i>Tillandsia flexuosa</i> )		T
Hoary wild-pine, fuzzywuzzy airplant ( <i>Tillandsia pruinosa</i> )		E
Giant wild-pine, giant airplant ( <i>Tillandsia utriculata</i> )		E
Soft-leaved wild-pine, leatherleaf airplant ( <i>Tillandsia variabilis</i> )		T
Chiggery grapes ( <i>Tournefortia hirsutissima</i> )		E
Entire-winged bristle fern ( <i>Trichomanes holopterum</i> )		E
Hoopvine ( <i>Trichostigma octandrum</i> )		E
Florida gamagrass ( <i>Tripsacum floridanum</i> )		T
Leafy vanilla ( <i>Vanilla phaeantha</i> )		E
Rain-lily, redmargin zephyrlily ( <i>Zephyranthes simpsonii</i> )		T

Sources: USFWS 2015, USDA 2015, and Florida Natural Areas Inventory 2015

<sup>1</sup>Species in this table include only those that have been documented in BICY and/or FPNWR

<sup>2</sup>C=candidate, T=threatened, E=endangered

**Florida Prairie Clover**—Florida prairie clover is a candidate for listing under the ESA and is state listed as endangered. Historically, Florida prairie clover was distributed in Miami-Dade, Collier, Monroe, and Palm Beach counties. It is found in pine rocklands, edges of rockland hammocks, coastal uplands, and marl prairie habitats. In BICY, this plant has been observed along roads

adjacent to pine rocklands and marl prairies and an ecotone between pineland and hardwood hammocks, with 11–100 individuals in both populations (FWS 2013a). Florida prairie clover has also been observed in FPNWR. Its habitat has been destroyed by development and regional water control efforts. Fire exclusion, ORVs, and exotic species infestations have also contributed to the species decline. Critical habitat has not been designated for this species.

Threats to Florida prairie clover, a fire-adapted plant, include fire exclusion, exotic plant invasion, and ORVs. Impacts from fire exclusion have been minimized through the regular application of prescribed fire. Impacts from exotic plant infestations are minimized through a combination of prescribed fire and physical control of exotic species that may impact Florida prairie clover. The effects of ORVs are minimized by restrictions of such vehicles to designated trails.

**Everglades Crabgrass**—Everglades crabgrass is a candidate for listing under the ESA and is state-listed as endangered. Everglades crabgrass habitat has been destroyed by development and regional water control efforts. Fire exclusion and exotic species infestations have also contributed to the species' decline. Critical habitat has not been designated for this species.

Historically, pineland crabgrass was distributed from south Miami to Long Pine Key. The current distribution of this species in BICY is widely distributed within and adjacent to the Lostmans Pines region (FWS 2013b). It prefers the ecotone between pine rocklands and marl prairie but will occasionally occur in both of these habitats. Periodic fires are required to maintain habitat by removing understory hardwoods and litter accumulations (FWS 2013b).

Threats to Everglades crabgrass, a fire-adapted plant species, include fire exclusion, exotic plant invasion, and changes to the regional hydrology from artificial drainage. Impacts from fire exclusion have been minimized through the regular application of prescribed fire. Impacts from exotic plant infestations are minimized through a combination of prescribed fire and physical control of exotic species that may impact Everglades crabgrass. The effects of changes in regional hydrology through restoration may have significant impacts on this species and the habitats that it occupies. Hydrologic restoration could restore groundwater levels, surface flow to marl prairies, and growing conditions in pine rocklands (FWS 2013b). Plants can withstand inundation for one to several months each year. Alternatively, increased hydroperiods (immersion) in wetland habitats where this species occurs may lead to a reduction in the amount of suitable habitat, a potential reduction in the area occupied, and a reduction in the number of individuals found in Lostmans Pines. It is unclear to what extent this may occur, if at all. At this time, it is not known whether the proposed restoration and associated hydrologic modifications would have positive or negative impact on the Everglades crabgrass (FWS 2013b).

**Everglades Bully**—Everglades bully is a candidate for listing under the ESA. Historically, this species had a narrow distribution which was generally restricted to pine rocklands and marl prairies in southern Miami-Dade County and the Lostmans Pines area of BICY in Monroe County. Plants occur in lower elevation pine rocklands, marl prairies and the ecotone between the two habitats. Loss of habitat, drainage and exotic species infestations have reduced the range of this species, and plants are now generally restricted to protected habitats in BICY. Outside of the Preserve, habitat destruction and degradation resulting from hydrological modifications and exotic species infestations remain the primary threats to populations of this species. Critical habitat has not been designated for this species.

In BICY, this species is found along the edges of Gum Slough within the Lostmans Pines area (south of Loop Road) on the mainland portion of Monroe County (FWS 2013c). A total of 17 plants have been recorded in pine rocklands associated with sawgrass and hardwood habitats (FWS 2013c).



Threats to Everglades bully include habitat loss or degradation from sea level rise, hydrological changes from artificial drainage (decreased surface water flow), fire exclusion, and invasive exotic plant species. In addition, the effects of changes in regional hydrology through restoration may have impacts on this species and the habitats that it occupies. Hydrologic restoration could restore groundwater levels, surface flow to marl prairies, and growing conditions in pine rocklands could improve (FWS 2013c). Alternatively, increased hydroperiods in wetland habitats where this species occurs may lead to a reduction in the amount of suitable habitat, a potential reduction in the area occupied and a reduction in the number of individuals found in Gum Slough. It is unclear to what extent this may occur, if at all. At this time, it is not known whether the proposed restoration and associated hydrologic modifications would have positive or negative impact on the Everglades bully (FWS 2013c).

### ***Other Plant Species of Concern***

Other plant species of concern include trees and shrubs of Caribbean origin, nearly endemic understory herbs, and temperate grasses as well as terrestrial and epiphytic orchids (Table 4). The abundance and distribution of these species varies widely, with some restricted to a single known site and others found in a variety of habitats. The amount of information available for each of these species ranges from qualitative descriptions to site-specific quantitative data that are periodically updated by BICY/FPNWR natural resource staff. In general, information on long-term status and trends is limited for the majority of these species. Recorded data collection is limited to geographic coordinates, population estimates or counts, reproductive status, habitat occupied and associated taxa. This information has been collected for a subset of species in this group that are known to be very limited in distribution or otherwise warrant special consideration when planning and implementing projects that may impact them. Existing data, site visits and best professional judgment are used to generate protective measures or other mitigations on a case-by-case basis during the planning process for fire management activities.

Factors that may impact populations of plant species of management concern that occur in fire-dependent habitats include fire exclusion, implementation of prescribed fire and other fire management activities, exotic plant and insect infestations, hydrological modifications to wetland habitats, vegetation management activities and poaching. The extent to which these factors have influenced populations over time is not well understood. The long-term persistence of rare plant species in fire-dependent habitats where historical and current information is available indicates that most of the rarest species are typically as abundant or are more abundant than they were historically. Plant species of management concern found in fire-dependent habitats with exotic plant infestations have likely declined in those areas. The influence of hydrological modification on these species, if any, is unknown.

### ***Animals***

**Table 5. Federal and State Listed Threatened, Endangered, or Candidate Animal Species Known to Occur within BICY and/or FPNWR<sup>1</sup>.**

Species	Status <sup>2</sup>	
	Federal	State
<b>Mammals</b>		
Florida bonneted bat <i>Eumops floridanus</i>	E	E
Everglades mink <i>Mustela vison evergladensis</i>	—	T

Species	Status <sup>2</sup>	
	Federal	State
Florida panther <i>Puma concolor coryi</i>	E	E
Big Cypress fox squirrel <i>Sciurus niger avicennia</i>	—	T
West Indian manatee* <i>Trichechus manatus</i>	E	E
<b>Birds</b>		
Cape Sable seaside sparrow <i>Ammodramus maritimus mirabilis</i>	E	E
Piping plover <i>Charadrius melodus</i>	T	T
White-crowned pigeon <i>Columba leucocephala</i>	—	T
Florida sandhill crane <i>Grus canadensis pratensis</i>	—	T
Wood stork <i>Mycteria americana</i>	T	T
Red-cockaded woodpecker <i>Picoides borealis</i>	E	E
Everglades snail kite <i>Rostrhamus sociabilis</i>	E	E
Audubon's crested caracara <i>Polyborus aristodemus poneanus</i>	T	T
Least tern <i>Sterna antillarum</i>	—	T
<b>Reptiles</b>		
American alligator <i>Alligator mississippiensis</i>	SAT	T
American crocodile <i>Crocodylus acutus</i>	T	T
Eastern indigo snake <i>Drymarchon corais couperi</i>	T	T

Sources: FWS 2015 and Florida Natural Areas Inventory 2014.

\*Designated Critical Habitat is present in BICY

<sup>1</sup>Species in this table include only those that have been documented in BICY and/or FPNWR

<sup>2</sup>T=threatened, E=endangered, SAT=similarity of appearance to a threatened or endangered species

**Florida Panther**—The Florida panther was listed as endangered under the ESA in 1967. Critical habitat for the Florida panther has not been designated by FWS. Both BICY and FPNWR provide suitable habitat for the panther. Panthers require large, contiguous areas with adequate prey availability and reduced levels of human disturbance. Primary prey of the Florida panther includes the white-tailed deer (*Odocoileus virginianus*) and non-native wild pig (Maehr et al. 1990, Dalrymple and Bass 1996). Secondary prey includes raccoons (*Procyon lotor*), ninebanded armadillos, marsh rabbits (*Sylvilagus palustris*) (Maehr et al. 1990) and alligators (Dalrymple and Bass 1996). Panthers select forested habitat types interspersed with other habitat types that are used in proportion to their availability (Land et al. 2008, Onorato et al. 2011). Den sites are usually located in dense, understory vegetation, typically saw palmetto (Maehr 1990, Shindle et al. 2003). Panthers prefer to move through vegetated areas and rarely move through open areas except at night. It is important to maintain vegetated corridors between habitats to allow for panther movement.

Currently, the only confirmed breeding panther population is located in south Florida, with the current population centered in and around BICY/FPNWR, including Everglades National Park, Fakahatchee Strand Preserve State Park, Picayune Strand State Forest, and privately owned lands north of BICY/FPNWR in Collier and Hendry counties. Both BICY and FPNWR have the primary responsibility for protecting the panther (as well as other listed species) on lands under their jurisdiction. NPS efforts have concentrated on the distribution of panthers on NPS lands in the Preserve south of I-75 and east of SR 29 and in Everglades National Park. FPNWR is responsible for panther research and management and has focused on panther home ranges and movement patterns, habitat selection and needs, food habits, demographic parameters, physical condition and health, and other life history and management questions. Much of the FPNWR prescribed burning program has been focused on sustaining prime panther habitat.

The Florida Panther Habitat Preservation Plan (Logan et al. 1993) identified about 926,000 acres of habitat considered essential to maintaining a minimum viable population of panthers in south Florida. Panthers use approximately 2.2 million acres of land in south Florida. Of the 2.2 million acres, BICY accounts for approximately 27% of the total habitat used by panthers and FPNWR makes up 1.4% of the range (Dees et al. 1999). Radio-telemetry data on collared panthers has shown 3–11 panthers using FPNWR and 12 den sites in the vicinity of FPNWR (FWS 2000).

Ecosystems on BICY and FPNWR evolved with frequent fires as a component of the landscape, thus panthers have adapted to this fire regime. Dees et al. (2001) found that panther use of pinelands in prescribed fire areas the first year post-burn was the greatest, with use declining in subsequent years. The response to the 1-year post-burn is likely due to the positive response of white-tailed deer and other prey species to the vegetation and structural changes (Dees et al. 2001, Maehr et al. 1990). Prey species could be attracted to burned areas due to hard mast (e.g., acorns) that is exposed and/or increased quantity and quality of forage. In addition, vegetation recovery in south Florida is rapid, with most regrowth occurring in the first year (Snyder 1986) and with subsequent growth being slower with a gradual buildup of leaf litter and woody debris.

Maehr and Larkin (2004) estimated that less frequent fire return intervals of 15–20 years would best benefit panthers in some areas. However, this estimate was based on the assumption that panthers would use large patches of mature and dense saw palmetto as a refuge, including for denning and raising young. Excluding fire for longer periods to allow the growth of mature, dense saw palmetto patches may increase the use by panthers but would also increase the likelihood of intense future wildland fires in these areas, which may increase the likelihood of kitten mortality and changes in suitability of habitat.

The FWS recovery plan for the Florida panther established three recovery objectives (FWS 2008):

- to maintain, restore, and expand the panther population and its habitat in south Florida and expand the breeding portion of the population in south Florida to areas north of the Caloosahatchee River
- to identify, secure, maintain, and restore panther habitat in potential reintroduction areas within the historic range and to establish viable populations of the panther outside south and south-central Florida
- to facilitate panther recovery through public awareness and education

**Florida Bonneted Bat**—The Florida bonneted bat was federally listed as endangered under the ESA in 2013 and is currently listed by the state of Florida as threatened. The Florida bonneted bat is a year-round resident but may have seasonal shifts in roosting sites. To date little is known about habitat needs and preferences. Existing roost sites need to be identified so that they can be preserved

and protected. In 1981, Beltwood found a small colony of Florida bonneted bats roosting in pine flatwoods community in longleaf pine cavities near Punta Gorda, Florida, that had been excavated by a red-cockaded woodpecker. Until recently, all other roost sites identified have been in man-made structures (e.g., bat houses, buildings). Eger (1999) noted that in forested areas, old mature trees were essential roosting sites. This bat species also uses foliage of palm trees and possibly limestone crevices and outcrops. This species has two breeding seasons in the summer and during January and February (Timm and Genoways 2004).

Florida bonneted bats have been found foraging for insects in semitropical forests in tropical hardwoods, pineland, and mangrove habitats, as well as man-made areas (Robson 1989). In BICY, bonneted bats have been found in various habitats, but primarily in cypress swamps and wetlands. Bonneted bats have been detected acoustically in BICY with one detection during 16 nights of effort at Deep Lake along the western edge of BICY (Marks and Marks 2008). In 2012, the bonneted bat was detected in Cal Stone's camp in pine and palmetto vegetation with cypress domes in the surrounding area (FWCC 2013). Additional call data obtained in 2012–2013 suggests that this bat species uses a wide variety of habitat types, including forested areas, wetlands, and open water in BICY. Marks (2013) recommended natural habitats conducive to insect diversity be protected and that pesticides should be used with caution. Bonneted bats have also been detected acoustically within multiple habitats on FPNWR. On July 7, 2015, a Florida bonneted bat roost was discovered on FPNWR by University of Florida researchers. At the time, this was only the second active natural roost discovered in the last 30 years. The current roost on FPNWR is in a dead slash pine snag about 14 inches in diameter at breast height. This snag is located within a pine woodland community that has been frequently burned. In fact, there is evidence of this snag burning during past prescribed fire operations. Initial 2015 roost monitoring indicates there are approximately 12–15 Florida bonneted bats utilizing this roost.

**Big Cypress Fox Squirrel**—This is a state listed threatened species found only in southwest Florida. They typically nest in most types of forests, including open pinelands, mixed open pine-cypress, mixed open pine hardwoods, open hardwood, prairie with interspersed pines, live oak savannas, mangrove, cypress, and hardwood swamps. In BICY, fox squirrels were found to nest in cypress domes that abutted pine forests with open canopy and low/sparse understory (Kellam et al. 2013, Ditgen et al. 2007). This fox squirrel prefers to inhabit areas that provide year-round sources of food and optimal nesting conditions. The preferred open canopy pine forest habitat is maintained by prescribed fire.

**Cape Sable Seaside Sparrow**—The Cape Sable seaside sparrow was federally listed as endangered under the ESA in 1967. Designated critical habitat occurs in Taylor Slough, which is outside BICY and FPNWR. The Cape Sable seaside sparrow inhabits marl prairies, periodically flooded prairies that contain fresh to brackish water. These habitats are subject to occasional flooding, which can be a major cause of nest loss (USACE et al. 2000). This sparrow typically nests between March and August. It is only known to occur in the southeastern corner of BICY in Monroe County. There is no designated critical habitat within BICY.

Current management for the Cape Sable seaside sparrow includes periodic prescribed fires and maintenance of water levels. Prescribed fires and natural wet season fires can enhance marsh habitat and retard the invasion of native shrubs and trees into the prairies occupied by sparrows. A natural fire regime resulting in a burn mosaic is compatible with protecting sparrow habitat (Kushlan et al. 1982). Maintenance of water levels is also important to sparrows because periods of inundation are required to perpetuate the marshes on which they depend.

**Red-cockaded Woodpecker**—The red-cockaded woodpecker was federally listed as endangered under the ESA in 1970. Designated critical habitat has not been identified by FWS, but a recovery plan was updated in 2003. The red-cockaded woodpecker is a non-migratory bird that prefers open, park-like stands of mature pine maintained by frequent fire. The red-cockaded woodpecker typically nests between April and August in live pine tree cavities located 20 to 50 feet above ground. In 2011, there were 86 active clusters with 84 potential breeding groups in BICY. There are no known red-cockaded woodpecker cavities or clusters on FPNWR, but the Refuge has suitable pine habitat (FWS 2000).

Current management of the red-cockaded woodpecker consists of avoiding high-intensity fire in cluster areas, utilizing prescribed burning to reduce understories, and restricting oil and gas activity to avoid disturbing active colonies. Management actions in BICY include mechanical removal of fuel loads under cavity trees and protection of active cavity tree areas.

**Everglade Snail Kite**—The Everglade snail kite was federally listed as endangered under the ESA in 1967. Designated critical habitat for the Everglade snail kite was identified in 1977 east of BICY along the western perimeter of Lake Okeechobee and the South Florida Water Management District's Water Conservation Areas 1, 2A, 2B, and 3A. In the *South Florida Multi-Species Recovery Plan*, FWS recommends a reconsideration of the critical habitat boundaries for the Everglade snail kite, as it has not been revised since 1977.

Habitat for the Everglade snail kite primarily consists of lowland freshwater marshes and shallow littoral zones of lakes inhabited by apple snails (*Pomacea paludosa*). Apple snails are the primary prey species, thus maintaining a healthy apple snail population is critical. Kites prefer foraging habitat that consists of short-stature, sparse, graminoid marsh vegetation and water clarity that allows a clear view for hunting and capturing apple snails (Kitchens et al. 2002). The low-density emergent vegetation is also important for apple snail reproduction.

The presence of interspersed shrubs or small trees in the emergent vegetation in the marsh or lake littoral zone is another important habitat feature for the snail kite. The kite uses this woody vegetation for foraging activities, roosting, and nesting. Kite roosting and nesting sites are predominantly located over open water. Nests in shrubs or small trees are less susceptible to water level fluctuations, waves, human disturbances, and predators than nests in emergent herbaceous vegetation. Thus, the nest sites in interspersed shrubs and small trees tend to be more successful than those in herbaceous vegetation. The Everglade snail kite is an uncommon visitor with no known breeding pairs or nests occurring in BICY/FPNWR.

**Wood Stork**—The wood stork, a federally and state-listed threatened species, nests in fresh water and brackish wetlands, primarily in cypress or mangrove swamps. Wood storks prefer cypress trees or other tall wetland forest species for nest sites, and it has been noted that the presence of alligators might be beneficial to the species, as they help prevent nest predation by raccoons and other small mammals. In response to deteriorating habitat conditions in south Florida, wood storks in the Everglades and Big Cypress basins have delayed the initiation of nesting until February or March in most years since the 1970s.

Wood storks feed in freshwater marshes, narrow tidal creeks, or flooded tidal pools, primarily on fish. Ideal feeding sites are depressions in marshes or swamps where fish become concentrated during periods of falling water levels. Wood storks forage where water levels provide concentrations of fish. Since 1996 wood stork nests in BICY have been sporadic, which may be a data collection artifact due to the fact that nesting surveys have been conducted in conjunction with overflights and



aerial surveys for the Florida panther. In FPNWR, there are approximately six rookeries with active wood stork nests (FWS 2000).

Preservation and/or restoration of natural hydrologic processes is critical to the survival of the wood stork, as it depends on open water to support its nesting, roosting, and foraging sites.

**American Crocodile**—The American crocodile is one of two crocodilian species native to the United States and is limited to south Florida. It was listed as a federally endangered species under the ESA in 1975 with critical habitat designated in 1979. The designated critical habitat includes most of Florida Bay and its perimeter lands, running from the Florida Keys north and west to the southern portions of the Everglades, which includes the periphery of BICY.

The American crocodile inhabits mangrove swamps and mangrove-lined creeks, rivers, and bays. Habitat use varies by season with crocodiles inhabiting exposed shorelines and nearby inland creek banks during breeding and nesting season. In south Florida, breeding typically occurs from late February through March, when ambient air and water temperatures are high enough to trigger reproductive hormonal activity in the crocodiles. In non-nesting seasons, crocodiles generally prefer the lower saline waters of inland swamps, ponds, and creeks (Kushlan and Mazzotti 1989). Given this dependence on inland waterbodies with low salinity and brackish estuaries, the timing and frequency of inland freshwater flow deliveries to south Florida and Florida Bay are very important attributes of American crocodile habitat (FWS 1999).

Crocodiles typically select nest sites in well-drained, sandy soils at about the normal high water level. However, nests in other substrates, such as peat, marl, and rocky spoil piles, are not uncommon. The nesting success often depends on sustained soil moisture, but success can also be affected by flooding and egg predation. Females must return to the nests to excavate the soil for the hatchlings, thus human presence during nest building, egg laying, and incubation tending can adversely affect nest success. Research indicates that some females may abandon their nest if they are exposed to repeated human disturbances (Kushlan and Mazzotti 1989).

The American alligator is also listed as threatened in south Florida due to similarity of appearance to the crocodile as an additional protection measure for the crocodile. While alligator hunting is permitted in the state of Florida, it is currently prohibited in BICY and FPNWR.

**Eastern Indigo Snake**—The eastern indigo snake, a threatened federal and state listed species, is primarily associated with sandhill habitat in northern Florida and south Georgia. However, the snake is also widely distributed throughout central and south Florida. In southern Florida, eastern indigo snakes prefer pine flatwoods, pine rocklands, and hardwood hammocks (Steiner et al. 1983). In winter months, gopher tortoise burrows and stumps are used as den sites. In wetter habitats that lack gopher tortoises, the eastern indigo snake may use hollowed root channels, hollow logs, or burrows of rodents, armadillos, or land crabs for shelter (Layne and Steiner 1996).

According to the South Florida Multi-Species Recovery Plan, FWS has an objective to stabilize and increase the overall eastern indigo population and ensure that multiple healthy populations exist and are protected. If it is determined that sufficient, suitable habitat exists in south Florida for the eastern indigo snake population to stabilize or increase, delisting criteria would be considered. The eastern indigo snake has been documented on both BICY and FPNWR.

### **Wilderness**

FPNWR has no wilderness, so this section is not applicable to Refuge lands. Approximately 259,500 acres (188,300 acres in the original Preserve and 71,200 acres in BICY Addition) meet the eligibility criteria in the Wilderness Act in BICY (NPS 2010a, 2015). Of the 259,500 acres, 47,000 acres have



been proposed for designation as wilderness in the BICY Addition (NPS 2010a) and about 188,300 acres in the original Preserve are currently being assessed to develop a possible wilderness proposal (NPS 2015b). Lands identified as being suitable for wilderness designation, wilderness study areas, proposed wilderness, and recommended wilderness (including potential wilderness) must be managed to preserve the wilderness character and values in the same manner as designated wilderness until Congress has acted on the recommendations (NPS 2010a). Therefore, for the purpose of this FMP, the 259,500 acres of eligible wilderness located in BICY would be managed as designated wilderness until Congress takes action. These lands provide visitors an opportunity to experience BICY's wild natural landscape and other wilderness values.

The 1964 Wilderness Act defined wilderness as “an area where the earth and its community of life are untrammelled by man.” In addition, the act states “except as necessary to meet the minimum requirements for the administration of the area for the purposes of this act, there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area.” The act also contains a special provision allowing for the use of aircraft in the control of fire. The NPS may develop a wilderness proposal for the original Preserve wilderness-eligible lands with the Backcountry Access Plan/Wilderness Study/EIS that is currently underway.

The NPS is charged with preserving and enhancing the wilderness character of the wilderness areas it administers. According to Director's Order 41: *Wilderness Stewardship* (NPS 2013), wilderness character can be measured by four “tangible qualities,” which the NPS can utilize for guidance in wilderness planning, stewardship, and monitoring. These four qualities are practical and measureable and are rooted in the Wilderness Act:

- **Untrammelled**—Wilderness is essentially unhindered and free from modern human control or manipulation. Actions authorized or unauthorized by the federal land manager that manipulate the biophysical environment are indicators used to identify effects to the untrammelled quality.
- **Natural**—Ecosystems are substantially free from the effects of modern civilization. Plant and animal species and communities, physical resources, and biophysical processes are indicators used to identify effects to the natural quality.
- **Undeveloped**—Wilderness retains its primeval character and influence and is without permanent improvements or modern human habitation. Non-recreational structures, installations, and developments, inholdings, use of motor vehicles, motorized equipment, or mechanical transport, loss of statutorily protected cultural resources are indicators used to identify effects to the Undeveloped quality.
- **Opportunity for Solitude or Primitive and Unconfined Recreation**—Remoteness from sights and sounds of people inside the wilderness, remoteness from occupied and modified areas outside the wilderness, facilities that decrease self-reliant recreation, management restrictions on visitor behavior are indicators used to identify effects to the Solitude or Primitive and Unconfined quality.

A brief summary of BICY's wilderness characteristics are below.

***Untrammelled:*** Most of BICY's wilderness lands are natural and are allowed to function essentially unhindered and free from modern human control or manipulation. Portions of the lands are in transition from past human land disturbing activities—farming, grazing, minor roads, and ORV use. While the land has substantially rebounded in recent decades, natural

systems are still influenced by the legacy of past human disturbance, as well as the ongoing disruption from past and current wildland fire practices within the Preserve.

**Natural:** The BICY eligible wilderness lands protect a diverse array of natural habitats, plants, and animals (e.g., Cape Sable seaside sparrow habitat) that are substantially free from the effects of modern civilization. However, unnatural processes such as alteration of water drainage and retention systems and other human-caused impacts have affected natural systems. The presence of exotic, non-native plants detracts from the natural quality by affecting natural vegetative communities. The past and current wildland fire practices help to maintain the ecological integrity of fire-adapted habitats and associated wildlife species and the scenic diversity of vegetation in the wilderness.

**Undeveloped:** Although much of the natural landscape has been modified by past human activity (e.g., inholdings of private parcels and designated access trails), lands have substantially rebounded and there are expansive areas that have retained their primeval character and where the footprint of man is substantially unnoticeable.

**Opportunity for Solitude or Primitive and Unconfined Recreation:** The remote location with few trails provides outstanding opportunities for solitude and backcountry use, such as camping and hiking. There are no visitor facilities or services present, so visitor use is low, but BICY wilderness provides opportunities for hiking on- and off-trail, scenic viewing, wildlife watching, fishing, and camping. Canoeing and kayaking are also possible in certain areas.

Since the Preserve contains numerous fire-adapted vegetation and wildlife communities, the NPS considers wildland fire an important ecological process that needs to be utilized and properly managed in the eligible wilderness lands.

## Cultural Resources

BICY and FPNWR are in the Glades region (an area defined by hardwood and pinewood hammocks, sawgrass, and dwarf cypress interspersed with shallow freshwater marshes and prairies) of south Florida. The limited vegetation of this region is a result of thin soils underlain by limestone bedrock. This region also includes Everglades National Park and portions of the Atlantic coast, the Ten Thousand Islands, and the Florida Keys.

Human habitation of the Glades region can be traced back to the late Pleistocene or Lithic era. Paleo-Indian populations migrating throughout North America probably arrived in south Florida sometime before 13,000 years ago. Florida's environment was substantially different during this period. Its land area was approximately twice the state's current size, due to water captured in the polar and glacial regions of the world, and the climate was significantly cooler and drier. The story of human activity in Florida during this period is not well understood, due in part to the fact that much of the area occupied by humans was inundated by rising sea levels that occurred with the retreat of the continental ice sheets that began around 12,000 to 13,000 years ago. This change in global glaciations signaled the end of the Pleistocene era.

The prehistoric periods of human culture represented by sites in south Florida include (1) the Paleo-Indian, (2) the Archaic period, which spanned roughly 8,000 BC to 500 BC, and (3) the Glades Tradition, which extends into the historic period, spanning 500 BC to 1760 AD. The historic periods of human culture began with the initial Spanish contact in 1513 and continue through the 20th century.

### **Archeological Resources**

In BICY, a total of 452 sites have been identified (395 in original BICY boundary and 57 sites in the Addition). Many of these sites are multi-component, containing more than one discrete cultural occupation. The Archaic period is represented by one site, the Glades by 283 components, and the Archaic and Seminole occupation by 116. Nine sites are listed on the NRHP and 12 are eligible for listing (NPS 1991, NPS 2015c).

Of the 57 sites found in the Addition, 10 have been determined to be prehistoric; 23 are determined to be Native American; and 22 are associated with the Glades cultural period. Five sites span a range of historic periods and contain artifacts representing Native American and Seminole cultures. More precise determinations of the chronological periods of the sites in the Addition will require additional research.

The sites consist of large habitation sites along rivers, strands, sloughs, and ponds, black earth middens, and smaller earth middens, which are refuse piles made up of artifacts (e.g., ceramics, bone and shell tools) and faunal remains. Evidence suggests that BICY was used year-round in a transitory hunting and gathering pattern and that agriculture was only practiced minimally.

FPNWR has identified 17 archeological and historic sites (FWS 2000). Three of the sites are black earth middens and date to the Glades period. The middens contain a variety of ceramics, worked bone and shell tools, and faunal materials as found in BICY. Eleven of the historic sites are 20<sup>th</sup> century hunting camps. The Miccosukee and Seminole bands may have utilized the Refuge in the 19<sup>th</sup> and 20<sup>th</sup> centuries. However, no sites or camps have been found or reported on the Refuge that may be attributed to either group.

Other historic sites in FPNWR include a shell rock mining and crushing company operated near Pistol Pond and the Colding House, which was moved to its current location in 1950. None of the historic sites are eligible for listing on the NRHP.

### **Ethnographic Resources**

Ethnographic resources are traditional sites, structures, objects, landscapes, natural resources, and other material features associated with contemporary cultural systems of a group traditionally associated with it. Traditionally associated peoples are defined as contemporary neighbors or ethnic or occupational groups that have been associated with a unit for two or more generations (40 years) and whose interests in the unit began prior to the unit's establishment. The Miccosukee Tribe of Indians of Florida and Seminole Tribe of Florida are both recognized in the enabling legislation as peoples traditionally associated with BICY.

Both the Miccosukee and Seminole are descendants of the Creek Nation, an association of clan villages that lived in Georgia and Alabama. Both tribes have histories that pre-date Columbus and Spain's "discovery" of Florida in the early 16th century. Due to conflicts between the Creek people and European settlers, many Creek families fled to Florida's remote Glades region to seek refuge. Here, the Miccosukee and Seminole tribes developed distinct cultures.

The Miccosukee and Seminole continue to access natural resources as their ancestors did. They use timber for construction of traditional shelters known as chickees, harvest plants and animals for personal use, and have ceremonial sites within BICY. Because of the tribes' concern for maintaining confidentiality, not all ethnographic resources are known by BICY/FPNWR staff. However, the tribes regard all archeological sites that may retain tribal/cultural associations (e.g., middens, burial locations) as having cultural and/or sacred importance, and they believe these sites should be protected and not disturbed. BICY/FPNWR consult regularly with the tribes and plan to continue

such collaboration efforts. BICY/FPNWR have a goal of avoiding and minimizing impacts to ethnographic resources; if tribes identify ethnographic resources that need to be protected or enhanced (such as by prescribed burning), BICY/FPNWR will try to enhance the condition of those resources.

The Miccosukee have a repatriation plan that outlines the protocols for the repatriation of human remains and associated funerary objects, sacred objects, and objects of cultural patrimony found in Florida. The tribe also claims cultural affiliation with the ancestral Calusa Indians who formerly inhabited BICY; therefore, the tribe retains repatriation interests for cultural materials determined to be of Calusa origin.

## **Human Resources**

### **Visitor Use and Experience**

Total visitation to BICY from 2004 to 2014 was approximately 9.1 million persons with about 1.2 million visitors in 2014 alone (NPS 2015d). In 2005, BICY changed its counting methods by adding visitor counts from the Oasis Visitor Center parking lot and vehicle counts from the east and west ends of Loop Road. Peak visitation occurs during the dryer winter months from December to March (NPS 2015d). According to a 2007 visitor study, common visitor activities include viewing wildlife, taking a scenic drive, driving through to another destination, and birdwatching (Papadogiannaki et al. 2007). Eight percent reported staying for one day, 46% reported staying for 2–3 days, and 30% of visitors reported staying 7 days or more (Papadogiannaki et al. 2007).

The primary recreation activities within BICY include the following:

- Frontcountry driving, sightseeing, and visitor centers
- Walking and hiking
- Birdwatching and wildlife viewing
- Paddling
- Boating
- Camping
- Bicycling
- Riding ORVs
- Fishing and frogging
- Hunting
- Opportunities to experience peace and quiet in a natural environment

Although other recreational activities may occur (e.g., horseback riding), the above-listed activities account for the dominant visitor types of uses. Many of these activities are enjoyed by local residents, inholders, and hunting camp residents as a chief component of their lifestyle.

In FPNWR, public access and use is limited to an interpretive hiking trail loop that has educational exhibits, a wildlife viewing area on the east side of the Refuge near SR 29, and occasional tours given to small groups on a limited basis (FWS 2000). Public access is limited, as the mission of the Refuge is to conserve and manage lands primarily for the Florida panther, its habitat, other threatened and endangered species, natural diversity, and cultural resources. Heavy public visitation would conflict with that mission.

### **Socioeconomics**

Collier County is the primary geographic unit for this analysis of the socioeconomic impacts. However, fire management actions at BICY and FPNWR have the potential to cause socioeconomic impacts to surrounding areas (e.g. Miami-Dade and Monroe counties). Collier County is located on southwest Florida's Gulf coast, about 150 miles south of Tampa and 100 miles west of Fort Lauderdale, and is comprised of an area of 1,998 square miles (NPS 2010a, U.S. Census Bureau 2011). Tourism has been a major industry in Collier County, with an average of \$12 million in tourism tax revenue collected annually over the past 15 years (Naples, Marco Island, Everglades Convention and Visitors Bureau 2015). As of May 2015, tax revenues collected rose to \$1,829,632 in Collier County, which is an increase of 15 percent from March of 2014 (Regional Economic Research Institute 2015).

Local communities adjacent to BICY and FPNWR include Everglades City, the Big Cypress Seminole Indian Reservation, and the Miccosukee Indian Reservation. Tourism is the primary economic driver for Everglades City, which includes three hotels, vacation rentals, a number of restaurants and retail stores, museums, and two private campgrounds. Attractions located there include airboat and swamp buggy tours and wildlife and boating outfitters for both BICY and Everglades National Park. Hunting and fishing are also primary recreation activities in the area (Everglades City 2015).

On the Big Cypress Seminole Reservation, tourism is the primary economic driver, with a museum as well as an RV resort, swamp buggy tours, and Everglades National Park tours (Seminole Tribe of Florida 2015). The Miccosukee tribe provides guided tours of their village and airboat tours and owns and operates a restaurant, resort, and casino (Miccosukee Tribe of Indians of Florida 2015).

The tourism industry is a primary driver of economic activity and the leading employer in Collier County. In 2014, 1.77 million visitors came to Collier County (6.3% annual increase) with tourists spending \$1.8 billion and supporting 35,300 jobs (Naples Daily News 2015). The 2014 National Park Visitor Spending Effects Study conducted by the NPS measured how NPS visitor spending impacts local economies, generates business sales, and supports jobs and incomes. In 2014, BICY visitors spent \$91,111,200 directly in the local economy, which supported 1,323 jobs and \$50,613,100 in labor income (NPS 2014b). Trip-related spending by BICY visitors contributed \$129,699,800 to the local economies (NPS 2014b).

No data are available for FPNWR as public access is limited to occasional tours of small groups, a self-guided hiking trail loop, and a wildlife viewing area. Prospects to see the Florida panther are a tourism draw to south Florida however rare those opportunities may be, but its economic impact has not been determined.

### **Land Use (includes tribal uses)**

Communities adjacent to BICY and FPNWR are called gateway communities and include Everglades City, Chokoloskee, and Naples. Adjacent land uses include residential development, agriculture, public lands, and tribal lands. BICY is buffered from urban development by sharing administrative boundaries with public and tribal lands except on the western boundary along SR 29 south of US 41 near Everglades City and along the northern boundary near Sunniland. The northern boundary is shared with the Seminole tribe, the entire southern boundary is shared with Everglades National Park, the western boundary is shared with the Fakahatchee Strand Preserve State Park and FPNWR, and the eastern boundary is shared with the Miccosukee tribe and the Everglades and Francis S. Taylor Wildlife Management Area. FPNWR shares its southern boundary with Picayune



Strand Sate Forest and Fakahatchee Strand Preserve State Park and shares its eastern boundary with BICY; residential development is adjacent to the western and northern boundaries. The large residential development is part of Golden Gate Estates.

In an effort to ensure management continuity across all jurisdictional boundaries, fire management activities at BICY/FPNWR are coordinated with other agencies under the Southern Florida Planning Unit, with the major participants including the Seminole tribe and Everglades National Park. In addition, fire management activities are also coordinated with the Florida Forest Service and Division of Recreation and Parks, Miccosukee tribe, Collier County, and the Ochopee Fire Control District.

The wildland urban interface (WUI) refers to areas at risk for wildfires. The following WUI values within and adjacent to BICY and FPNWR were identified by NPS and FWS staff:

- Structures along SR 29 and US 41
- Year-round residents and private in-holdings
- Campgrounds
- Native American villages, homesteads, and ceremonial sites
- Ochopee Post Office
- Kirby Storter
- Oil and gas developments
- Commercial businesses
- FPNWR and BICY structures

Two major roads, I-75 and US 41, traverse BICY from west to east. I-75 runs west to east along the southern boundary of FPNWR, and SR 29 runs north to south along the western boundary of BICY and the eastern boundary of FPNWR. In addition, there are several county- and NPS-maintained roads used by visitors, Preserve employees, deliveries, researchers, and Preserve partners throughout the year in BICY. In FPNWR, there are FWS-maintained roads that Refuge employees, researchers, and partners use throughout the year. BICY is a national and international destination, with visitors arriving from nearby airports including Everglades City, Naples, Marco Island, Immokalee, and Broward and Miami-Dade counties. The Dade-Collier Training and Transition Airport and associated airstrips are located within BICY.

### **Human Health and Safety**

The health and safety of firefighters, visitors, employees, and surrounding residents and landowners of the BICY/FPNWR area is a primary objective. Visitors are provided with safety bulletins, press releases, and up-to-date information about fire management activities and potential risks. Safety issues in BICY/FPNWR focus on but are not limited to wildland fire intensity and behavior, access and egress near fires and values to be protected, and smoke exposure. There have been no deaths or injuries of visitors or residents directly caused by wildland fire in BICY/FPNWR, although the potential exists.

Fire management activities and wildfires can pose unplanned, unforeseen risks to the public and employees, but firefighters and BICY/FPNWR staff face direct risks when engaged in suppression-related activities. Smoke on roads in and adjacent to BICY/FPNWR is a visibility concern for traffic. In addition, smoke emissions from wildland fires can be an air quality issue to surrounding residents and the visiting public. The flaming front of a fire can put members of the visiting public, residents, Preserve and Refuge employees, and firefighters at risk. Accidents and unintended consequences can be more prevalent in chaotic, emergency wildfire situations. For this reason, risk areas from wildfires



or prescribed fires are closed to the public; mitigations are implemented as soon as recognized and practical, such as media information issuances, closures and/or restrictions, and traffic control for smoke visibility.

Wildfires represent a health and safety concern for local communities and visitors to BICY and FPNWR. In May of 2015, the Mud Lake Complex, consisting of 15 wildfires caused by lightning strikes in BICY, burned 35,321 acres of various habitat types in BICY. In the past decade, about 226,500 acres in BICY were burned by wildfires, ranging from 200 acres to 65,000 acres in a year. The average number of acres burned by wildfire in FPNWR is not known at this time.

The past and current fire management programs in BICY/FPNWR have worked to mitigate the long-term threat to the safety of visitors, employees, and surrounding landowners. These actions include removing hazard fuels loads primarily using prescribed fire, defensible space work around buildings and interior access roads, and additional manual and mechanical fuel reduction treatments in sensitive habitat areas. These activities would continue under both alternatives.

## CHAPTER 4—ENVIRONMENTAL CONSEQUENCES

### Methodology

The effects of each alternative are assessed for direct, indirect, and cumulative effects for each resource topic discussed in Chapter 3. Potential impacts are described in terms of type, context, duration, and intensity. Specific impact thresholds are given for each resource at the beginning of each resource section. General definitions for potential impacts are described as follows:

**Type:** Describes the impact as beneficial or adverse, direct or indirect:

*Beneficial:* A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.

*Adverse:* A change that moves the resource away from a desired condition or detracts from its appearance or condition.

*Direct:* An effect that is caused by an action and occurs in the same time and place.

*Indirect:* An effect that is caused by an action but is later in time or farther removed in distance, but is still reasonably foreseeable.

**Context:** Describes the location or area where the impacts will occur.

*Site-specific:* Impacts would occur within the location of the proposed action.

*Local:* Impacts would affect areas within the location of the proposed action and lands adjacent to the proposed action.

*Regional:* Impacts would affect areas within the location of the proposed action, land adjacent to the proposed action, and land in surrounding communities.

**Duration:** Unless otherwise specified in this document, the following terms are used for all impact topics.

*Short-term:* Impacts that generally last for the duration of the project. Some impact topics will have different short-term duration measures, and these will be listed with the resource.

*Long-term:* Impacts that generally last beyond the duration of the project. Some impact topics will have different long-term duration measures, and these will be listed with the resource.

**Intensity:** Describes the degree, level, or strength of an impact. The impacts can be *negligible*, *minor*, *moderate*, or *major*. Definitions of intensity can vary by resource topic and are provided separately for each impact topic analyzed.

### Cumulative Impacts

The CEQ regulations, which guide the implementation of NEPA of 1969 (42 USC 4321 et seq.), require assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts are considered for both alternatives.

Cumulative impacts were determined by combining the impacts of the alternative with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other ongoing or reasonably foreseeable future projects in BICY/FPNWR and, if applicable, the

surrounding region. The temporal scope includes projects within a range of approximately 10 years. The following projects and activities were identified:

- Fire management programs in adjacent public and tribal lands, including Fakahatchee Strand Preserve State Park, Collier-Seminole State Park, Rookery Bay National Estuarine Research Reserve, Everglades National Park, Ten Thousand Islands NWR, state water conservation areas, and the Miccosukee and Seminole reservations. Most if not all of these entities use prescribed fire for resource benefit and fuels reduction.
- The Comprehensive Everglades Restoration Plan (CERP) and the Everglades Forever Act (EFA) water management programs. The CERP is to restore the surface water flow regime between the eastern Big Cypress Swamp and the Everglades by removing canals and levees along the eastern boundary of BICY. The EFA is expected to reduce water pollution upstream within the Everglades Agricultural Area. The Big Cypress Seminole Indian Reservation Water Conservation Plan is expected to change water volume, distribution, and quality within the reservation, which will affect downstream areas in BICY. Water management practices from citrus expansion north of BICY/FPNWR may influence hydrology and water quality as well.
- The active oil and gas wells within BICY.

Other actions with the potential to have a cumulative effect in conjunction with the FMP alternatives were identified in Chapter 1: Purpose and Need for Action under the heading "Relationship to Other Plans and Policies."

## **Natural Resources**

### **Air Quality**

#### ***Methodology and Intensity Thresholds***

Air quality impacts were qualitatively assessed using literature reviews and professional judgment based on consideration of fuel levels and types, size of area that could burn, and knowledge of air chemistry. The thresholds of change for the intensity and duration of an impact are defined as follows:

*Negligible:* The effects of the actions would result in no changes, or changes in air quality would be below or at the level of detection, and if detected would have effects that would be considered slight and short-term.

*Minor:* The effects of the actions would be measurable, small, short-term, localized changes in air quality. Alteration to air quality would be temporary and limited smoke exposure to sensitive resources. No mitigation measures would be necessary.

*Moderate:* The effects of the actions would be measurable, localized changes in air quality that would have consequences, but air quality standards would still be met. Alteration to air quality resources would be short-term smoke exposure to sensitive resources. Mitigation measures would be necessary and would likely be successful.

*Major:* The effects of the actions would be measurable, regional changes in air quality that would have substantial consequences and would violate state and federal air quality standards and Class II air quality standards. Alteration to air quality resources would be long-term smoke exposure to sensitive resources. Extensive mitigation measures would be needed to offset any adverse effects, and their success could not be guaranteed.

Duration of impacts is defined as follows:

*Short-term:* Recovers in seven days or less.

*Long-term:* Takes more than seven days to recover.

### ***Impacts of Alternative A***

BICY/FPNWR would continue to coordinate prescribed fire activities under their existing FMPs and federal wildland fire policies. BICY/FPNWR would continue to adhere to the requirements of Florida's Prescribed Burning Act.

Each prescribed burn plan would include expected smoke trajectory maps and identify smoke-sensitive areas. Fire weather forecasts would be used to correlate ignitions with periods of optimal combustion and smoke dispersal. Mitigation measures would be defined in the plan and arrangements made prior to ignition to ensure that designated resources are available if needed to implement the mitigation measures. Prescribed fires would not be implemented when atmospheric conditions exist that could permit degradation of air quality to a degree that negatively affects public health for an extended period (federal and state air quality standards would be the basis for this decision).

Prescribed fire smoke situations that arise and threaten smoke-sensitive areas in a significant way may trigger suppression and/or mitigation measures that terminate the prescribed burn.

Wildfires are not planned around favorable weather events or meteorological conditions that would allow for dispersion and transport away from sensitive receptors (i.e., local communities, private residents). Unplanned wildfires could affect air quality and visibility in the Preserve/Refuge and surrounding urban areas, depending on the fire location, size, and wind direction. The effects of wildfire managed with aggressive suppression strategies would be localized, short- to long-term, and negligible to minor. Adverse impacts could increase to moderate depending on the direction of the winds and the size of the wildfire.

Wildfires could also be suppressed over time using confine/contain strategies when direct, aggressive attack by firefighters is unsafe or not feasible. The size and duration of fires managed under this suppression strategy could lead to effects that would be localized, short- to long-term, and negligible to minor. Adverse impacts could increase to moderate depending on the direction of the winds and size of the wildfire.

Impacts to air quality from particulate matter (ash) and smoke produced from wildfires and prescribed fires would be direct, adverse, minor, short-term, and localized. Negligible amounts of fugitive dust generated from fire suppression activities and increased vehicle traffic associated with fire crews would temporarily affect air quality and would be relatively limited in scale and site-specific where suppression activities were occurring. During and immediately following a fire, smoke, particulate matter, and dust emissions would impact visibility in BICY/FPNWR and the surrounding area, including Everglades National Park, a Class I area. There may be an intermittent and short-term exceedance of air quality standards (especially particulates), resulting in short-term, localized, and negligible to minor adverse impacts to air quality and visibility. Overall, fire management activities would reduce the potential for future intense or severe wildfires, which deposit large particulate matter loads into the air, resulting in a long-term beneficial impact to air quality.

Air pollutants and dust would be generated by use of gasoline-powered equipment in mechanical and manual fuel reduction projects. Fugitive dust could also be generated from driving on unpaved roads

to treatment sites. The direct adverse effect of these pollutants on air quality, given the limited size and scale of the projects and infrequency of activity, would be localized, short-term, and negligible to minor. The indirect and longer-term adverse impacts would be negligible.

Overall, the No Action Alternative would result in adverse, negligible to moderate, localized, short-term impacts as well as long-term and beneficial impacts.

*Cumulative Impacts.* Cumulative impacts to air quality would occur from Alternative A plus other activities including wildland fires (other agency and private property prescribed fires and wildfires, including agricultural burning) originating from adjacent lands, exotic plant control within BICY/FPNWR using prescribed fire, traffic within and outside BICY/FPNWR, pollution from the surrounding metropolitan of Miami-Fort Lauderdale-Naples, and potential for private development near BICY/FPNWR. The effects of the past, present, and foreseeable future actions on air quality would result in adverse, minor, short- to long-term, localized cumulative impacts. Contribution to cumulative air quality impacts resulting from Alternative A would be minor, as most air quality impacts are from other sources.

Alternative A in combination with the past, present, and foreseeable future actions would result in short-term, minor, adverse cumulative effects to air quality.

*Conclusion.* Alternative A would result in adverse, negligible to moderate, localized, short-term impacts as well as long-term beneficial impacts to air quality. Cumulative impacts to air quality would be adverse, minor, short-term, and localized.

### ***Impacts of Alternative B***

Similar to Alternative A, air quality would be affected by management operational responses to wildfires, including emissions of air pollutants from the operations of mechanical equipment and the operation of vehicles, helicopters, and fixed-wing aircraft for fire management activities.

The effects of wildfire and prescribed fire to air quality would be the same as described for Alternative A with adverse, short- to long-term, minor to moderate impacts depending on the fire conditions (e.g., location, size, and wind direction). However, under Alternative B wildfires managed for resource objectives would continue at FPNWR and be allowed at BICY. Wildfires managed for resource objectives could cover a larger area, which would further reduce hazard fuel loads, decreasing the potential for future intense and severe unplanned wildfires. The reduction of unplanned intense and severe wildfires would over time reduce emissions and fire effects to air quality, resulting in long-term beneficial impacts. Alternative B could lead to burning of more areas by wildfires. In some cases, where these areas were burned in wildfires, the planned prescribed burns in these areas may not need to occur, which could lead to decreased smoke emissions from prescribed burns. Prescribed burns often occur in the winter months when smoke dispersal conditions are not as effective as during wildfire season.

Alternative B would increase the use of mechanical treatments at BICY to include reducing hazard fuel levels, developing or maintaining defensible space and fuel breaks, and restoring and maintaining cultural resources and landscapes, all of which would continue at FPNWR. If these management strategies were to be implemented, the impacts would be adverse, negligible, short-term, and site-specific. The impacts would be dust and emissions from mechanical equipment and vehicles used to reduce hazard fuel loads.

Alternative B could potentially produce slightly lower smoke emissions over time by more effectively reducing a larger amount of hazard fuels, likely leading to lower and less intense wildland fire emissions, which would have a beneficial local and regional effect.

*Cumulative Impacts.* The past, present, and foreseeable future actions would be the same as described for air quality under Alternative A with adverse, minor, short- to long-term, localized cumulative impacts. Alternative B in combination with the past, present, and foreseeable future actions would result in minor, short-term, adverse, localized cumulative impacts to air quality with long-term, moderate, beneficial, cumulative effects due to the reduction in fuels and reduced risk of intense and severe wildland fire. Contribution to cumulative air quality impacts resulting from Alternative B would be minor, as most air quality impacts are from other sources.

*Conclusion.* Alternative B would result in short-term, localized, and negligible to moderate, adverse impacts to air quality as well as indirect, long-term, and beneficial effects to air quality. Overall, cumulative effects under this alternative would be minor, short-term, adverse, and localized.

## **Vegetation**

### ***Methodology and Intensity Thresholds***

The methodology used for assessing vegetation impacts included using available spatial data and literature to identify the plant communities present and identifying the potential effects to plant populations (e.g., composition, diversity, abundance) by the alternatives. The thresholds of change for the intensity of an impact are defined as follows:

*Negligible:* Effects on individual plants, plant populations, or functional processes would not be observable. Disturbance would not result in changes to plant community structure or composition beyond what would occur through natural processes.

*Minor:* Impacts would be detectable but not apparent. Damage to individual plants would be restricted to herbs and small shrubs and would not affect below-ground plant structures. Changes in community structure and composition would be restricted to the herbaceous and low-shrub layer. Post-disturbance plant communities would quickly return to pre-disturbance conditions.

*Moderate:* Impacts would be apparent. Damage to above-ground structures would be extensive for herbs, shrubs, and saplings. Significant changes in plant community structure and composition would occur in the understory and mid-story. Post-disturbance plant communities would retain many characteristics of pre-disturbance communities, but impacts would persist for several years.

*Major:* Impacts would be obvious without close inspection. Plant damage would extend to below-ground structures (e.g., roots). Changes in community structure would include all vegetation strata. Changes in species composition would be dramatic because of species loss/recruitment or invasion of new species. Post-disturbance plant communities may not resemble pre-disturbance communities even after several years or decades.

Duration of impacts is defined as follows:

*Short-term:* Impacts to vegetation would occur only during the management action, and effects would last less than five years.

*Long-term:* Impacts would persist for five or more years.

### ***Impacts of Alternative A***

Existing fuel/vegetation management would continue under this alternative. Vegetation communities in BICY/FPNWR have evolved with fire, and about 70% of plants endemic to south Florida are estimated to occur in fire-dependent communities (Wade et al. 1980). Therefore, a natural fire regime is emulated using prescribed fires to maintain the species diversity and composition and community structure of native vegetation communities. The BICY/FPNWR fire staff plan prescribed



fires to achieve resource management and/or hazard fuel reduction objectives, which includes managing non-native species and reducing fuel loads to promote new growth and the maintenance of the natural ecological function. Impacts from prescribed fires and wildfires are similar, with the degree of impact depending on the fire intensity and severity, which depends on local variables such as the time of year, fuel composition, relative humidity, and soil moisture.

Impacts to vegetation communities from wildfires depend on the fire intensity and severity. High-intensity wildfires could remove most vegetation and soil organic matter (duff/litter), altering soil resources (e.g., soil sterilization, kill rhizomes and mycorrhizae, cause hydrophobic layers), and leading to short- and long-term changes in vegetation communities. Removing most standing vegetation and soil organic matter from the soil surface could also create bare and burned soil areas susceptible to increased opportunities for invasive and non-native plant species to become established.

Wildland fire management actions, including suppression tactics, could remove vegetation to create control lines, use natural openings for helipad areas, or involve swamp buggies to carry personnel and equipment; wildland fire suppression activities could also compact soils and temporarily remove or trample vegetation. However, MIST would be used during wildland fire suppression to minimize the impact of fire control actions to soils and vegetation, thus reducing potential adverse impacts. The impacts to vegetation communities from fire suppression activities would be short-term, adverse, and negligible to minor.

Potential spread of invasive plants could also occur from equipment used by fire crews on wildland fire suppression efforts (i.e., carried in on equipment from outside the area, fireline construction equipment) or naturally distributed by wind or animals. Soil disturbance and bare soil areas from fireline construction could lead to increased opportunities for invasive/non-native plant establishment and potential increase of invasive/non-native plants. Following fire management suppression activities, areas would be monitored for invasive and non-native vegetation. Impacts from the spread of invasive/non-native species would be long-term and adverse if viable seeds become established. However, due to mitigation measures that would be used (e.g., cleaning of equipment before and after use, firelines re-contoured and covered with cut vegetation debris after suppression activities), impacts would be negligible.

During drought conditions, wildfires could damage organic soils in moist vegetation types that typically do not burn due to live fuel moisture, such as wet prairies, hammocks, and marshes, which could alter species composition and hydrology. Wildfires could have short- to long-term, adverse, and minor to moderate impacts. However, wildfires would be suppressed during extreme drought conditions, which would have short-term, adverse, negligible impacts. The prevention of burning organic soils would have beneficial, long-term benefits.

Implementing prescribed fires would benefit the native plant communities over the long term by rejuvenating the soils with nutrients, reducing fuel buildup, propagating understory growth of grasslands and forbs, eliminating trees and shrubs in prairies, reducing competition from invasive plants (e.g., Brazilian pepper, old world climbing fern), and enhancing the diversity of native vegetation communities and associated wildlife. Prescribed fire could also increase production and/or seed germination of understory plant species and maintain native vegetation structure, composition, and function in pinelands. Over the long term, utilizing prescribed fire would be expected to reduce hazard fuel accumulations and decrease the potential size and intensity of wildfires. Maintaining traditional fire behavior would lead to increased vigor of fire-dependent vegetation found at the Preserve and Refuge.

The use of prescribed fire could result in the loss of individual plants and communities of plants in the short term. However, prescribed fires are designed to be lower in intensity than wildfires, promoting survival of diverse species and seedbeds. Thus, overall impacts would be direct, minor to moderate, beneficial, long-term, and localized by maintaining native vegetation structure, composition, diversity, and function of historically fire-maintained vegetation associations.

As part of fire management activities, mechanical treatments may include removal of vegetation near buildings and structures or may be used to reduce/eliminate invasive and/or exotic plants under the exotic vegetation management plan (NPS 2010b). Mechanical treatments would remove small areas of vegetation, not entire vegetation communities, and associated vehicles and crews could compact soils and temporarily trample or remove vegetation. Impacts to vegetation communities would be short-term, adverse, negligible, and localized.

*Cumulative Impacts.* Implementation of the Addition GMP (NPS 2010a) and the 2000 Recreational ORV Management Plan would increase ORV opportunities on designated trail systems in BICY, which would increase habitat fragmentation and human disturbance, resulting in long-term, minor to moderate, adverse impacts to vegetation communities.

The numerous NPS and FWS management plans (CCP (FWS 2000), Resource Management Plan (NPS 2001), Water Resource Management Plan (NPS 1996), South Florida and Caribbean Parks Exotic Plant Management Plan (NPS 2010b)) provide guidance for the protection and management of natural resources and would have long-term, moderate, beneficial impacts to vegetation communities.

Implementation of future oil and gas proposals could have a short- to long-term, minor to moderate, adverse, localized impact on vegetation communities; however, it is unknown what plant communities would be affected. Impacts would be minimized by mitigation measures in the approved operations plans.

Numerous regional ecosystem restoration and recreation projects and plans would perpetuate sheet flow and hydrologic connectivity, which would likely improve plant vigor, abundance, and vegetation distribution. This would have a long-term, minor to moderate, beneficial impact on vegetation communities.

Regional growth and development is expected to continue in the general area, resulting in the conversion of wildlife habitat to developed lands. This would increase habitat fragmentation and the loss of habitat, which has caused habitat degradation and ecosystem function in south Florida. Continued growth and development would be expected to have long-term, moderate, adverse impacts on vegetation communities.

Alternative A in combination with the past, present, and reasonably foreseeable future actions would result in moderate, long-term, beneficial, and localized impacts due to improved health and vigor of vegetation communities and maintaining fire-adapted vegetation communities.

*Conclusion.* Overall, Alternative A would have minor to moderate, beneficial, long-term, localized impacts by maintaining native vegetation structure, composition, diversity, and function of historically fire-maintained vegetation associations. Wildfires occurring during drought conditions could have adverse, minor to moderate, localized, and long-term impacts to non-fire prone areas (e.g., mangroves, marshes, wet prairies) due to physical alteration of vegetation structure, composition, and function. Cumulative impacts would be moderate, long-term, beneficial, and localized due to improved health and vigor of vegetation communities and maintaining fire-adapted vegetation communities.

### ***Impacts of Alternative B***

Impacts to vegetation communities would be similar to those described under Alternative A, with the spatial extent of adverse and beneficial impacts increasing as wildfires managed for resource objectives and mechanical treatments to reduce hazard fuels and to maintain defensible space would continue in FPNWR and be allowed in BICY. Mechanical treatments would primarily be used in areas where use of prescribed fire is not feasible and to protect sensitive habitat areas.

The management of wildfires for resource objectives may cover a larger area in BICY, allowing further reduction of hazard fuels and reducing wildland fires requiring suppression actions. Wildfires managed for multiple objectives over time under this alternative would further decrease the potential for intense, large wildfires. Wildland fires would move further toward having impacts within the range of naturally occurring fires across the landscape, thus reducing impacts from fire suppression activities. Furthermore, wildland fire containment boundaries (natural or human made) might be more distant depending on the resource objectives and values to be protected, instead of immediate direct suppression.

The increased ability to use mechanical treatments to reduce hazard fuels and to create and/or maintain defensible space and fuel breaks would also further protect and maintain native vegetation communities and the associated wildlife species. Impacts would be long-term, beneficial, and minor to moderate. There would also be short-term, adverse, and negligible impacts, as individual plants or patches of vegetation, not entire communities, are removed or trampled.

In riparian habitat, wildfires managed for resource objectives would generally be managed under less rigorous fire conditions than suppression-oriented wildfires, thus effects on vegetation would not be expected to be as intense.

*Cumulative Impacts.* The past, present, and foreseeable future actions would be the same as described for vegetation resources under Alternative A. Cumulative impacts would be the same as described under Alternative A, with moderate, long-term, beneficial, and localized impacts due to improved health and vigor of vegetation communities and maintenance of fire-adapted vegetation communities.

*Conclusion.* Overall, Alternative B would have a greater degree of minor to moderate, beneficial, long-term, localized impacts than Alternative A by removing more hazard fuels and potentially maintaining more vegetation communities. Wildfires occurring during drought conditions could have adverse, minor to moderate, localized, and long-term impacts to non-fire prone areas (e.g., mangroves, marshes, wet prairies) due to physical alteration of vegetation structure, composition, and function. Cumulative impacts would be moderate, long-term, beneficial, and localized due to improved health and vigor of vegetation communities and maintenance of fire-adapted vegetation communities.

## **Water Resources**

### ***Methodology and Intensity Thresholds***

The methodology used for assessing water resource impacts included using available GIS data and literature to identify the water resources present and identifying the potential effects to water resources by the alternatives. The thresholds of change for the intensity of an impact are defined as follows:

*Negligible:* Neither water quality nor hydrology would be affected, or the changes would be either non-detectable or would have effects that would be considered slight and non-measurable.

*Minor:* The action would change hydrology or water quality, but the change would be small, localized, and of little consequence. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

*Moderate:* The action would change hydrology or water quality; the change would be measurable and of consequence. Mitigation measures, if needed to offset adverse effects, could be extensive but would likely be successful.

*Major:* The action would noticeably change hydrology or water quality; the change would be measurable and result in a severely adverse or major beneficial impact with regional consequences. Extensive mitigation measures would be needed to offset any adverse effects, and their success would not be guaranteed.

Duration of impacts is defined as follows:

*Short-term:* Water resources would recover in one year or less.

*Long-term:* Water resources would recover in more than one year.

### ***Impacts of Alternative A***

Wildfires and prescribed fires may burn/reduce vegetation along stream banks and shorelines and during extreme fire conditions temporarily increase water temperatures, cause negligible soil erosion, and sediment yield. Fires may also burn broader vegetated areas and prairies, reducing resistance to sheet flow and increasing water movement to adjacent areas, depending on the location, size, and timing of the fire. Sheet flow is often slow and almost imperceptible due to the slight elevation change in the BICY/FPNWR area. Sheet flow, temperature, and soil erosion impacts would result in direct, negligible to minor, adverse, short-term, and localized impacts and would be eliminated and/or reduced once vegetation re-established or after a rainstorm. However, vegetation would be expected to recover quickly with hydrological conditions returning to pre-fire conditions.

High-intensity wildfires could cause soil sterilization, remove soil organic matter, lower the soil pH and nitrogen content, kill rhizomes and mycorrhiza, or cause soil to repel water, resulting in short- to long-term, negligible to minor, adverse impacts as ponds are formed where there was sheet flow prior to fire.

The direct adverse effect of fire suppression efforts would be negligible even when water is drawn from surface sources via helicopter buckets or firefighting pumps. If this occurred, the direct adverse effects of reduced flow would be localized, short-term (hours), and minor. Indirect adverse effects could include destabilizing stream banks or shores due to shoreline trampling, equipment use, or nearby off-road travel with firefighter swamp buggies. These impacts would be mitigated by minimizing off-road travel and shoreline use, utilizing READs, and prompt rehabilitation of any damaged shorelines or stream banks.

Mechanical and manual hazard fuel reduction treatments would be avoided whenever possible in riparian areas or along riverbanks. If mechanical and/or manual fuel reduction projects were necessary for ecological restoration, then immediate rehabilitation would occur using the appropriate mitigation measures. Impacts could be adverse, negligible, short-term, and localized from trampling of river and riparian banks or similar disturbances by felled trees. Indirect impacts to water resources from slightly increased streamflow would be localized, short-term, adverse, and negligible due to a reduction in vegetation and thus less transpiration on the treated area.

Wildfires and prescribed fires are beneficial to water resources by providing an influx but not an overwhelming flush of nutrients to the soil from the plant biomass burned. This stimulates seed

production and new vegetation growth and helps to perpetuate the vegetation and wildlife species associated with water resources, such as wetlands (Craft and Casey 2000, Battle and Golladay 2001). The influx of nutrients could have an adverse or beneficial effect on water quality depending on the amount and frequency of precipitation events and the ability of remaining or new vegetation to act as a filter. The impacts are expected to be short-term.

In wildland fire suppression tactics, water quality may be impacted by the use of firefighter swamp buggies, adjacent fire engines and vehicles on the roads, and other equipment that may release localized quantities of oil or other petroleum products or increase turbidity if standing water is present. The use of fire retardants or foams, usually by helicopter or fixed wing aircraft, could also potentially cause short-term, local impacts to water quality if misapplied or mishandled. Retardants dropped in water resources contain ammonia and phosphate or sulfate ions, which could temporarily change the chemistry of a water body, thus making it lethal to fish and other aquatic organisms. Foams contain detergents that can interfere with the ability of fish gills to absorb oxygen. The degree of impact would depend on the volume of retardant/foam dropped into the water body, the size of the water body, and the volume of flow. However, since mitigation measures limit the use, type, and proximity to water bodies by foam and fire retardants, impacts to water quality would be minimal or negligible. Overall, the use of retardant is restricted in BICY/FPNWR due to cost and water quality impact issues.

Water drops used to suppress fires are obtained from water resources within BICY/FPNWR, including canals and other surface water sources. Use of water sources within BICY/FPNWR ensures water quality of dropped water is of the same as the existing surface water sources. In addition, air tankers and helicopters used for water drops must rinse out tanks prior to responding to fires within BICY/FPNWR. Continued use of water drops and air tankers is not expected to affect water quality.

*Cumulative Impacts.* Cumulative impacts to water resources from other disturbances include existing practices at BICY/FPNWR and adjacent private facilities (septic tanks), adjacent upstream grazing and agriculture practices, and oil and gas operations. The preservation and restoration of natural hydrologic functions and water quality under the BICY Water Resources Management Plan (1996) and the CERP would impact all natural resources in BICY/FPNWR. Alternative A in combination with the past, present, and foreseeable future actions would result in both adverse and beneficial, minor, short- and long-term cumulative impacts.

*Conclusion.* Alternative A would have short-term, adverse, minor impacts as well as short-term, beneficial, minor impacts to hydrology and water quality. Alternative A in combination with the past, present, and foreseeable future actions would result in both adverse and beneficial, minor, short- and long-term cumulative impacts.

### ***Impacts of Alternative B***

Under Alternative B, the management of wildland fires would be similar as described for Alternative A. However, wildfires may be used to treat larger areas in BICY, as wildfires could be managed for resource objectives and would continue to be used in FPNWR. Eventual containment boundaries (natural or human made) could be more distant depending on the resource objectives and values to be protected, instead of immediate direct suppression.

The impacts of wildfires in regards to fire suppression and wildfire resource benefits would be the same as described under Alternative A. The temporary increase of temperatures, soil erosion, and sediment yield due to vegetation removal may increase in extent as well as the beneficial impacts.



Increased sheet flow from burned areas to adjacent areas would result in direct, negligible to minor, adverse, short-term, and localized impacts as well as short-term beneficial impacts. Wildfires managed for resource objectives over time under this alternative would decrease the potential for intense, large wildfires. Wildfires would move over time toward having impacts within the range of naturally occurring wildfires, thus reducing impacts from fire suppression activities.

Effects on water quality would be the same as described under Alternative A with adverse, short-term minor impacts as well as beneficial impacts potentially increasing in spatial extent if more and larger wildfires were managed for resource objectives. Generally, wildfires managed for resource benefits are managed under less rigorous fire conditions than suppression-oriented wildfires; thus fire effects on vegetation are often not as intense as they can be under some wildfires.

Under Alternative B, mechanical treatments would continue in FPNWR and be allowed in BICY. Mechanical treatments include reducing hazard fuel levels, developing or maintaining defensible space and fuel breaks, and restoring and maintaining cultural resources and landscapes. Mechanical treatments would have a negligible impact on water quality, as ground disturbance near water resources is not expected to increase from current fire management strategies. BICY/FPNWR fire managers plan mechanical treatments to minimize water quality effects. Increasing the reduction of hazard fuel loads could increase the potential for localized, lower-intensity ground fires and increasing the overall health and vigor of vegetation communities that serve as filters for water resources, thus water quality would increase. Given the size of BICY, the use of mechanical treatments for additional reasons would not be expected to have much effect on the overall vegetation regimes at BICY/FPNWR due to the small scale of the proposed treatments.

*Cumulative Impacts.* The past, present, and foreseeable future actions would be the same as described for water resources under Alternative A with adverse, minor, short- to long-term, localized cumulative impacts. Cumulative impacts to hydrology and water quality from Alternative B in combination with past, present, and foreseeable future actions would be direct, minor, short-term, adverse and beneficial.

*Conclusion.* Alternative B would have short-term, adverse, minor impacts as well as short-term, beneficial, minor impacts to hydrology and water quality. Alternative B in combination with the past, present, and foreseeable future actions would result in both adverse and beneficial, minor, short- and long-term cumulative impacts.

## **Wildlife**

### ***Methodology and Intensity Thresholds***

The methodology used for assessing wildlife impacts included using BICY and FPNWR knowledge and available literature to identify the wildlife species and habitat communities present and identifying the potential effects to wildlife populations (e.g., composition, diversity, abundance) by the alternatives. The thresholds of change for the intensity of an impact are defined as follows:

*Negligible:* Impacts would be barely detectable and/or would affect a minimal area of fish and wildlife habitat. Impacts on fish and wildlife communities would not be detectable.

*Minor:* Impacts would be slight but detectable, and/or would affect a small area of habitat or a few members of the fish and wildlife communities. The severity and timing of changes would not be expected to be outside natural variability, either spatially or temporally. Key ecosystem processes and community structure would be retained at the local level.



*Moderate:* Impacts would be readily apparent and/or would affect a large area of habitat and/or a large portion of the fish and wildlife communities. The severity and timing of changes would be expected to be outside natural variability, either spatially and/or temporally; however, key ecosystem processes and community structure would be retained at the landscape (regional) level.

*Major:* Impacts would be severely adverse and/or would affect a substantial area of habitat and/or the majority of the inhabiting fish and wildlife community. The severity and timing of changes would be expected to be outside natural variability, both spatially and temporally. Key ecosystem processes and community structure may be disrupted. Habitat for wildlife species may be rendered nonfunctional at the landscape level.

Duration of impacts is defined as follows:

*Short-term:* Individual species or habitat would recover in three years or less.

*Long-term:* Individual species or habitat would recover in more than three years.

### ***Impacts of Alternative A***

Existing fuel/vegetation management would continue under this alternative. Wildlife species would respond in the same approximate manner to prescribed fires and wildfires, with the degree of impacts depending on the size, location, time of year, fuel composition, and other variables. Wildfire suppression tactics would temporarily increase noise disturbance from human presence and equipment, smoke, fire, and soil disturbance. Additional disturbances to wildlife could result from the use of helicopters for transport of personnel and firefighting control actions. Low-level fixed wing aircraft flights and retardant drops could be used in firefighting suppression, also disturbing wildlife. In addition, reproduction and survival for individuals could be affected due to increased stress and loss of foraging opportunities after habitat burns in high-intensity wildfires. Temporary loss of habitat and displacement may occur for individuals within the burn area. Mortality to wildlife species that are small and less mobile, such as small mammals, lizards, turtles, and snakes, may also occur from wildfires, while larger animals may not always be able to move out of the fire path in time, becoming disoriented by the wildfire. Following fire, some wildlife species respond favorably and could increase in numbers, while other wildlife species respond negatively and could decrease in numbers.

The use of the current fuel/vegetation management tools would increase the success rate of emulating the natural fire regime as an ecological process in treated areas. This would increase the prevalence and vigor of fire-dependent vegetation and benefit associated native wildlife species. In addition, the reduction of hazard fuel loads would increase wildlife habitat quality and available ground forage. Reducing hazard fuel loads would increase the potential and likelihood for wildfires to be lower-intensity ground fires in treated areas, which would have less impact on wildlife and their habitat. Thus, Alternative A would have beneficial, minor to moderate, long-term, localized impacts by maintaining and/or restoring the abundance and diversity of fire-adapted vegetation communities and wildlife habitat present and reducing the potential for future severe wildfires in treated and burned areas.

Prescribed fire could benefit individual wildlife species and their habitat by emulating the natural fire regime and creating a more historic and natural vegetation pattern across BICY/FPNWR. Prescribed fire could create localized areas of early succession vegetation and enhance the variety and diversity of vegetation communities and wildlife habitat present, especially ground level fire-adapted plant species. Prescribed burns would increase the amount of nutrients in the soils in the short term, which could increase plant growth, ground cover, number of species, and the nutritional

quality of the forage for wildlife species, including game species. The burned areas generally green up earlier than non-burned areas, thus providing earlier grazing opportunities (Redmon and Bidwell 2003).

Prescribed fires could directly impact nesting resident and migratory birds if conducted during breeding/nesting season (generally between April to August) through mortality of nestlings and fledglings at ground level or in the lower canopy that are unable to flee or avoid the fire activities. Effects on overall breeding success would vary by species, and is difficult to predict, as bird abundance and species richness often do not change post-burn (King et al. 1998, Fitzgerald and Tanner 1992). Some nesting birds could become more susceptible to predators, such as raccoons, due to the opening of the understory and increased open areas (Jones et al. 2004). However, fires have played a long-term integral role in the maintenance of south Florida ecosystems, with many of the avian species in BICY and FPNWR evolving with periodic fires; some avian species require periodic fires to maintain suitable habitat conditions and viable populations (e.g., red-cockaded woodpecker). Studies in southeastern pine forests of BICY, FPNWR, and Everglades National Park showed little response by plant and bird communities to variation in fire-return intervals, which illustrates how flora and fauna of this ecosystem are highly tolerant of periodic, low-intensity fires (Lloyd and Slater 2012, 2011). In addition, past studies in the southeast have shown no change in breeding success from seasonality of fires (growing season fires versus dormant fires), which may be due to the ability of many bird species to re-nest (Brennan et al. 1998, Cox and Wiedner 2008, Knapp et al. 2009). Implementing prescribed fires when possible outside the breeding season and/or avoiding known concentrated nesting areas should help mitigate potential impacts. Prescribed fires could also have beneficial impacts on birds that inhabit fire-adapted vegetation communities, such as increased insect abundance and improved breeding and foraging habitat by maintaining preferred vegetation structure.

Because of more prevalent moisture conditions, prescribed fires in riparian habitat are more likely to be low-intensity fires that would lightly burn streamside vegetation and associated ground litter/debris. This allows riparian vegetation to regrow quickly with increased vigor. Adverse impacts to riparian habitat from prescribed fires would be short term and localized from increased sedimentation from ash and increased water temperature due to removal of streamside vegetation providing shade. Furthermore, the abundant cover of native, herbaceous, and soil-binding riparian plant species found along riparian areas should serve as a barrier or filter to reduce the potential for sedimentation from prescribed fires.

Fish-bearing water bodies could be impacted by wildfires from removal of streamside vegetation that provides shade, which would increase water temperature until vegetation regrowth occurs. Impacts to fish populations would depend on the severity, size, location, and proximity to fish populations, as downstream reaches could cool rapidly if vegetation is present (Johnson 2004). Water bodies could also experience large pulses of water from precipitation events and an increase in sedimentation from woody debris and ash from wildfires. This could lead to a temporary increase in turbidity and degraded water quality, which could adversely affect riparian habitats and fish.

Impacts on less mobile wildlife species from mechanical and manual treatments would be short-term, adverse, and localized due to stress and disturbance. Potential mitigations include avoiding seasons when ground and shrub/tree nesting birds are actively nesting. Short-term impacts on more mobile wildlife species (e.g., deer) would be temporary displacement from the treatment areas.

*Cumulative Impacts.* Implementation of the Addition GMP (NPS 2010a) and the 2000 Recreational ORV Management Plan would increase ORV opportunities on designated trail systems in BICY,

which would increase habitat fragmentation and human disturbance, resulting in long-term, minor to moderate, adverse impacts to wildlife and their habitat.

Implementation of future oil and gas proposals could have short- to long-term, minor to moderate, adverse, localized impacts on wildlife and their habitat.

The numerous NPS and FWS management plans (CCP (FWS 2000), Resource Management Plan (NPS 2001), Water Resource Management Plan (NPS 1996), South Florida and Caribbean Parks Exotic Plant Management Plan (NPS 2010b)) provide guidance for the protection and management of the natural resources and would have long-term, moderate, beneficial impacts to wildlife species' habitat.

Numerous regional ecosystem water restoration and recreation projects and plans would enhance sheet flow and hydrologic connectivity of the greater Glades systems, which would likely improve wildlife habitat by increasing natural water processes, plant vigor, abundance, and species composition. This would have a long-term, minor to moderate, beneficial impact on wildlife habitat for south Florida.

Regional growth and development is expected to continue in the general area, resulting in continued conversion of wildlife habitat to developed lands outside of BICY and FPNWR. This would increase habitat fragmentation and the loss of habitat, which has caused habitat degradation and degradation to ecosystem function in south Florida. Continued growth and development would be expected to have long-term, moderate, adverse impacts on wildlife and their habitat.

Alternative A in combination with the past, present, and reasonably foreseeable future actions would result in adverse, minor, short-term, localized impacts due to increased noise and disturbance to wildlife as well as beneficial, minor, long-term, and localized impacts due to improved habitat quality and maintained and/or restored fire-adapted vegetation communities and associated wildlife species.

*Conclusion.* Impacts to native wildlife resources would be minor to moderate, beneficial, long-term, and localized from maintaining a variety and diversity of native and fire-adapted vegetation communities and wildlife habitat. The localized maintenance of fire-adapted vegetation communities would likely be insufficient for maintenance on a large spatial scale. The potential for future large and intense wildfires would decrease. Adverse impacts would be short-term and localized due to stress and disturbance for less mobile species and temporary displacement within and near treatment units for mobile wildlife species. Overall, cumulative impacts to wildlife resources would be beneficial, minor, long-term, and localized due to maintaining habitat quality with an increased mosaic of habitat types and a decrease in the potential for severe and intense wildfires.

### ***Impacts of Alternative B***

Impacts to wildlife and their habitat would be similar to those described under Alternative A, with the spatial extent of adverse and beneficial impacts increasing as wildfires managed for resource objectives would continue in FPNWR and be allowed in BICY; over time more acres would be treated in fire-adapted vegetation communities and associated wildlife species. The use of mechanical treatments to reduce hazard fuels and to create and/or maintain defensible space and fuel breaks would continue to in FPNWR and be allowed for more uses in BICY. Mechanical treatments would primarily be used in areas where use of prescribed fire is not feasible and to protect sensitive habitat areas and infrastructure.

The management of wildfires for resource objectives may cover a larger area in BICY, allowing further reduction of hazard fuels and reducing wildfires requiring aggressive suppression and

management actions. Over time, wildfires managed for resource objectives under this alternative would further decrease the potential for intense, large wildfires. Wildfires would move further toward having impacts within the range of naturally occurring fires across the landscape, thus reducing impacts from fire suppression activities. Furthermore, wildland fire containment boundaries (natural or human made) might become more distant over time depending on the resource objectives and values to be protected, instead of involving immediate direct suppression or smaller containment area.

The increased ability to use mechanical treatments to reduce hazard fuels and to create and/or maintain defensible space and fuel breaks around human values (e.g., infrastructure, private property, cultural values) would be small in scale but would increase the success of managing wildfires. This would help to maintain more acres of fire-adapted vegetation and associated wildlife species. Impacts would be long-term, beneficial, and minor to moderate. There would also be short-term, adverse, and negligible to minor impacts to wildlife species due to temporary displacement or disturbance from equipment use and field crews and noises from vehicles and equipment within and near treatment areas.

In riparian habitat, wildfires managed for resource objectives would generally be managed under less rigorous fire conditions over time than suppression-oriented wildfire responses, thus effects on vegetation would not be expected to be as intense.

*Cumulative Impacts.* The past, present, and foreseeable future actions would be the same as described for wildlife resources under Alternative A. Cumulative impacts would be the same as described under Alternative A, with adverse, minor, short-term, localized impacts due to increased noise and disturbance to wildlife as well as beneficial, minor, long-term, and localized due to improved habitat quality and maintained and/or restored fire-adapted vegetation communities.

*Conclusion.* Impacts to native wildlife resources would be minor to moderate, beneficial, long-term, and localized from maintaining a variety and diversity of native and fire-adapted vegetation communities and wildlife habitat. The potential for future large and intense wildfires would decrease over time, as would aggressive wildfire suppression actions. Adverse impacts would be short-term and localized due to stress and disturbance for less mobile species and temporary displacement within and near treatment units for mobile wildlife species. Overall, cumulative impacts to wildlife resources would be beneficial, minor, long-term, and localized due to increased habitat quality with an increased mosaic of habitat types and a decrease in the potential for severe and intense wildfires. Although impacts would be similar to Alternative A, Alternative B would have increased beneficial impacts, as acres and frequency of areas treated over time would increase, as well as the potential for increased short-term, adverse impacts.

### **Special Status Species**

#### ***Methodology and Intensity Thresholds***

The methodology used for assessing special status impacts included using available GIS data and literature to identify the special status species and habitat communities present and identifying the potential effects to special status populations (e.g., composition, diversity, abundance) by the alternatives. The thresholds of change for the intensity of an impact are defined as follows:

*Negligible:* There would be no observable or measurable impacts to special status species, their habitats, or the natural processes sustaining them in the proposed project area.

*Minor:* Individuals may temporarily avoid areas. Impacts would not affect critical periods (e.g., breeding, nesting, denning, feeding, resting) or habitat. Critical habitat may be affected, but not in a manner that substantially affects the primary constituent elements (PCEs).

*Moderate:* Individuals may be impacted by disturbances that interfere with critical periods (e.g., breeding, nesting, denning, feeding, resting) or habitat, and the level of impact may result in physical injury or mortality of individuals but would not be expected to affect the population's likelihood of persistence or lead to extirpation or declines. Critical habitat may be affected, and PCEs may be minimally altered, such as minor changes in the arrangement, amount or condition of PCEs, but the action would not remove PCEs or cause adverse modification.

*Major:* Individuals may suffer physical injury or mortality such that populations may decline substantially or be extirpated from the Refuge or Preserve. Critical habitat would be affected, and one or more PCEs would be eliminated or substantially altered.

Duration of impacts is defined as follows:

*Short-term:* Impacts to special status species would occur only during the management action, and effects would last less than five years.

*Long-term:* Impacts would persist for five or more years.

### ***Impacts of Alternative A***

#### ***Plants***

Fire may result in injury or mortality of individual special status species plants. The likelihood of mortality depends on adaptations and locales specific to each species and the intensity, severity, and size of the fire. Low-intensity ground fires that occur in areas with lower fuel loads are less likely to result in injury or mortality than high-intensity fires that could occur in areas with greater fuel loads. Impacts to special status plant species from wildfires depend on the fire intensity and severity. High-intensity wildfires could remove most vegetation and soil organic matter, altering soil resources and injuring and/or killing individual plants or local populations. Prescribed fires help to restore and enhance fire-maintained habitat by implementing fire intervals similar to a natural fire regime. Additionally, fuel loads that could cause high-intensity fires that could be more of a threat to special status plant populations as a whole would be reduced.

**Florida Prairie Clover**—The impacts of fire on Florida prairie clover are not entirely understood. Fire is necessary to maintain an open understory that is required by this species to persist in pine rockland, pine rockland/rockland hammock ecotone, and marl prairie habitat. Periodic wildland fire also reduces infestations of exotic species that may compete with Florida prairie clover, particularly Brazilian pepper. Periodic fires have resulted in a 30–45% mortality rate of individuals in low-density populations (Stevens and Beckage 2009) and have reduced fecundity of surviving individuals for at least two years (Stevens and Beckage 2010). Recruitment from re-sprouting individuals was observed within one year following fire (Stevens and Beckage 2010).

Under Alternative A, prescribed fire would be implemented in pine rockland habitat where Florida prairie clover is present. Florida prairie clover is known from two occurrences at BICY and one occurrence at FPNWR. Prescribed fire would be proposed at four-year intervals and could be expected to lead to long-term maintenance of pine rockland habitat. It is anticipated that mortality of Florida prairie clover is likely to occur with prescribed fire. Mortality or injury of individuals may occur from 1) unintentional trampling and fire management activities (e.g., fireline construction), and 2) wildland fires (as described above) that occur within known populations. However, it is



anticipated that regularly recurring fire would result in the rapid establishment of new individuals of this species, as ash would provide an infusion of nutrients to the soil, and removal of the duff layer has been shown to encourage and perpetuate high seedling recruitment (FWS 2013a).

Due to the anticipated establishment of new individuals and long-term maintenance of habitats by periodic prescribed fires, impacts of fire management under Alternative A would be long-term and beneficial to the Florida prairie clover. Management under Alternative A may affect and is likely to adversely affect Florida prairie clover due to the potential for injury or mortality of individuals from fire and associated fire management activities.

**Everglades Crabgrass**—The impacts of fire on Everglades crabgrass are not well understood. Fire is critical in maintaining the open understory and species diversity in marl prairies and wet pine rocklands where this species occurs. Mortality of some individuals may occur from prescribed fire, and it is anticipated that mortality would increase with increasing fire intensities that could occur in areas with high fuel loads. Plants are perennial, so re-sprouting from existing rootstock in moist marl soils or limestone bedrock is likely to occur after low-intensity fires.

Currently, limited information is available on differences in mortality or long-term population impacts resulting from wet or dry season burns. Indirect evidence suggests that burning in either season is suitable to maintain populations of Everglades crabgrass in pine rocklands. Herndon (1998) suggested that summer or wet season fires increased the likelihood that the combined influence of fire and flooding would occur. Prescribed fire should be conducted during the wet season in an effort to better mimic natural lightning-ignited fire patterns. Currently, prescribed fire is conducted year-round in pinelands and marl prairies where Everglades crabgrass occurs.

Under Alternative A, prescribed fire would be implemented in pine rockland and marl prairie habitat where Everglades crabgrass is present. Occurrences are known from one population in BICY. Prescribed fires would be proposed at approximately four-year intervals and would be expected to lead to long-term maintenance of pine rockland and marl prairie habitats. It is anticipated that mortality of Everglades crabgrass is likely to occur with prescribed fire. Mortality or injury of individuals may also occur from unintentional trampling and fire management activities (e.g., fireline construction) that occur within known populations. However, it is anticipated that regularly recurring fire would maintain conditions required for establishment of new individuals of this species.

Fire management activities carried out under Alternative A would result in reduced fuel loads and subsequently localized, lower-intensity ground fires. These conditions would most likely represent the greatest chance of long-term survival of Everglades crabgrass. Preserve fire management staff would be able to plan prescribed fires for habitat maintenance. As a result, the timing, frequency, intensity and spatial area would be more predictable and could be modified as new data emerge. In this scenario, populations of Everglades crabgrass would likely be stable or increase over time. Mosaic patterned burning in pine rockland habitat would reduce the chances that all habitat occupied by Everglades crabgrass would burn during each prescribed fire. However, it is expected that over time, all areas within a given burn block would burn, resulting in maintenance of all occupied habitat. Due to the potential for limited mortality of individuals with the application of prescribed fire, management under Alternative A would lead to short-term, negligible to minor adverse impacts to Everglades crabgrass. Due to the potential for long-term maintenance of habitats required by this species, impacts of management under Alternative A would be long-term and beneficial. Management under Alternative A may affect and is likely to adversely affect Everglades crabgrass



due to potential injury or mortality of individuals from fire and associated fire management activities.

**Everglades Bully**—The impacts of fire on Everglades bully are not entirely understood. Fire is necessary to maintain an open understory that is required by this species to persist in marl prairies and pine rockland habitat and is important in reducing exotic species infestations. Periodic fires may result in mortality of individuals if occupied habitat burns. However, this species grows in wet marl soils and in soil deposits within cracks in the limestone bedrock, which provides natural protection from fire to the roots of this perennial species and allows plants to re-sprout following fire. Currently, no information is available on differences in mortality or long-term population impacts resulting from wet or dry season burns. Indirect evidence suggests that burning in either season is suitable to maintain populations of Everglades bully in pine rocklands. Prescribed fire management should be conducted during the wet season in an effort to better mimic natural lightning-ignited fire patterns. Everglades bully may occur in BICY but needs to be confirmed (Gann 2015). Prescribed fire is conducted year-round in BICY, which should provide long-term maintenance of populations in those areas and help to sustain populations of Everglades bully.

Under Alternative A, prescribed fire is planned for implementation in pine rockland and marl prairie habitat where Everglades bully habitat is present. Prescribed fire would be proposed at approximately four-year intervals and would be expected to lead to long-term maintenance of pine rockland and marl prairie habitats. It is anticipated that mortality of Everglades bully is likely to occur where present with prescribed fire. Mortality or injury of individuals may occur from unintentional trampling and fire management activities (e.g., fireline construction) that occur within known populations. However, it is anticipated that regularly recurring fire would maintain conditions required for establishment of new individuals of this species.

Fire management activities carried out under Alternative A would result in reduced fuel loads and subsequently localized, lower-intensity ground fires. These conditions would most likely represent the greatest chance of long-term survival of Everglades bully. Preserve fire management staff would be able to plan prescribed fires for habitat maintenance. As a result, the timing, frequency, intensity and spatial area would be more predictable and could be modified as new data emerge. In this scenario, populations of Everglades bully would likely be stabilized or increase over time. Mosaic patterned burning in pine rockland and marl prairie habitat would reduce the chances that habitat occupied by Everglades bully would burn during each prescribed fire. However, it is expected that over time, all areas within a given burn block would burn, resulting in maintenance of all occupied habitat.

Due to the potential for limited mortality of individuals with the application of prescribed fire, management under Alternative A would lead to short-term, negligible to minor adverse impacts to Everglades bully. Due to the potential for long-term maintenance of habitats required by this species, impacts of management under Alternative A would be long-term and beneficial. Management under Alternative A may affect and is likely to adversely Everglades bully due to potential injury or mortality of individuals from fire and associated fire management activities.

**Other Plant Species of Management Concern that Occur in Fire-Dependent Habitats**—The effect of fire on other special status plant species considered in this analysis depends on a variety of factors. The likelihood of mortality depends not only on adaptations specific to each species but also on the behavior and characteristics of the fire. For example, low-intensity fires that occur in habitats with lower fuel loading are thought to be less likely to result in injury and mortality than high-intensity fires that occur in habitats with greater fuel loading. Indirect impacts to plant species of

management concern could also occur through successional processes that occur in the absence of periodic fire. For example, unburned pine rockland may convert to rockland hammock, resulting in habitat loss for plant species of management concern in a relatively short period of time. In general, it is assumed that if fire-dependent habitats experience fire at intervals similar to those that occurred historically, fire-adapted species would persist in the landscape over time.

Under Alternative A, prescribed fire would be conducted in pine rockland and marl prairie habitat where fire-adapted plant species occur. In cases where a species has a limited distribution, pre-burn notification and coordination between fire management staff and resource management staff would occur to determine if any sensitive plant populations are known and if additional burn-specific mitigations are needed to protect those species. It is anticipated that mortality of individual plants is likely to occur with prescribed fire. It is also anticipated that regularly recurring fire would maintain conditions required for reproduction and establishment of new individuals of fire-adapted species.

Due to the potential for mortality of individuals with the application of prescribed fire, management under Alternative A may lead to short-term, negligible to moderate adverse impacts to these species. Due to the potential for long-term maintenance of habitats required by fire-adapted plant species, impacts of management under Alternative A would be long-term and beneficial. Impacts would range from site-specific to regional and would depend on the distribution of the species within BICY/FPNWR. Management of these areas is expected to lead to the long-term maintenance of fire-dependent vegetation, such as pine rockland and marl prairie, and persistence of these plant species. It is also anticipated that mortality of individual plants is likely to occur with prescribed fire. However, it is anticipated that regularly recurring fire would maintain conditions required for reproduction and establishment of new individuals, benefiting the population as a whole. In addition, mosaic patterned burning in pine rockland and marl prairie habitats would reduce the chances that habitat occupied by individual special status plants would burn during each prescribed fire. However, it is expected that over time, all areas within a given burn block would burn, resulting in maintenance of all occupied habitat.

### *Animals*

**Florida Panther**—Under Alternative A, prescribed burns would be implemented throughout BICY/FPNWR with one of the goals being to maintain and enhance habitat for the Florida panther and its prey. Prescribed fires would generally occur under environmental and fire behavior parameters designed to create a mosaic of burned and unburned vegetation within a unit.

While adult panthers would be expected to successfully avoid fires, panther kittens up to 6 months of age that occur in a prescribed burn area could be injured or killed. Panthers use a variety of habitat types for denning, but thick, dense vegetation is a consistent characteristic, which could be susceptible to intense burning in prescribed burns or wildfires. Within BICY/FPNWR, these conditions are often associated with pine flatwoods and hardwood hammocks, but dense sawgrass, palmetto, or other highly combustible vegetation may also be used. Extensive telemetry monitoring of panthers occurs within BICY/FPNWR; it is likely that most panther den locations would be known in areas subject to prescribed fire, and the Preserve/Refuge fire staff avoids implementing prescribed fires in known active den sites. Therefore, it would be unlikely that a panther den would be lost to prescribed fire, although there is a possible risk to panthers not collared for telemetry. However, the likelihood that at least one panther den could be affected by prescribed fire is present when considering a program conducted over large areas and over many years.

The mosaic of burned and unburned patches of vegetation created by prescribed fire within an individual burn unit would provide favorable post-fire conditions for panthers by providing cover

adjacent to the habitat conditions that would attract prey. Additionally, more frequent fires would tend to maintain habitat in a better condition for panther hunting. The expected lower intensity and severity of prescribed fires expected under Alternative A would lead to reduced fuel loads and burning under more favorable conditions than wildfires. The fuel reductions under planned prescribed fire conditions would tend to prevent intense wildfires that could enter hardwood hammocks and would create vegetation mosaics of burned and unburned patches, which include dense saw palmetto, possible den sites. Regular fuels treatments are expected to reduce the overall prevalence of dense, combustible vegetation areas that panthers may select as dens. However, prescribed fire in a given three-year period is not prevalent throughout the BICY and FPNWR landscape and would not be expected to create a significant loss of den sites. In treated areas, there could be reduced availability of den sites, but there would also be a reduction of the potential risk for loss of kittens due to fire.

Under Alternative A, suppression is a management objective of all BICY wildfires. This wildfire strategy could result in hazard fuel buildup over large areas. Hazard fuel buildup could lead to intense, severe wildfires that could burn large areas of Florida panther habitat and would not result in unburned patches of dense saw palmetto that would be good den sites. Overall, this alternative would be expected to maintain the mosaic of habitats used by Florida panthers as well as suitable habitat conditions.

Fire management, aviation, wildfire operations, fire effects monitoring, and other fire-related activities could all cause temporary disturbance to Florida panthers. Disturbance resulting from the presence of fire management and monitoring personnel may cause temporary changes in behavior that may affect normal breeding, feeding, and sheltering and could increase risk of predation of young kittens. Operation of vehicles during fires would have the potential to injure or kill panthers, although fire traffic in the Preserve and Refuge ORV areas and dirt roads occurs at slow speeds that would allow avoidance. Alternative A would be expected to have short-term, minor to moderate, adverse effects on Florida panthers and short- and long-term beneficial effects by maintaining natural habitat characteristics. These impacts would be site-specific. Fire management under Alternative A may affect and is likely to adversely affect Florida panthers due to the possibility of individual take as a result of prescribed fires.

**Florida Bonneted Bat**—Considering the lack of knowledge of the habitat use and needs of the Florida bonneted bat and its response to fire, it is difficult to predict the impacts of the fire management strategies under Alternative A. As more is learned about the habitat and needs of the bonneted bat, the Preserve and Refuge are expected to modify fire management techniques and objectives to help accommodate the needs of this species.

Fuel/vegetation treatment and burns would be implemented throughout BICY/FPNWR to manage fuel loads, maintain habitat, and to control exotic invasive species populations. Under this alternative, fuel accumulations would be expected to be reduced in general. Prescribed fires would occur under environmental and fire behavior parameters designed to create a mosaic of burned and unburned vegetation within suitable habitat areas. Less intense fire behavior and the presence of unburned refugia within a burn unit would be expected due to prescribed fire actions under Alternative A. The expected prescribed burn patterns would be expected to burn a portion of existing snags, retain a portion of the snags, and create some new snags. This pattern of snag effects would tend to lead to a consistent availability of snags over time that would likely support bat roosting. Few, if any, bats would be expected to perish in fires, and preferred habitat in BICY/FPNWR would be maintained by maintaining and enhancing snags and natural habitat conditions, which would be expected to also maintain prey availability. If Florida bonneted bats are roosting in habitats not

affected by fire, including hardwood hammocks or structures, impacts to those individuals would be unlikely to occur under Alternative A.

Under Alternative A, suppression is a management objective of all BICY wildfires. While providing temporary protection to some habitats, this strategy for all wildfires results in a more extensive build-up of hazard fuels over large areas, possibly resulting in more expansive areas of high-intensity burning over time, which may have negative implications for some suitable habitat areas.

Alternative A would have minor to moderate, short-term, site-specific, adverse impacts to Florida bonneted bat and long-term beneficial effects. Fire management under Alternative A may affect and is likely to adversely affect Florida bonneted bats due to the possibility of individual take as a result of prescribed fires.

**Big Cypress Fox Squirrel**—There is little information available on the effects of fire on the Big Cypress fox squirrel. Because they frequently occupy forested areas subject to frequent fire, they are assumed to be generally fire-adapted. They occupy pine rocklands and hardwood hammock habitats extensively. Hardwood hammocks are largely unaffected by fires. Fox squirrels generally appear to benefit from maintenance of forested habitats in a natural condition of many types. Fuel/vegetation treatment and burns would be implemented throughout BICY/FPNWR to manage fuel loads, maintain habitat, and to control exotic species. Under this alternative, fuel accumulations would be expected to be reduced in general. Prescribed fires would occur under environmental and fire behavior parameters designed to create a mosaic of burned and unburned vegetation within a unit. Less intense fire behavior and the presence of unburned refugia within a burn unit would be expected under Alternative A. These conditions would tend to perpetuate forested habitats used by fox squirrels and provide refugia during fires.

Under Alternative A, suppression is a management objective of all BICY wildfires. While providing temporary protection to some habitats, this strategy for all wildfires results in a more extensive buildup of hazard fuels over larger areas. This may result in more expansive areas of high-intensity burning over time, which may have negative implications for squirrel habitat.

Overall, the impacts of Alternative A would be short-term, negligible to minor, and adverse, as well as long-term and beneficial. These impacts would be local.

**Cape Sable Seaside Sparrow**—Fire has been documented to affect Cape Sable seaside sparrows, both directly and indirectly. Mortality from fire may be incurred by sparrow eggs, nestlings, or young fledglings because they occupy nests within reach of combustible marsh grasses that burn during fires, and they have limited ability to escape fires. Because the sparrow nests primarily during the dry season when wildfires are most likely both to occur and to spread, eggs and young are likely to be lost to wildfires. Sparrow eggs and young may be lost during any fires that occur in sparrow habitat between March 1 and August 31, with fires occurring in April through June, the peak sparrow nesting activity, having the greatest impact. In these instances, all nests, eggs, and recently fledged young that occur within a burned area would be expected to be killed. Adult and independent young Cape Sable seaside sparrows may be able to fly out of harm's way, but under some circumstances, even adults may be killed. La Puma et al. (2007) reported that none of the 35 color-banded adult sparrows that had occupied the area burned by the Lopez fire in subpopulation E in 2001 were seen again following the fire.

Following a fire, sparrows do not nest within burned areas for a period of 2–3 years (La Puma 2010, La Puma et al. 2007), and this is likely a result of the relatively sparse density of vegetation that does not support a nest structure and/or does not provide sufficient cover for nests. Unburned patches

within a large burned area may provide suitable nesting habitat for sparrows; thus, fires that create a mosaic of burned and unburned patches have greater potential for sparrows to retain the ability to nest following fires. After 2–3 years, suitable nesting habitat generally recovers, and sparrows resume nesting with approximately the same density and success as before fires (La Puma et al. 2007). Under circumstances when fires are followed by heavy rainfall that causes rapidly rising water levels to overtop the growing graminoid vegetation, nearly all vegetation can be killed. Under these circumstances, recovery of vegetation sufficient to support sparrow nesting may not occur for a decade or more. The rate of vegetation recovery may be affected by a variety of factors, including soil depth and post-fire hydrologic conditions.

Fire management and wildfire management actions also have the potential to affect sparrows. During nesting season, sparrow eggs, nestlings, and recently fledged young may be injured or killed by water drops, both from helicopter bucket or air tanker drops. The likelihood of this occurring would be low due to the relatively low probability that a nest would occur at the location where water is dropped. The presence of fire management personnel, helicopter and aircraft operation, and other equipment during wildfire management actions, fire effects monitoring, and related activities could also disturb sparrows, causing changes in normal behavior which may increase predation risk and interfere with normal breeding, feeding, and sheltering activity. During nesting season, activities that flush females from nests may increase the chances of nest failure.

Beneficial effects from fires include promoting the growth of C4 (warm season) grasses over C3 (cool season) grasses, which are associated with sparrow occupancy (Sah et al. 2010). In areas occupied by sparrows, this effect may have limited benefit to sparrows because the habitat is already in a suitable condition, but in areas that are suboptimal sparrow habitat such as sawgrass-dominated areas, fire may help improve suitability under some conditions. The dominant vegetation species found within sparrow habitat are fire-adapted and re-sprout quickly following a fire (Snyder 2003). Under normal conditions, fires would only remove the above-ground vegetation and leaf litter, leaving individual plants that are dominant in sparrow habitat (Snyder and Schaeffer 2004). Plant species found in sparrow habitat have been shown to respond quickly and re-sprout and grow rapidly following a fire, with some grasses growing more than 15 inches after only a few weeks (Snyder 2003). Therefore, vegetation species composition and structure may be similar from unburned areas two to three years post-burn (Lockwood et al. 2005).

Fires have been shown to be very effective in reducing and controlling woody vegetation, and in some areas, this effect could improve habitat. Fire also has the beneficial effect of reducing the risk of future wildfires. Relatively small fires within a larger unit of sparrow habitat would reduce the likelihood of an entire habitat patch burning and would increase the likelihood of successful management of wildfires by creating discontinuities in fuel loading. As wildfires encounter areas of lower fuel loading, their severity and rate of spread would be reduced, allowing for more successful and rapid control and increasing the likelihood that they could be extinguished by high humidity or light rainfall. Risk to sparrows and sparrow habitat would be mitigated through the Cape Sable seaside sparrow fire management strategy and through coordination with researchers and resource managers.

Throughout their history, fires have affected Cape Sable seaside sparrows in BICY in this manner, and taking this into account, the impacts of Alternative A would be moderate, short- and long-term, and adverse, with long-term beneficial effects resulting from the reduced risk of catastrophic fires and the restoration of habitat. The use of carefully planned prescribed fire in sparrow habitat would reduce the potential for high-intensity wildfires that could significantly reduce a subpopulation and would create a mosaic of burned and unburned patches that could provide suitable nesting habitat



while also reducing the potential for high-intensity wildfires. Alternative A may affect and is likely to adversely affect the Cape Sable seaside sparrow due to potential take of individuals as a result of prescribed fires.

**Red-cockaded Woodpecker**—Prescribed fire would continue to be used to restore and maintain open, park-like stands of mature slash pine preferred by this species in BICY/FPWR. Prescribed burns have the ability to control hardwoods and shrubs without damaging the herbaceous layer and soils (FWS 2003). In addition, prescribed fire as a restoration tool emulates historic fire regimes and aids in the reproduction, growth, and maintenance of slash pine and other species and aids in reestablishing highly diverse, native groundcovers, all important factors of healthy and suitable red-cockaded woodpecker habitat (FWS 2003). Prescribed burn plans would include mitigation measures to minimize any potential impacts to this species and its habitat, including nesting colonies.

Under Alternative A, suppression is a management objective for all BICY wildfires. This wildfire strategy could result in hazard fuel buildup over large areas. Hazard fuel buildup could lead to intense, severe wildfires that could burn large areas of red-cockaded woodpecker habitat, including red-cockaded woodpecker colonies. Overall, this alternative would be expected to maintain the open, mature slash pine habitat used by red-cockaded woodpeckers.

Fire management, aviation, wildfire operations, effects monitoring, and other fire-related activities could all cause disturbance to red-cocked woodpeckers. Disturbance resulting from aviation activities and the presence of fire management and monitoring personnel may cause temporary changes in behavior that may affect normal breeding, feeding, and sheltering and could increase risk of predation of eggs and nestlings if adults are flushed from the nest.

Alternative A would have site-specific, short-term, minor to moderate, adverse impacts to red-cockaded woodpeckers and short- and long-term beneficial effects as a result of habitat maintenance. Fire management under Alternative A may affect and is likely to adversely affect red-cockaded woodpeckers due to potential take of individuals as a result of prescribed fires. However, prescribed fires and associated fire management activities would result in habitat maintenance and enhancement and the reduced potential for high-intensity wildfires.

**Everglade Snail Kite**—Fire has the potential to directly and indirectly affect the Everglade snail kite. Kites nest within freshwater marshes in areas that are subject to fire, and if the marshes burn during breeding season, eggs, nestlings, and young fledglings may be injured or killed by fires. Because kites generally nest over water, some nests in trees or shrubs that are in areas with relatively sparse emergent vegetation may not burn because of insufficient fuels around nests. However, kites often nest in dense vegetation, including within dense stands of sawgrass or cattail that could burn intensely in fires regardless of whether there were water underneath the nests. Because of the variability in kite nesting areas and substrate, not all kite nests within a burned area would be expected to burn during fires. Surveys for snail kite nesting within BICY/FPNWR are not regularly conducted, and consequently it is unlikely that all snail kite nests that occur within a particular area would be identified in advance. Nests that are identified would have mitigation designed to avoid impacts and management efforts implemented to minimize risk of nest loss to fires.

Risk to snail kites would be mitigated through avoidance of known nests in cases where prescribed fire is employed. Fuels near and around nests would tend to be treated before they reached heavy accumulations. Using prescribed fire as the primary fuel management tool in BICY could lead to accumulated hazard fuels in unburned areas and the increased likelihood of fires occurring during the peak kite nesting season, when water levels are generally moderate and falling. However, the



wildfires that result after prescribed fires would be less severe and may be less likely to burn kite nests. Under Alternative A, fires would not be expected to substantially affect the suitability of habitat for kites. Areas that burn may support better foraging habitat due to improved visibility of snails, but they may also support fewer suitable nest sites. In general, these changes would not be anticipated to significantly improve conditions or limit snail kites.

Fire management, aviation, wildfire operations, effects monitoring, and other fire-related activities could all cause disturbance to Everglade snail kites. Disturbance resulting from aviation activities and the presence of fire management and monitoring personnel may cause temporary changes in behavior that may affect normal breeding, feeding and sheltering and could increase risk of predation of eggs and nestlings if adults are flushed from the nest. Rotor wash from helicopters also has the potential to dislodge kite nests from the vegetation substrate, causing nest failure.

There are cumulative impacts that would result from the addition of fire management to the impacts that have occurred and would continue to occur through hydrologic restoration and water management activities. Throughout BICY/FPNWR hydrologic management has in some cases degraded habitat and thereby reduced kite populations. Fires in these areas may have cumulative adverse impacts. These cumulative impacts are not likely to be significant because fires are not expected to strongly affect kites or their habitat, but the effects may be additive in some cases.

Alternative A would have site-specific, short-term, minor to moderate, adverse impacts to snail kites and short- and long-term beneficial effects as a result of improved foraging conditions and habitat maintenance, respectively. Prescribed fire and associated fire management activities would improve foraging conditions, habitat maintenance and enhancement, and the reduced potential for high-intensity wildfires. Alternative A may affect and is likely to adversely affect Everglades snail kites due to the potential for injury or mortality of individual snail kites as a result of prescribed fires.

**Wood Stork**—Wood storks are in general not highly susceptible to the effects of fire. Prescribed fires may be proposed and carried out during stork nesting season under Alternative A depending on conditions that are required to successfully accomplish the objectives of the burn. However, these burns would be conducted with mitigations to avoid potential impacts to stork nesting areas. While there would be some potential for adult and fledgling wood storks to be affected, the likelihood would be very small. Storks would likely move away from a fire or fire management disturbance, and they tend to forage in water 10–40 cm deep in open areas with only sparse emergent vegetation that would not likely burn. Furthermore, potential risks to wood stork nests would be mitigated through avoidance of nesting colonies, and most nesting colonies are well known, monitored, and surrounded by water. Under Alternative A, fires would have the potential to improve stork foraging by reducing vegetation density in foraging areas that may interfere with access to prey. Fires may also help reduce encroachment of woody invasive species in some areas.

Fire management, aviation, wildfire operations, effects monitoring, and other fire-related activities could temporarily disturb wood storks. Disturbance resulting from aviation activities and the presence of fire management and monitoring personnel may cause temporary changes in behavior that may affect normal breeding, feeding, and sheltering and could increase risk of predation of eggs and nestlings if disturbances occur near a nesting colony. Disturbance of nesting birds is unlikely because of mitigation measures to avoid active nesting colonies. Foraging birds are likely to respond to disturbance by moving out of the area.

Alternative A would have short-term, minor, adverse impacts to wood storks and short-term, local, beneficial effects. Alternative A may affect, but is not likely to adversely affect the wood stork.

**American Crocodile**—American crocodiles would be unlikely to be affected by wildfires because fires would generally be very infrequent in saltwater communities and estuarine waters where crocodiles generally occur. Fires near estuarine waters could result in disturbance to basking crocodiles, but injury or death of crocodiles would be unlikely because crocodiles generally bask in areas where they can quickly return to the water or in shallow water or mud that would limit fire intensity. Under Alternative A, fires could occur in the vicinity of crocodile nesting areas, including beaches and artificial uplands, with moderate intensity, primarily during wildfires. Wildfires would be expected to be of moderate intensity or less because of the generally moist habitat and vegetation types found in these wet areas; this environment is not generally conducive to high-intensity fires.

Prescribed fires would be conducted under planned environmental and fire behavior parameters that would be expected to prevent intense burning of organic soils and would be unlikely to impact crocodile nests. Fire managers could implement avoidance mitigations or not initiate prescribed fires if crocodile nests were present in the burn area.

Fire management and suppression activities, including helicopter use, presence of fire management personnel and equipment, and fire effects monitoring activities may disturb adult and juvenile crocodiles, causing temporary changes in behavior, including changes in breeding, feeding, and sheltering. Because crocodile habitat areas are not conducive to firefighters or equipment, chances of disturbance are small. These effects would not be expected to reach levels where injury, disturbance, or death occurs. These effects would be insignificant and negligible, and Alternative A would not likely adversely affect American crocodiles. Adverse effects of Alternative A on American crocodiles would be site-specific, short-term and negligible to minor.

Alternative A may result in temporary changes in the conditions of vegetation in some potential nesting areas but would otherwise not be expected to affect the overall availability, suitability, or amount of suitable crocodile nesting habitat, sheltered low-salinity estuarine waters, or the availability of prey, which are considered to be the primary constituent elements of crocodile habitat. Alternative A may affect, but is not likely to adversely affect the American crocodile.

**Eastern Indigo Snake**—Under Alternative A, prescribed burns would be implemented in pine rocklands where eastern indigo snake habitat occurs. Prescribed burns would be used to maintain the mosaic of habitat types that indigo snakes prefer, as well as general suitable habitat conditions. Although eastern indigo snakes move across the landscape quickly and retreat to burrows or other refugia when disturbed, some snakes may become caught in fires and injured or killed. If snakes are present at the fringes of habitats that do not typically burn, they may move into these habitats during fires. Snakes able to escape fire may be temporarily forced into marginal habitat or occupied territories, resulting in an increased likelihood of predation, difficulty in foraging, and difficulty in finding shelter and mates.

Multiple ignition locations, as would be expected under some prescribed fire scenarios, would have the potential to increase the risk of snakes becoming trapped in a prescribed fire, but this risk may be reduced by burning under conditions expected to result in less intense fire behavior and which provides unburned refugia. Prescribed fire preparation or exotic plant management actions includes some activities that may cause mulch piles, fallen logs, and stumps that could serve as dens, but mitigation actions that promptly remove or scatter debris piles to prevent eastern indigo snakes from inhabiting those temporary piles would reduce the potential for burning dens.

Fire management, wildfire operations, and effects monitoring could all cause minor disturbance to eastern indigo snakes. Disturbance resulting from the presence of fire management and monitoring personnel may cause temporary changes in behavior that may affect normal breeding, feeding, and

sheltering. Because mechanical ground disturbance related to BICY/FPNWR fires would be limited, the likelihood of injury or death of snakes during fire management and suppression activities would be low. However, operation of vehicles during fires could potentially injure or kill snakes. Alternative A would have short-term, minor to moderate, adverse impacts and long-term, beneficial effects by maintaining natural habitat characteristics used by the eastern indigo snake. Effects would be site-specific to local. Fire management under Alternative A may affect and is likely to adversely affect eastern indigo snakes due to the potential for injury or death of individuals as a result of prescribed fires.

*Cumulative Impacts.* Implementation of the Addition GMP (NPS 2010a) and the 2000 Recreational ORV Management Plan would increase ORV opportunities on designated trail systems in BICY, which would increase habitat fragmentation and human disturbance in corridor areas, resulting in long-term, minor to moderate, adverse impacts to special status species and their habitat. However, implementation of designated ORV trails would diminish impacts on dispersed areas that were formerly impacted by intermittent ORV use.

Implementation of future oil and gas proposals could have short- to long-term, minor to moderate, adverse, localized impacts on special status species and their habitat.

The numerous NPS and FWS management plans (CCP (FWS 2000), Resource Management Plan (NPS 2001), Water Resource Management Plan (NPS 1996), South Florida and Caribbean Parks Exotic Plant Management Plan (NPS 2010b)) provide guidance for the protection and management of numerous natural resources and would have long-term, moderate, beneficial impacts to special status species' habitat.

Numerous regional ecosystem water restoration and recreation projects and plans would improve sheet flow and hydrologic connectivity of the greater Glades system, which would likely improve special status species habitat by increasing natural water processes, plant vigor, abundance, and species composition. This would have a long-term, minor to moderate, beneficial impact on special status species' habitat for south Florida.

Regional growth and development is expected to continue in the general area surrounding BICY and FPNWR, resulting in continued conversion of wildlife habitat to developed lands. This would increase habitat fragmentation and loss of habitat and continue to degrade habitat and damage ecosystem function in south Florida. Continued growth and development would be expected to have long-term, moderate, adverse impacts on special status species and their habitat.

Fire management activities would continue to occur and could occur in areas with hydrologic restoration and water management activities. Hydrologic management has in some cases degraded portions of habitat and reduced sparrow populations. Fires in these areas may have cumulative adverse impacts. These cumulative impacts could be significant, as large fires could affect large portions of sparrow habitat, and these impacts could be additive with hydrologic impacts.

Alternative A in combination with past, present, and reasonably foreseeable future actions would result in adverse, minor, short-term, localized impacts due to increased noise and disturbance to individuals as well as beneficial, minor, long-term, and localized impacts due to improved habitat quality and habitat maintenance, especially of fire-adapted vegetation/wildlife communities. The contribution of Alternative A to cumulative impacts would depend on the amount, timing, and intensity of fires that occur.

*Conclusion.* Alternative A would result in a wide range of impacts on special status species, as described for individual species in the above analysis. Continuing current fire management activities

at BICY and FPNWR would have beneficial impacts on special status species and/or their habitat but may have long-term negative impacts to those species that require fire-adapted habitats. Suppression strategies utilized for wildfires, especially in BICY, would result in the buildup of hazard fuels in areas that are not burned by prescribed fires; over time these hazard fuels could lead to more intense wildfires over larger areas that may have direct or indirect adverse impacts on special status species and their habitat. The beneficial impacts would result from the maintenance and improvement of special status species' habitat. BICY and FPNWR would continue to coordinate with FWS and state resource agencies and would continue to minimize adverse impacts to special status species caused by fire management activities. However, some adverse impacts would be unavoidable. Cumulative impacts to special status species would be generally beneficial.

*Section 7 Determination of Effect.* Alternative A may affect but is not likely to adversely affect the American crocodile and wood stork. Alternative A may affect and is likely to adversely affect the Florida panther, Florida bonneted bat, Cape Sable seaside sparrow, red-cockaded woodpecker, Everglade snail kite, eastern indigo snake, Florida prairie clover, Everglades crabgrass, and Everglades bully due to the possibility of individual take as a result of prescribed fires. Adverse effects would generally be the result of injury (and in rare cases, death) to individuals rather than to long-term destruction of habitat or loss of local populations. Some short-term disturbance to habitats would occur, but over the long term, habitat conditions for affected species should be maintained or improved.

### ***Impacts of Alternative B***

Impacts to special status species and their habitat would be similar to those described under Alternative A, with the spatial extent of adverse and beneficial impacts increasing as wildfires managed for resource objectives would continue in FPNWR and be allowed in BICY. This allowance would likely result in more acres being treated by fire over time, emulating the natural fire regime, which would increase the health of fire-adapted habitats in BICY/FPNWR. As more acres are treated by wildfire over time, managers could more carefully focus prescribed fire on the areas and habitats that most need treatment by fire. Thus, the overall health of the ecosystem would be greater than Alternative A.

The use of mechanical treatments to reduce hazard fuels and to create and/or maintain defensible space and fuel breaks would continue in FPNWR and be allowed in BICY. Mechanical treatments would primarily be used in areas where prescribed fire is not feasible, to protect human values, and to protect sensitive habitat.

The management of wildfires for resource objectives may treat a larger area in BICY and FPNWR over time. This would allow more widespread reduction of hazard fuels, decreased wildfire intensities, and reduce the number of wildland fires requiring active suppression actions over the long term. Wildfires would move toward emulating a natural fire regime and having impacts within the range of naturally occurring fires across the landscape. Furthermore, wildland fire containment boundaries (natural or planned ignitions) might be more distant and able to use natural or pre-existing boundaries, depending on the resource objectives and values to be protected. This would reduce the risk and impacts of immediate aggressive suppression and reduce the need for building control lines or other required management actions, which may have site-specific direct impacts on special status species.

*Cumulative Effects.* The past, present, and foreseeable future actions would be the same as described for special status species under Alternative A. Cumulative impacts would be the same as described under Alternative A, with adverse, minor, short-term, localized impacts due to increased noise and

disturbance to special status species in and near treatment areas. Over time, the direct impacts to special status species from aggressive wildfire suppression may be less than Alternative A as less fireline construction and holding may be utilized. The beneficial impacts would be minor, long-term, and localized due to improved habitat quality and maintained and/or restored habitat. Beneficial impacts would increase in scope and scale under Alternative B as more acres in fire-adapted habitats would be treated over time.

*Conclusion.* Overall, Alternative B would have a range of beneficial impacts on special status species due primarily to the maintenance and improvement of special status species' habitat in BICY/FPNWR. Continuing current fire management activities plus managing wildfires for resource objectives in BICY and increasing the ability to use mechanical treatments at BICY would provide the agencies with a larger range of strategies to use in selecting the appropriate approach for maintaining the variety of habitats and species found in BICY/FPNWR. This would result in greater beneficial impacts on special status species than Alternative A. These beneficial impacts would result from more widespread maintenance and improvement of special status species' habitat. BICY and FPNWR would continue to coordinate with FWS and state resource agencies and monitor the status of special status species, developing new mitigations and techniques as more is learned about these species and their habitat needs. Although BICY and FPNWR would continue to minimize adverse impacts to special status species caused by fire management activities, some adverse impacts may be unavoidable. Cumulative impacts to special status species would generally be beneficial.

*Section 7 Determination of Effect.* Alternative B may affect but is not likely to adversely affect the American crocodile and wood stork. Alternative B is likely to adversely affect the Florida panther, Florida bonneted bat, Cape Sable seaside sparrow, red-cockaded woodpecker, Everglade snail kite, eastern indigo snake, Florida prairie clover, Everglades crabgrass, and Everglades bully due to the possibility of individual take as a result of prescribed fires. Adverse effects would generally be the result of injury (and in rare cases, death) to individuals rather than to long-term destruction of habitat or loss of local populations. Some short-term disturbance to habitats would occur, but over the long term, habitat conditions for affected species would be maintained or improved.

## **Wilderness**

### ***Methodology and Intensity Thresholds***

The methodology used for assessing wilderness impacts included using available literature to identify potential effects to wilderness character by the alternatives. The thresholds of change for the intensity of an impact are defined as follows:

*Negligible:* Impacts would result in a change to wilderness character, but the change would be so slight that it would not be of any measurable or perceptible consequence.

*Minor:* Impacts would result in a change to wilderness character and associated values that would be detectable, but the change would be small and of little consequence and would be expected to be localized.

*Moderate:* Impacts would result in a change to wilderness character and associated values that would be readily detectable but localized.

*Major:* Impacts would result in a change to wilderness character and associated values. It would be measurable and would have a substantial or possibly permanent consequence.

Duration of impacts is defined as follows:

*Short-term:* Wilderness effects would not extend beyond the duration of the project or incident.



*Long-term:* Wilderness effects would extend beyond the duration of the project or incident.

### ***Impacts of Alternative A***

There would be no mastication (use of tracked or wheeled equipment to reduce fuels) and no manual or mechanical thinning in wilderness under Alternative A, and thus this activity utilized in other Preserve areas would not affect wilderness character.

In BICY wilderness, where wildfire has played a prominent role in shaping and maintaining the ecological systems and the landscape, natural fire is considered a fundamental component of the wilderness environment. Fire suppression has been relatively unsuccessful or not utilized in BICY wilderness in the 20<sup>th</sup> and 21<sup>st</sup> centuries, so physical changes such as fire control lines are not present. In addition, lack of aggressive suppression has not altered the natural fire regime and fire frequency as much as in many other parks, wilderness, and natural areas.

Under this alternative, prescribed fire treatments in wilderness would be considered if recent fire frequencies were inadequate for habitat maintenance or hazard fuel reduction. Prescribed fires would then be planned to meet identified resource management and/or hazard fuel reduction objectives. Prescribed fire could be initiated using ground ignition or aerial ignition techniques. Ground ignitions would be initiated outside the wilderness boundaries, and prescribed fire control lines would also be outside the wilderness boundaries, utilizing natural boundaries such as sloughs or trails. Aerial ignition would be conducted using a helicopter; BICY presently utilizes aerial ignition throughout the Preserve for both suppression burnouts and prescribed fires. Planned ignitions would be managed under an approved Prescribed Fire Plan.

Wildfire suppression activities that could impact wilderness character include use of equipment such as helicopter, pumps, handheld motorized equipment (e.g. chainsaws) and hand tools (e.g. pulaski axes, cross-cut saws, shovels, pruners) and activities such as aviation water drops. BICY uses existing trails, roads, and natural features located outside wilderness as control lines to confine and contain wildfires. BICY does not anticipate using ORVs, aviation water drops, pumps, or installing control lines in wilderness, but these may be considered under certain rare circumstances, such as to protect a threatened and endangered species site located in wilderness from a high-intensity wildfire spreading towards it.

Impacts to the individual qualities of wilderness character would be as follows:

**Untrammelled**—Under Alternative A, prescribed fire treatments and suppression of wildfires in wilderness would continue. The implementation of planned prescribed fires would continue to emulate the natural fire regime and help maintain natural ecological functions in wilderness. If wildfires had occurred recently, then prescribed fires would not typically be considered. Implementation of fire management activities, such as prescribed fires and suppression of wildfires, would degrade the untrammelled quality of wilderness character by continued human manipulation of the natural fire regime. Impacts to the untrammelled quality would be adverse, minor to moderate, and localized. Impacts to the untrammelled quality from wildfire suppression efforts would depend on whether firefighter actions were taken in wilderness. If a wildfire was human caused and outside the range of variability of natural fires, then the untrammelled quality could be degraded; these impacts would depend on the fire size, time of year, fuel conditions, and fire intensity.

**Natural**—Implementation of prescribed fires would impact the air quality, alter the structure and composition of the vegetation communities, and could displace wildlife within and near the treatment area. However, these effects would be similar in scope and scale to natural wildfires, which are considered a natural process in BICY's wilderness. Fire is needed to maintain fire-adapted



vegetation communities and to reduce hazard fuel loads in areas not burned recently. Impacts would be site-specific and would not affect ecological processes beyond the range of variability found with natural wildfires. Fire management activities would result in adverse, negligible to moderate, and localized impacts to the natural quality of wilderness character. NPS policy allows limited use of prescribed fire in wilderness to achieve objectives that provide long-term benefits to the natural quality.

The natural quality could be impacted by wildfire suppression actions that require the use of ORVs to create control lines or suppress spot fires in wilderness. The type of ORV and options for use would be limited and subject to the MRA process, limiting the extent of tracks and areas where natural quality could be impacted. The use of ORVs to create control lines would result in short-term, minor to moderate impacts to the natural quality due to the disruption and compaction of vegetation. Some activities and equipment would have programmatic MRA pre-approval for initial attack wildfire suppression actions, such as hand tools, handheld motorized equipment, and helicopter landings. Impacts to the natural quality would be short-term, adverse, minor to moderate, and localized. Impacts to the natural quality from wildfire suppression efforts would depend on whether fire suppression actions occurred in the wilderness. If a wildfire was human caused and outside the range of variability of natural fires, then the physical effects of the wildfire could degrade the natural quality; these effects would depend on fire size, time of year, fuel conditions, and fire intensity.

The natural quality would benefit in two ways. First, prescribed fires would maintain fire-adapted vegetation communities, associated wildlife, the diversity of vegetation, and reduce the presence of exotic plants, all qualities of a natural wilderness. Second, hazard fuels would continue to be reduced in burn treatment areas, increasing the potential for localized, lower-intensity wildfires. Implementing planned prescribed burns would have short- to long-term, beneficial and adverse impacts to the natural quality.

Prescribed fire emulates the natural ecological wildfire processes, an essential wilderness ecosystem process that allows managers to enhance and maintain the natural quality.

**Undeveloped**—Implementing prescribed fire would leave little imprint as a human-caused effect, as fire is a natural process within BICY ecosystems. Prescribed fire management activities would not use mechanical equipment or vehicles in wilderness. Control lines for prescribed fires would be placed outside wilderness boundaries. The presence of a helicopter for aerial ignition in wilderness would have short-term, negligible to minor, adverse impacts to the undeveloped quality of wilderness character; however, these impacts would only last as long as the helicopter was present in the area.

Under Alternative A, wildfire suppression could require ORVs to transport equipment and fire crew or create control lines, helicopters, or the use of handheld motorized equipment to remove vegetation (e.g. snags). Because of the lack of fire control features in wilderness, these actions are unlikely to occur in wilderness. The NPS would minimize these types of actions to rare or unusual occasions necessary for specific objectives, and utilizing the MRA process. The presence and associated noise of mechanized (e.g. ORVs, helicopters, pumps) and handheld motorized equipment (i.e. chainsaw) deemed necessary for wildfire management by the MRA process would temporarily affect the undeveloped quality. These impacts would only last as long as they were present in wilderness. Thus, impacts would be short-term, negligible to moderate, and adverse.

**Opportunities for Solitude or Primitive and Unconfined Recreation**—The quality of outstanding opportunities for solitude or a primitive and unconfined type of recreation would be relatively

unaffected by fire management activities, except on a temporary basis. During prescribed fire treatments and wildfire suppression activities, visitors may be excluded from certain areas for safety reasons. These access closures would result in short-term, negligible to moderate, adverse, localized impacts on opportunities for solitude or primitive and unconfined recreation. The extent of impacts would depend on whether fire management actions were needed in wilderness, which depends on the location, size, duration, and time of year a wildfire occurs.

As discussed previously, wildfire suppression may require the use of mechanized and/or handheld motorized equipment. The presence and associated noise from the firefighters and mechanized equipment could have short-term, negligible to moderate impacts on opportunities for solitude and unconfined recreation depending on the proximity to visitors. Impacts would only last as long as firefighters and equipment were present in the wilderness area.

Overall effects on the quality of outstanding opportunities for solitude or a primitive and unconfined type of recreation would be short-term, adverse, and negligible to moderate.

*Cumulative Impacts.* Implementation of the Addition GMP (NPS 2010a) and the 2000 Recreational ORV Management Plan would minimize the effects of ORVs on wilderness resources and values by confining ORVs to designated trails and non-wilderness corridors, thus reducing the potential for impacts to wilderness quality. The addition of 130 miles of ORV trails in the Addition outside eligible wilderness areas could adversely affect the natural soundscape if placed too close to the wilderness and had frequent motorized traffic. However, the BICY designated trail system would reduce overall impacts from ORV use and limit changes to wilderness character by concentrating ORV use to areas outside of wilderness. Additionally, a half-mile non-wilderness corridor was placed around ORV trails to buffer wilderness areas from human disturbance. Impacts from the ORV Management Plan would be long-term, minor to moderate, and beneficial.

The numerous resource management and protection plans for BICY are focused on management and protection of natural resources and would have a long-term, beneficial, minor to moderate impact on wilderness character in BICY.

Implementation of future oil and gas proposals could have adverse impacts on wilderness character. If such proposals include using off-road equipment and constructing roads and pads in or near wilderness, this could create human disturbances and alter natural habitats in or near wilderness. Short-term impacts on wilderness character would be moderate, adverse, and localized; residual long-term impacts would be minor, adverse, and localized.

The numerous regional watershed ecosystem restoration plans and projects would enhance the sheet flow and hydrologic connectivity in the region, which would impact a range of natural resources. This would have a long-term, moderate, beneficial impact on wilderness character.

Regional growth and development is expected to continue in the general area, which would result in an increase in the conversion of natural lands to developed lands and in visitation and use of BICY. Increased visitation to BICY could lead to conflicts with opportunities for solitude and primitive and unconfined recreation. Continued growth and development near BICY and adjacent to wilderness areas would be expected to have a long-term, minor, adverse impact on wilderness character.

Alternative A, in combination with the past, present, and reasonably foreseeable future actions, would result in long-term, minor, beneficial impacts as well as short-term, negligible, adverse cumulative impacts.

*Conclusion.* Under Alternative A, fire management actions would have a variety of impacts on wilderness character. Impacts to the untrammelled quality of wilderness would be adverse, minor to

moderate, and localized. Fire management actions would have short-term, adverse, negligible to moderate, and localized as well as short- to long-term and beneficial impacts on wilderness character. The extent of impacts would depend on the amount of prescribed fire and wildfire that occurred in wilderness.

### ***Impacts of Alternative B***

Impacts to wilderness character would be similar to those described under Alternative A, with the spatial extent of beneficial impacts increasing as wildfires managed for resource objectives would be allowed in BICY wilderness. Under Alternative B, prescribed fire would continue to be used to reduce hazard fuels and to meet resource objectives in wilderness, with the eventual goal being that wildfires managed for resource objectives would be primarily used to maintain ecological fire processes. If the number of ignitions is inadequate or fire suppression outside of wilderness prevents natural frequencies, then planned ignitions (prescribed fire) might need to play a role in maintaining the naturalness of wilderness. The exact fire and habitat needs of specific areas of wilderness at BICY would be constantly assessed and monitored by managers and researchers.

Under Alternative B, wildfires in wilderness could be managed under selected strategies and identified incident objectives, which would include resource objectives. It is important to understand the concept of managing wildfire for resource objectives under NPS and national policy; they do not require that all natural ignition fires be managed for resource objectives. The decision to manage a wildfire is unique for each wildfire based on the total circumstances present at the time of ignition. A large number of factors are considered, including firefighter safety, values at risk, weather and fire behavior, access, and available firefighting resources. A relative risk assessment is developed, and fire staff and Preserve managers define objectives and a course of action for managing a wilderness wildfire. The Superintendent must approve these strategies and the course of action. Many wildfires have multiple objectives; one flank may be suppressed where it is approaching infrastructure or other values to be protected outside wilderness, while another flank is allowed to burn in order to achieve resource objectives in wilderness or mostly open, natural areas. The primary resource objective of wilderness wildfires would be to restore and maintain natural fire regimes. This supports ecosystem biodiversity and stability by maintaining vegetative fuel conditions within a range of natural variability.

**Untrammeled**—Impacts to the untrammeled quality of wilderness would be similar as described under Alternative A, with the spatial extent of impacts increasing as wildfires managed for resource objectives would be allowed in wilderness. The management of wildfires for resource objectives would be selected as a strategy when weather, fire behavior, and vegetation conditions are in the natural range of historic conditions. Over time, more wildfires would be managed as naturally occurring events where necessary suppression actions would occur outside the wilderness, thereby reducing the amount of human manipulation and control of the natural fire regime in the wilderness compared to Alternative A. In addition, managing wildfires for resource objectives would reduce hazard fuels would be reduced to a greater extent than Alternative A, where wildfires would be suppressed more often, preventing their beneficial impacts. Under Alternative B, impacts to the untrammeled quality of wilderness would be short-term, negligible to moderate, adverse, and localized, as manipulation would be needed to manage wildfires for resource objectives and to implement prescribed fires.

**Natural**—Impacts to the natural quality of wilderness would be similar as described under Alternative A, with the beneficial impacts to the natural quality of wilderness covering a greater extent. The use of wildfires managed for resource objectives could lead to a greater reduction of

hazard fuel loads and restoration and maintenance of natural habitats than Alternative A, as more beneficial wildfires could be allowed to resume their natural ecosystem function in wilderness. Over time, this would increase the potential for localized, lower-intensity ground fires and increase the amount of acres maintained for fire-adapted vegetation communities and associated wildlife and the diversity of vegetation. Over time, wildfires managed for resource objectives would be managed as naturally occurring wildfire events where necessary suppression actions would occur outside wilderness. Therefore, wildfire management actions and effects on the natural quality of wilderness would likely be less than Alternative A. Overall impacts to the natural quality of wilderness would be long-term, beneficial, localized, and minor to moderate.

**Undeveloped**—As under Alternative A, implementation of prescribed fires would leave little imprint as a human-caused effect, as fire is a natural process within BICY ecosystems, and prescribed fire control actions would occur outside wilderness. Over time, vegetation conditions would be expected to improve to reflect the natural range of historic conditions, allowing more wildfires to be managed for resource objectives and resulting in fewer prescribed fires in wilderness. These wildfire incidents would have necessary control actions occurring outside wilderness. Thus, use of mechanized equipment (e.g. disruption of vegetation, noise) would be less compared to Alternative A. Under Alternative B, impacts to the undeveloped quality would be short-term, negligible to minor, and adverse; lasting as long as mechanized equipment was present.

**Opportunities for Solitude or Primitive and Unconfined Recreation**—Impacts to opportunities for solitude or primitive and unconfined type of recreation under Alternative B would be less than Alternative A over time, as fewer fire management actions would need to occur in wilderness. Visitation closures may occur under both alternatives, but these typically would occur during lower visitation periods, and durations and extent of closures would not vary appreciably under either alternative. The extent of impacts would depend on the duration, size, and time of year a wildfire occurs. Overall, the impacts would be short-term, negligible to moderate, and adverse, depending on the location, duration, and intensity of fire management actions taken.

As discussed previously, wildfire suppression may require the use of mechanized and/or handheld motorized equipment, although these actions usually occur outside wilderness. The presence and associated noise from firefighters and mechanized equipment could result in short-term, adverse, and negligible to moderate impacts to the opportunities for solitude or primitive and unconfined recreation depending on proximity to the visitor. Impacts would only last as long as the firefighters and equipment were present in the wilderness area.

*Cumulative Impacts.* Cumulative impacts to wilderness character from past, present, and reasonably foreseeable actions are similar to those described under Alternative A. Alternative B in combination with the past, present, and reasonably foreseeable future actions would result in long-term, minor, beneficial impacts as well as short-term, minor, adverse cumulative impacts.

*Conclusion.* Under Alternative B, fire management actions would have a variety of impacts on wilderness character. Overall, impacts to the natural quality of wilderness character would be long-term, negligible to moderate, localized, and beneficial as little manipulation would be needed to manage wildfires for resource objectives; use of prescribed fires would be less than Alternative A. Impacts from the use of mechanized equipment for wildfire suppression would likely be less compared to Alternative A. Impacts to wilderness character would be short-term, adverse, negligible to moderate. Cumulative impacts would be long-term, minor, and beneficial as well as short-term, minor, and adverse.

## Cultural Resources

### Archeological Resources

#### *Methodology and Intensity Thresholds*

The methodology used for assessing archeological resource impacts included using available literature to identify the archeological resources present and identifying the potential effects to archeological resources by the alternatives. The thresholds of change for the intensity of an impact are defined as follows:

*Negligible:* Impact would be at the lowest level of detection, measurable but with no perceptible consequences. For the purposes of NHPA Section 106, the determination of effect would be no adverse effect.

*Minor:* Impacts would be perceptible and measurable but would be localized and confined and result in little if any loss of integrity. For the purpose of Section 106, the determination of effect would be no adverse effect.

*Moderate:* Site(s) would be disturbed but would not be obliterated. For the purpose of Section 106, the determination would be adverse effect.

*Major:* Site(s) would be obliterated. For the purpose of Section 106, the determination would be adverse effect.

Any disturbance to archeological resources would be permanent and would thus be considered long-term.

#### *Impacts of Alternative A*

Current fire management actions identify a vulnerability range of archeological sites to fire in BICY/FPNWR from low for features such as shell mounds to high for sites with wood or organic matter. BICY/FPNWR fire staff also coordinate with the cultural resource staff and appropriate tribal groups to avoid known archeological sites. Resource protection measures included in the existing FMPs serve to provide long-term, beneficial impacts to archeological sites. Overall, the current fire management actions protect archeological resources by helping to reduce hazard fuel loads, control non-native plant species, and maintain defensible space. This would increase the potential for wildland fires to be of lower intensity and near the ground surface, which are easier to suppress/manage, thus reducing the potential risk of damage to archeological resources.

Wildland fire activities could result in long-term, adverse, minor, localized impacts to archeological sites due to displaced surface materials, exposure of materials due to ground disturbance associated with the activities, or disturbance of materials immediately below the surface with vehicle use due to earth moving or compaction. Aerial use of retardant could discolor surface artifacts or structures. Indirect adverse impacts could include exposure of artifacts to erosion, which could increase looting. Mitigation measures (see Mitigation Measures Section) would reduce or eliminate many impacts from wildland fire suppression actions.

Although wildfire has likely impacted BICY/FPNWR archeological resources in the past, they may be affected by unplanned, intense wildfires. Depending on the intensity and duration of the fire, fires could cause discoloration of surface artifacts, burning of perishable materials, checkering or cracking of glass and ceramic artifacts, spalling of stone, and melting of metals (Ryan et al. 2012). These impacts would be long-term, minor to moderate, and adverse.



Indirect impacts could include post-fire erosion and loss of vegetation near archeological resources, which could increase looting of exposed archeological resources. This indirect impact would be long-term, negligible, and adverse.

*Cumulative Impacts.* Past actions, including road construction, energy exploration, logging, looting, and agricultural development, would have adverse, long-term, and negligible to minor impacts on archeological resources. Large-scale water projects and land development could also have impacts on archeological resources in the area. However, archeological resources would likely be avoided to the greatest extent possible, resulting in long-term, adverse, and negligible to minor impacts.

Future oil and gas proposals could have adverse impacts on archeological resources. However, approval of oil and gas proposals requires an approved operations plan, which includes mitigation measures to eliminate or reduce impacts on archeological resources. Therefore, the effect of energy exploration on archeological resources should be negligible.

Alternative A in combination with past, present, and reasonably foreseeable future actions would result in adverse, minor, long-term cumulative impacts.

*Conclusion.* Alternative A impacts would be long-term, minor to moderate, adverse and localized due to potential impacts from intense wildfires. Beneficial, minor to moderate, long-term, and localized impacts would also occur by helping to reduce hazard fuel loads around archeological resources. Cumulative impacts would be adverse, minor, long-term, and localized.

*Section 106 Summary.* After applying the Advisory Council on Historic Preservation's criteria of adverse effect (36 CFR part 800.5, *Assessment of Adverse Effects*), the NPS concludes that implementation of Alternative A would generally result in no adverse effect on archeological resources.

### ***Impacts of Alternative B***

Impacts to archeological resources would be similar to those described under Alternative A, with the spatial extent of adverse and beneficial impacts increasing as wildfires managed for resource objectives would continue in FPNWR and would be allowed in BICY. The use of mechanical treatments to reduce hazard fuels, to create and/or maintain defensible space and fuel breaks, to restore and maintain cultural resources, and to help define the burn unit or agency boundaries for controlling fire would also continue in FPNWR and would be allowed in BICY. Mechanical treatments would be primarily used in areas where use of prescribed fire is not feasible and to protect archeological resources. Unplanned fire management activities would have the potential for ground disturbance within and near archeological resources. However, wildfires managed for resource objectives would have less impact on vegetation and soils from ground disturbance than full suppression of wildfires.

Managing wildfires for resource objectives and the additional uses of mechanical treatments would increase the degree and range of protection for archeological resources by reducing hazard fuel loads adjacent to archeological resources, increasing the ability to achieve desired resource conditions, and maintaining/creating defensible space and fuel breaks around and near archeological resources. These activities would result in long-term, beneficial, and minor to moderate impacts.

Mechanical hazard fuel treatments could result in direct, adverse, long-term, localized impacts due to surface disturbances, which could physically damage materials or augment looting of archeological resources. Mechanical-related ground disturbance could expose, disturb, or damage materials immediately below the surface with vehicle use or compaction. Indirect impacts could occur if mechanical hazard fuel treatments changed the context in which the archeological resource is found,



leaving it vulnerable to impacts such as erosion. With avoidance of known archeological resources and implementation of mitigation actions, the direct and indirect adverse impacts would be minor, localized, and long-term.

*Cumulative Impacts.* Cumulative impacts to archeological resources from past, present, and reasonably foreseeable actions would be similar to those described under Alternative A, with long-term, negligible to minor, adverse impacts. Alternative B in combination with past, present, and reasonably foreseeable future actions would result in long-term, adverse, and minor cumulative impacts to archeological resources.

*Conclusion.* Overall, Alternative B would have a greater degree of minor to moderate, beneficial, long-term, localized impacts than Alternative A by removing more hazard fuels and maintaining/creating defensible space and fuel breaks around and near archeological resources. Cumulative impacts would be adverse, minor, long-term, and localized.

*Section 106 Summary.* After applying the Advisory Council on Historic Preservation's criteria of adverse effect (36 CFR part 800.5, *Assessment of Adverse Effects*), the NPS concludes that implementation of Alternative B would generally result in no adverse effect on archeological resources.

### **Ethnographic Resources**

#### ***Methodology and Intensity Thresholds***

The methodology used for assessing ethnographic resource impacts included using available literature to identify the ethnographic resources present and identifying the potential effects to ethnographic resources by the alternatives. The thresholds of change for the intensity of an impact are defined as follows:

*Negligible:* Impact would be at the lowest levels of detection, measurable, with no perceptible consequences, either adverse or beneficial. For purposes of NHPA Section 106, the determination of effect would be no adverse effect.

*Minor:* Impacts would be slight but noticeable, or they may result in limited changes in traditional resource access or use, or the relationship between the resource and the affiliated group's body of beliefs or practices. Slight alteration(s) to any of the characteristics that qualify the resource for inclusion in the NRHP may diminish the integrity of the site. For purposes of Section 106, the determination of effect would be no adverse effect. Beneficial minor impacts would allow traditional access and use and/or accommodate a group's traditional practices or beliefs.

*Moderate:* Impacts would be readily apparent and would interfere with traditional resource access or use or the relationship between the resource and the affiliated group's beliefs and practices, even though the group's beliefs and practices would survive. The effect would change one or more of the characteristics that qualify the resource for inclusion in the NRHP and would diminish the resource's integrity but would not jeopardize the resource's NRHP eligibility. For purposes of Section 106, the determination of effect would be adverse effect. Moderate beneficial impacts would noticeably enhance the group's traditional resource access or use or its relationship between the affiliated group's body of beliefs and practices.

*Major:* Impacts would be substantial, noticeable, and permanent and would result in significant changes in traditional resource access or use, or in the relationship between the resource and the affiliated group's beliefs and practices, to such a degree that the survival of the group's beliefs and practices would be jeopardized. The action would severely change one or more characteristics that

qualify the resource for inclusion in the NRHP, diminishing the resource's integrity to such an extent that it would be no longer eligible for listing in the NRHP. For purposes of Section 106, the determination of effect would be adverse effect. Major beneficial impacts would substantially enhance traditional resource access and use and the relationship between the resource and the affiliated group's beliefs and practices.

Any disturbance to cultural resources would be permanent and would thus be considered long-term.

### ***Impacts of Alternative A***

Current fire management actions provide protection of archeological sites that have ethnographic importance to the affiliated tribes. BICY/FPNWR fire staff also coordinate with the cultural resource staff and appropriate tribal groups to avoid known ethnographic resources (e.g. archeological sites, ceremonial plants, ethnographic sites). Resource protection measures included in the existing FMPs serve to provide long-term, beneficial impacts to ethnographic resources, including archeological sites that have ethnographic importance. Overall, the current fire management actions protect cultural and natural resources that have ethnographic importance by helping to reduce hazard fuel loads, control non-native plant species, and maintain defensible space. This would increase the potential for wildland fires to be of lower intensity and near the ground surface, which are easier to suppress/manage, thus reducing the potential risk of damage to ethnographic resources. Impacts to archeological sites considered ethnographic resources from fire management actions are as described above in the archeological resources section.

Although wildfire has likely impacted BICY/FPNWR ethnographic resources in the past, they may be affected by unplanned, intense wildfires. Depending on the intensity and duration of the fire, fires could affect plants or trees traditionally used by the affiliated tribes. In addition, specific locations/ethnographic sites that hold spiritual significance could be impacted by alterations to the viewshed or temporary closure from a wildfire event occurring during ceremonial events or in nearby areas. These impacts would be long-term, minor to moderate, and adverse.

Since there is often sensitivity connected to ethnographic sites, and some may be undocumented, there may not be enough advance notice to avoid impacting these sites by fire management activities during emergency suppression actions. Individual plants or trees or specific locations of spiritual significance could also be impacted by wildfire, equipment and crew staging, and post-burn mop-up and rehabilitation actions.

Any impacts to ethnographic resources attributed to the affiliated tribes would generally result from changes to the tribe's folk customs and independent lifeways and not from fire management actions. The affiliated tribes have used BICY and FPNWR for generations and are likely accustomed to prescribed fire and wildfire events. Furthermore, BICY/FPNWR coordinates efforts with the affiliated tribes and BICY/FPNWR cultural resource staff to avoid known ethnographic resources.

Overall, Alternative A would have beneficial, minor to moderate, long-term, and localized impacts as well as long-term, minor, adverse impacts to ethnographic resources.

*Cumulative Impacts.* Past actions, including road construction, energy exploration, logging, and agricultural development, would have adverse, long-term, and negligible to minor impacts on ethnographic resources. Large-scale water projects and land development could also have impacts on ethnographic resources in the area. However, ethnographic resources would likely be avoided to the greatest extent possible, resulting in long-term, adverse, and negligible to minor impacts.

Future oil and gas proposals could have adverse impacts on ethnographic resources. However, approval of oil and gas proposals requires an approved operations plan, which includes mitigation

measures to eliminate or reduce impacts on ethnographic resources. Therefore, the effect of energy exploration on ethnographic resources should be negligible.

Alternative A in combination with past, present, and reasonably foreseeable future actions would result in adverse, minor, long-term cumulative impacts.

*Conclusion.* Alternative A impacts would be long-term, minor, adverse and localized due to potential impacts from wildland fires and associated activities as well as beneficial, minor to moderate, long-term, and localized. Cumulative impacts would be adverse, minor, long-term, and localized.

*Section 106 Summary.* After applying the Advisory Council on Historic Preservation's criteria of adverse effect (36 CFR part 800.5, *Assessment of Adverse Effects*), the NPS concludes that implementation of Alternative A would generally result in no adverse effect on ethnographic resources.

### ***Impacts of Alternative B***

Impacts to ethnographic resources would be similar to those described under Alternative A, with the spatial extent of adverse and beneficial impacts increasing as wildfires managed for resource objectives would continue in FPNWR and would be allowed in BICY. The use of mechanical treatments to reduce hazard fuels, to create and/or maintain defensible space and fuel breaks, to restore and maintain cultural resources, and to help define the burn unit or agency boundaries for controlling fire would also continue in FPNWR and would be allowed in BICY. Mechanical treatments would be primarily used in areas where use of prescribed fire is not feasible and to protect ethnographic resources. Unplanned fire management activities would have the potential for ground disturbance within and near ethnographic resources. However, wildfires managed for resource objectives would have less impact on vegetation and soils than full suppression of wildfires.

Managing wildfires for resource objectives and the additional uses of mechanical treatments would increase the degree and range of protection for ethnographic resources by reducing hazard fuel loads adjacent to ethnographic resources, increasing the ability to achieve desired resource conditions, and maintaining/creating defensible space and fuel breaks around and near ethnographic resources. These activities would result in long-term, beneficial, and minor to moderate impacts.

Impacts to ethnographic resources attributed to the affiliated tribes would be the same as described in Alternative A. Therefore, implementation of Alternative B would have long-term, negligible, adverse impacts to ethnographic resources.

*Cumulative Impacts.* Cumulative impacts to ethnographic resources from past, present, and reasonably foreseeable actions would be similar to those described under Alternative A, with long-term, negligible to minor, adverse impacts. Alternative B in combination with past, present, and reasonably foreseeable future actions would result in long-term, adverse, and minor cumulative impacts to ethnographic resources.

*Conclusion.* Impacts to ethnographic resources under Alternative B would be adverse, minor, and long-term as well as beneficial, minor to moderate, long-term, and localized. Beneficial impacts to ethnographic resources would be greater than Alternative A. Cumulative impacts to ethnographic resources would be long-term, minor, and adverse.

*Section 106 Summary.* After applying the Advisory Council on Historic Preservation's criteria of adverse effect (36 CFR part 800.5, *Assessment of Adverse Effects*), the NPS concludes that implementation of Alternative B would generally result in no adverse effect on ethnographic resources.

## **Human Resources**

### **Visitor Use and Experience**

#### ***Methodology and Intensity Thresholds***

The methodology used for assessing visitor use and experience impacts included identifying the potential effects to visitor use by the alternatives. The thresholds of change for the intensity of an impact are defined as follows:

*Negligible:* Visitors would not be affected or changes in visitor use and/or experience 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/or experience 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/or experience 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/or experience would be readily apparent and have substantial, 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.

Duration of impacts is defined as follows:

*Short-term:* Impacts would generally last less than one year and would affect only one season's use by visitors.

*Long-term:* Impacts would generally last more than one year and would be more permanent in nature.

#### ***Impacts of Alternative A***

There would be temporary visitor use restrictions in specific sections of BICY/FPNWR to assure that no visitors are near where fuel management actions are actively being applied (i.e., prescribed burns, mechanical treatments) or where wildfires are present. Temporary road closures that prevent visitors from accessing BICY/FPNWR may also impact visitor use. In the short term, such restrictions may negatively impact people who are prevented from accessing an area. Noise associated with mechanical tools such as chainsaws or masticators could temporarily disrupt the visitor experience.

Wildfires and prescribed fire could also produce smoke, altering or obstructing the scenic views; odors; and limited blackened areas that could affect some visitor experiences. These adverse impacts would be localized, short-term, and negligible to moderate. The presence of fire, smoke, and blackened areas may present an opportunity for education and interpretation of natural values and processes or restoration of cultural landscapes, which may provide a minor, long-term, beneficial impact. Overall, this alternative would have direct, short-term, negligible to moderate, adverse impacts in the immediate area of treatment during the treatment period and would be expected to have indirect, minor to moderate, beneficial, long-term, localized impacts.

*Cumulative Impacts.* Cumulative impacts to visitor use and experience from other activities include fire management activities planned by other agencies, wildfires occurring on adjacent lands, noise-

related impacts from vehicles, and maintenance activities (e.g., road, facility) within BICY/FPNWR. Continued population growth in south Florida may increase the amount of local visitors to BICY/FPNWR. Increased visitation during fire management activities may have long-term, beneficial impacts as visitors are given the opportunity to learn about the fire-adapted ecosystems and the importance of fire in resource management. There would also be short-term, minor to moderate, adverse effects due to closures of treatment areas or disruption in the transportation networks within and adjacent to BICY/FPNWR. Alternative A in combination with past, present, and reasonably foreseeable future actions would result in adverse, short-term, minor to moderate impacts as well as long-term, beneficial cumulative impacts to visitor use and experience.

*Conclusion.* Impacts to visitor use and experience would be adverse, negligible to moderate, short-term and localized due to public use closures and smoke impacts. Cumulative impacts would be adverse, short-term, and minor to moderate as well as long-term and beneficial.

### ***Impacts of Alternative B***

Impacts from Alternative B would be similar to those described under Alternative A, with the spatial extent of adverse and beneficial impacts increasing as wildfires managed for resource objectives would be allowed for BICY. Implementing wildfires managed for resource objectives could increase the potential for short-term closures to recreational sites and visitor facilities. The use of mechanical treatments to create and maintain fuel breaks and defensible space, to reduce hazard fuel loads, and to maintain cultural landscapes would provide long-term, beneficial impacts on visitor use and experience by reducing the potential for short- to long-term closures and increasing the perpetuation of native vegetation communities and native wildlife for viewing. Management of wildfires for resource objectives would further reduce hazard fuel loads, increasing the potential for low-intensity, surface ground fires and therefore reducing the need for suppression activities, resulting in fewer disturbances from noise and closures to visitors.

The effects of Alternative B on FPNWR are expected to be similar to BICY; however, there would be no change in impacts at FPNWR, as these fire management activities are currently allowed by their FMP and CCP.

*Cumulative Impacts.* Cumulative impacts to visitor use and experience resources from past, present, and reasonably foreseeable actions are similar to those described under Alternative A, with short-term, negligible to moderate, adverse impacts and long-term beneficial impacts. Alternative B in combination with past, present, and reasonably foreseeable future actions would result in short-term, adverse, and negligible to minor cumulative impacts to visitor use and experience as well as beneficial, long-term, minor cumulative impacts.

*Conclusion.* Impacts to visitor use and experience would be adverse, short-term, negligible to minor, and localized in the immediate area of treatment during the treatment period. There would also be indirect, minor to moderate, beneficial, long-term, localized impacts from fuel management activities, decreasing the potential for intense wildfires and improving native herbaceous plant communities and habitat diversity, which would provide more desirable scenery and an increase in forage availability for white-tailed deer that could result in a higher-quality hunting experience. Cumulative impacts would be short-term, adverse, and negligible to minor as well as beneficial, long-term, and minor.



## **Socioeconomics**

### ***Methodology and Intensity Thresholds***

Impact analysis on socioeconomics was based on the previous assessments of BICY and surrounding communities by NPS, the U.S. Census, and previous studies and assessments by the Convention and Visitors Bureau and surrounding communities. The thresholds of change for the intensity of an impact on socioeconomics are defined as follows:

*Negligible:* Little or no noticeable change in economic activity, employment and income levels, or population migration or immigration.

*Minor:* Local changes in economic activity, employment and income levels, or population migration or immigration.

*Moderate:* Regional changes in overall economic activity, employment and income levels, or population migration or immigration.

*Major:* Widespread, significant changes in overall economic activity, employment and income levels, or population migration or immigration.

Duration of impacts is defined as follows:

*Short-term:* Impacts would generally last for the duration of the management action.

*Long-term:* Impacts would generally last beyond the duration of the management action.

### ***Impacts of Alternative A***

Fire management activities would continue under the BICY 2005 FMP and the FPNWR 2009 FMP. Impacts would be minor and both beneficial and adverse to local and regional businesses located outside BICY/FPNWR and to commercial services permitted to provide visitor services within BICY. Wildland fires may provide additional opportunities for businesses in the regional economy but may also decrease the visitation rate to BICY/FPNWR, reducing income to local businesses from visitor spending. The local economy could benefit from fire management associated expenditures for labor, equipment, and other goods and services. Impacts would be short-term, negligible to minor, beneficial, and limited to the duration of the fire event.

An indirect effect would be from the impact of spending by visitors in both the local and regional economies. Expenditures may include food and lodging, fees, rentals, guide and outfitting services, scenic and sightseeing tours, and other retail purchases. Visitor spending from tourism is a primary driver of economic activity for the local economy, which supports local employment as well as local and regional businesses. Another indirect effect to the local economy may include additional spending of income earned directly or indirectly from employment in businesses benefiting from visitor spending associated with BICY/FPNWR.

The potential for BICY visitation rates and associated visitor spending to be affected by wildland fire events depends on the size, location, and extent of the fire. Losses to the local economy would occur from temporary closures during fire events and longer-term effects associated with the damage, destruction or loss of access to BICY/FPNWR. Temporary disruptions would also result from wildland fire events from smoke and increased fire personnel in areas but would be unlikely to alter visitor spending in the local economy over the long term.

The impacts of prescribed fire would be beneficial to the local and regional businesses. Expenditures for labor and equipment, supplies and other materials needed to manage prescribed fires would be



expected to have a negligible to minor, short-term, beneficial impact to the local economy. Short-term, adverse impacts could include restricted access to visitors in burn areas and temporary closures, which may result in a short-term decrease in visitor spending. However, prescribed burns would be limited in size and duration and scheduled outside of the peak tourist season to minimize visitor disruptions. Therefore, adverse impacts to visitor spending would be expected to be negligible and temporary in duration.

Fuel reduction and/or restoration projects using manual and mechanical equipment would be expected to have negligible effects on the local and regional income and employment. The manual and mechanical treatments could be labor-intensive, requiring a work crew, which could benefit the local economy through increased local spending to support the crews as well as higher incomes to local contractors for the duration of the project.

*Cumulative Impacts.* Implementation of the Addition GMP (NPS 2010a), the Commercial Services Plan (NPS 2009), and the 2000 Recreational ORV Management Plan would increase visitor use opportunities in BICY and would likely increase spending in BICY, resulting in a long-term, beneficial, minor to moderate impact and a long-term, adverse, negligible impact to the local economy. No regional impacts are expected to result from implementation of these plans.

Implementation of future oil and gas proposals could produce a short-term, moderate amount of revenue that would impact the Collier County economy. Oil and gas proposals would also be expected to have a short-term, beneficial, minor impact on employment in Collier County.

The numerous regional ecosystem restoration and recreation projects and plans would enhance the visitor use and experience by providing additional recreational opportunities (e.g., wildlife viewing), facilities, and access points to visitors in the region. This would have a long-term, minor, beneficial impact on revenue and employment for the south Florida region.

Regional growth and development is expected to continue in the general area. Continued growth and development would be expected to have a long-term, moderate, beneficial impact on revenue from increased local tourism.

Alternative A in combination with past, present, and reasonably foreseeable future actions would result in short-term, minor, beneficial impacts as well as short-term, negligible, adverse cumulative impacts.

*Conclusion.* Visitation rates and corresponding visitor spending would not be expected to change under this alternative. Overall, impacts on socioeconomics of BICY/FPNWR, Collier County, and the south Florida region would be short-term, negligible to minor, and beneficial.

### ***Impacts of Alternative B***

Impacts on socioeconomic resources would be similar to those described for Alternative A. The implementation of wildfires managed for resource objectives in BICY could lead to more acres burned, which could decrease the need for prescribed burns in these areas, reducing the disruption to visitors by smoke emissions from prescribed fires. Wildfires managed for resource objectives over time under this alternative would decrease the potential for intense, large wildfires. Wildfires would move over time toward having impacts within the range of naturally occurring wildfires, thus reducing impacts from fire suppression activities, such as the length of time for closed areas and access restrictions to visitors. This could reduce adverse impacts on visitation rates and corresponding visitor spending.

The use of manual and mechanical treatments to include hazard fuel reduction, developing or maintaining defensible space and fuel breaks, and restoring and maintaining cultural resources and landscapes would increase the potential for localized, lower-intensity ground fires and would have the same impacts to socioeconomic resources as described for wildfires managed for resource objectives.

*Cumulative Impacts.* Cumulative impacts to socioeconomics from past, present, and reasonably foreseeable actions are similar to those described under Alternative A, with short-term, negligible, adverse impacts and short-term, minor, beneficial impacts. Alternative B in combination with past, present, and reasonably foreseeable future actions would result in short-term, minor, beneficial impacts as well as short-term, negligible, adverse cumulative impacts.

*Conclusion.* Visitation rates and corresponding visitor spending would not be expected to change perceptibly under this alternative. Overall, impacts on socioeconomics of BICY/FPNWR, Collier County, and the south Florida region would be short-term, negligible to minor, and beneficial, with potential for short-term, negligible, adverse impacts associated with disruptions to visitor use and corresponding visitor spending in BICY and the local communities. Beneficial impacts would be greater under Alternative B compared to Alternative A.

### **Land Use (includes tribal uses)**

#### ***Methodology and Intensity Thresholds***

Impacts on land use were evaluated using available literature to identify the current land uses within BICY/FPNWR, adjacent landowners (both public and private property), inholders, and the transportation network within and directly adjacent to BICY/FPNWR lands. The thresholds of change for the intensity of an impact on land use are defined as follows:

*Negligible:* Impacts would be so slight that it would not be of any measurable or perceptible consequence to BICY/FPNWR neighbors.

*Minor:* Effects to BICY/FPNWR neighbors would be detectable, although the changes would be slight. Neighbors could be aware of the effects associated with the alternative, but only slightly.

*Moderate:* Effects to BICY/FPNWR neighbors would be readily apparent. Neighbors would be aware of the effects associated with the alternative and would likely be able to express an opinion about the impacts of the alternative on their property or lifestyle.

*Major:* Effects to BICY/FPNWR neighbors would be readily apparent and would have important consequences. Neighbors would be aware of the effects associated with the alternative and would likely express a strong opinion about the impacts of the alternative on their property or lifestyle.

Duration of impacts is defined as follows:

*Short-term:* Impacts would generally last for the duration of the project or incident.

*Long-term:* Impacts would generally last beyond the duration of the project or incident.

#### ***Impacts of Alternative A***

Existing fire management activities would continue to occur in BICY/FPNWR and would continue to occur from localized areas in BICY/FPNWR to neighbors (such as Sunniland, Everglades City, Miccosukee and Big Cypress Seminole Reservations, and Everglades National Park). Fire management effects to BICY/FPNWR neighbors would primarily be associated with smoke.

Private inholdings within BICY include fishing and hunting camps, buildings, towers, Native American home sites, and the Dade-Collier jetport. Adjacent BICY/FPNWR properties include homes and landscaping, native vegetation communities, and structures. Fuel reduction efforts to restore native habitats in BICY/FPNWR have reduced hazard fuel loads near neighboring properties and inholdings, providing long-term, beneficial impacts. Wildland fire activities have the potential to limit access to impacted areas and to produce smoke intrusions for private camp users as well as adjacent landowners. Fire staff and equipment used for fire management activities may cause disruptions in use, smoke intrusions, and/or temporary limited access for inholdings or areas within the Miccosukee and Big Cypress Seminole Reservations.

Smoke-related impacts, such as reduced visibility, to BICY/FPNWR, local, and regional roads from fire management activities would continue to occur. Depending on smoke density, traffic volume, and roadway conditions, appropriate warning signage and/or full or partial road closures may be necessary. Smoke could also affect the Dade-Collier jetport and other public and private aviation facilities near BICY/FPNWR. Impacts to air facilities could range from flight delays or cancellations to airspace restrictions. Smoke-related impacts would be localized and last only for the duration of the fire. Impacts to roads and flight operations are expected to be short-term, adverse, and negligible.

Fire management activities may also provide long-term, beneficial impacts to transportation both within BICY/FPNWR and to the nearby regional transportation network by reducing hazard fuels through fire management activities and therefore reducing the potential for intense, severe wildfires.

*Cumulative Impacts.* Past land uses and agricultural practices, population growth, transportation projects within and adjacent to BICY/FPNWR, utilities projects, other regional planning efforts, and wildland fire activities on adjacent lands contribute to cumulative impacts on transportation. Continued population growth in south Florida may cause the wildland urban interface surrounding BICY/FPNWR to be encroached, causing both beneficial and adverse impacts. Increased populations within close proximity to BICY/FPNWR may experience short-term, negligible to minor, adverse effects due to smoke from wildland fire events. Fire management activities do provide long-term, beneficial impacts, as hazard fuels are reduced near close populations/communities.

Alternative A in combination with past, present, and reasonably foreseeable future actions would result in short-term, negligible to minor, adverse impacts as well as long-term, negligible, beneficial cumulative impacts.

*Conclusion.* Overall, Alternative A would have short-term, negligible to minor, adverse impacts and long-term beneficial impacts to land use and transportation. Alternative A in combination with past, present, and reasonably foreseeable future actions would result in short-term, negligible to minor, adverse impacts as well as long-term, negligible, beneficial cumulative impacts.

### ***Impacts of Alternative B***

Under Alternative B, impacts to land use and transportation would have similar impacts as described under Alternative A, with fire management activities benefitting inholders, adjacent landowners, and transportation. Implementing wildfires managed for resource objectives in BICY and continuing this strategy in FPNWR may burn larger areas, which would further reduce hazard fuel loads, decreasing the potential for future intense and severe unplanned wildfires. The reduction of unplanned intense and severe wildfires over time would also reduce smoke emissions to adjacent landowners, resulting in long-term beneficial impacts.

In BICY, mechanical treatments would include additional vegetation/fuel management options—reducing hazard fuels, developing or maintaining defensible space, protecting infrastructure and

private property, restoring and maintaining cultural resources and landscapes, and helping to define burn unit or agency boundaries for controlling fire. Impacts would be the same as described under Alternative A with the extent of beneficial impacts increasing. Developing or maintaining defensible space would provide smoke and fire breaks near developed areas, resulting in long-term beneficial impacts.

Alternative B would have similar impacts on road visibility, temporary road closures, traffic pattern disruptions, and flight operation disruptions as described under Alternative A. However, under Alternative B there could be larger areas burned for wildfires managed for resource objectives, which could increase adverse smoke impacts compared to Alternative A. Impacts would still be short-term, negligible to minor, and adverse as well as long-term and beneficial. The additional mechanical treatment options would provide smoke and fire breaks near developed areas, which could include roads, resulting in long-term beneficial impacts.

*Cumulative Impacts.* Cumulative impacts to land use and transportation from past, present, and reasonably foreseeable actions are similar to those described under Alternative A, with negligible to minor, adverse impacts as well as long-term, negligible, beneficial impacts. Alternative B in combination with past, present, and reasonably foreseeable future actions would result in long-term, beneficial as well as short-term, negligible to minor, adverse cumulative impacts.

*Conclusion.* Alternative B would have short-term, negligible to minor, adverse impacts and long-term beneficial impacts to land use and transportation. Alternative B in combination with past, present, and reasonably foreseeable future actions would result in long-term, beneficial as well as short-term, negligible to minor, adverse cumulative impacts.

## **Human Health and Safety**

### ***Methodology and Intensity Thresholds***

The methodology used for assessing human health and safety impacts included identifying the potential effects to human health and safety by the alternatives. The thresholds of change for the intensity of an impact are defined as follows:

*Negligible:* Impacts would not have a noticeable effect on human health and safety, with no injuries or loss of life.

*Minor:* Impacts would be detectable but would not have an appreciable effect on human health and safety, with few or minor injuries and no loss of life.

*Moderate:* Impacts would have readily detectable impacts and would result in substantial, noticeable effects to human health and safety on a local scale, with possible serious injuries but no loss of life.

*Major:* Impacts would have readily detectable impacts and would result in substantial, noticeable effects to human health and safety on a regional scale or the possibility of extremely serious injuries and/or loss of life.

Duration of impacts is defined as follows:

*Short-term:* Impacts would generally last for the duration of the project or incident.

*Long-term:* Impacts would generally last beyond the duration of the project or incident.

### ***Impacts of Alternative A***

Direct adverse impacts to firefighter health and safety include activities associated with wildland fire suppression efforts, such as intense exposure to heat, smoke inhalation, accidental spills, injuries

from the use of fire-fighting equipment, and in severe cases, injuries from wildland fires. Impacts to the public could include smoke inhalation, and in severe cases, injuries from wildland fires.

Fuel break construction could pose safety threats to firefighters from the use of equipment as well as traveling over land to targeted areas during suppression efforts. Each crewmember is trained in the use of firefighting equipment, but accidental injuries may still happen. Adherence to guidelines concerning firefighter accreditation and equipment and procedural safety guidelines would minimize accidents.

Smoke inhalation may also pose a threat to human health and safety. Acute smoke exposure from wildland fires begins with acute eye and respiratory irritation and shortness of breath but can develop into headaches, dizziness, and nausea. A study on firefighter smoke exposure found most smoke exposures were not considered hazardous, with a small percentage routinely exceeding recommended exposure limits for carbon monoxide (primary inhalation hazard) and respiratory irritants (USDA 2000).

In the event of a potentially hazardous wildfire within BICY/FPNWR, the fire staff would coordinate public notification, restrictions, closures, and evacuation efforts with Preserve and Refuge law enforcement staff and local emergency response agencies. The extent of public notice would depend on the specific fire situation. Assuring visitor, local residents, and staff safety would take priority over other BICY/FPNWR activities.

Prescribed fire and mechanical and manual treatments would involve more pre-planning and implementing activities under defined conditions. This normally allows for better health and safety protections and precautions under planned and controlled workplace conditions than the inopportune times often occurring when wildfires burn, which is usually during more severe meteorological and fuel conditions. Health and safety of staff would be enhanced when additional fire personnel would be brought in, as needed, from interagency cooperators for prescribed fires. Human safety is the primary objective for prescribed burns and all BICY/FPNWR activities; additional staff brought in would help to ensure safety mitigations were implemented. Therefore, the potential for direct and indirect impacts associated with management actions (though it is not possible to eliminate all risk) would be reduced overall. The impacts to health and safety because of fuel/vegetation management actions would be short-term, negligible to minor, adverse, and localized, with minimal human health and safety concerns for firefighters and the public.

Overall, Alternative A would have direct, short- to long-term, minor to moderate, adverse, localized impacts.

*Cumulative Impacts.* Cumulative impacts to human health and safety from other activities include development of lands adjacent to BICY/FPNWR and management activities. Such actions would have an adverse, negligible to minor, and short- and long-term impact because expanded wildland urban interface boundaries could add additional hazard fuel loadings and increase the number of homes and structures at risk, thus increasing the risks to firefighters and the public in protecting those areas and people in an intense wildfire. Alternative A in combination with past, present, and foreseeable future actions would result in direct, minor, short- to long-term, adverse, and localized impacts.

*Conclusion.* Alternative A would have short- to long-term, minor to moderate, adverse, localized impacts to human health and safety. Cumulative impacts would be minor, short- to long-term, adverse, and localized.



***Impacts of Alternative B***

Human health and safety impacts would be the same as described under Alternative A in regards to the effects of wildland fire suppression and fuels/vegetation management activities. The use of wildfires managed for resource objectives in BICY could lead to burning of larger areas, which could expose firefighters and the public to more smoke emissions than Alternative A. However, planned prescribed burns in these areas may not be needed, which could result in a decrease of smoke emissions from prescribed fires. In addition, wildfires managed for resource objectives could cover larger areas, further reducing hazard fuel loads, which could decrease the potential for future intense and severe wildfires.

Alternative B would allow the use of mechanical treatments to include reducing hazard fuel levels, developing or maintaining defensible space and fuel breaks, and restoring and maintaining cultural resources and landscapes at BICY. The additional mechanical treatment options would further reduce hazard fuel loads and better protect structures, which would likely increase the potential for wildfires to be lower-intensity, surface fires that are easier to suppress/manage and thus less risk to human health and safety.

The effects of Alternative B on FPNWR are expected to be similar to BICY; however, there would be no change in impacts at FPNWR, as these fire management activities are currently allowed by their FMP and CCP.

Alternative B would have direct, minor to moderate, beneficial, long-term, localized impacts by reducing the potential for future severe wildfires as the acres of hazard fuels decreases.

*Cumulative Impacts.* Cumulative impacts to human health and safety from other activities include continued development on lands adjacent to the Refuge/Preserve. Such actions would have an adverse, minor to moderate, and short- and long-term impact because expanded WUI areas would add additional area residents and increase the number of homes and structures at risk, thus increasing the risks to firefighters and the public in protecting those areas and people in an intense wildfire. Alternative B in combination with past, present, and foreseeable future actions would result in direct, negligible, short-term, adverse, localized impacts due to potential exposure to associated fire risks (e.g., heat, smoke inhalation). There would also be direct, beneficial, minor, long-term, and localized impacts by reducing the potential for future severe wildfires as the amount of hazard fuel reduction increases.

*Conclusion.* Short- and long-term impacts to human health and safety under Alternative B would be beneficial and minor to moderate as well as negligible to minor, adverse, and localized. Overall, cumulative impacts would be beneficial, minor, long-term, and localized.



## CHAPTER 5—CONSULTATION AND COORDINATION

### Internal Scoping

Scoping is a process to identify the affected environment that may be impacted by the proposed project and to explore possible alternative ways of achieving the proposal while minimizing potential adverse impacts. Internal scoping was conducted on October 22–23, 2014, by an interdisciplinary team of professionals from BICY/FPNWR and the NPS Southeastern Regional Office, including representatives from fire management, resource management, NEPA specialists, and the private contractor working on the EA. The interdisciplinary team discussed the purpose and need for the project, potential alternatives to address these needs, potential environmental impacts, past, present, and foreseeable future projects that may contribute to cumulative effects, and potential mitigation measures. The team members also conducted a site visit to view and evaluate the existing conditions of cultural and natural resources and hazard fuels.

### External Scoping

External scoping was conducted to inform the public about the proposal and to generate input on the preparation of this EA. This effort was initiated by distributing a scoping letter dated January 8, 2015, to various stakeholders describing the project and asking for comments. In addition, the letter was posted on NPS's Planning, Environment, and Public Comment (PEPC) website for comments related to both agencies (<http://parkplanning.nps.gov/bicy>). The NPS and FWS developed a joint press release, which was posted on PEPC, the BICY website (<http://www.nps.gov/bicy/learn/news/preserve-refuge-fire-management-plan.htm>), and the BICY Facebook page, while links to PEPC and the BICY website were provided on the FPNWR website ([http://www.fws.gov/refuge/florida\\_panther/what\\_we\\_do/fmp.html](http://www.fws.gov/refuge/florida_panther/what_we_do/fmp.html)). The press release was also sent out electronically to over 800 constituents on the BICY and FPNWR contact lists. The public was given 30 days to comment on the project.

### Agency Consultation

In accordance with the ESA, BICY and FPNWR consulted with FWS with regards to federally listed species. A copy of the EA will be sent to FWS for review along with a request for their concurrence with the determination of effects on federally listed species described in this EA.

In accordance with Section 106 of the NHPA, as amended in 1992 (16 USC 470 *et. seq.*), NPS contacted the Florida SHPO by letter dated January 13, 2015, during the public scoping period asking for information concerning cultural resources. A copy of this EA will be sent to the SHPO along with a request for their concurrence with the determination of effects on historic properties.

### American Indian Consultation

The affiliated American Indian tribes—Miccosukee Tribe of Indians of Florida, Seminole Tribe of Florida, Poarch Band of Creeks, Muscogee (Creek) Nation, Seminole Nation of Oklahoma—were contacted by scoping letter dated January 13, 2015, informing them of the proposed action and soliciting comments. Information from the tribes also was requested to determine if any ethnographic resources are in the project area and if the tribes wanted to be involved in the environmental compliance process. As of the date of this EA, no comments were received. The tribes that are traditionally associated with BICY and FPNWR will have an opportunity to review and comment on this EA.

## **Environmental Assessment Review and List of Recipients**

The EA is subject to a 30-day public comment period. To inform the public of the availability of the EA, NPS will distribute a letter to various agencies and tribes, as well as a press release. The document will be available for review on the PEPC website at <http://parkplanning.nps.gov/bicy>, and FPNWR will provide links to the EA on their website ([http://www.fws.gov/refuge/florida\\_panther/what\\_we\\_do/fmp.html](http://www.fws.gov/refuge/florida_panther/what_we_do/fmp.html)).

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

### **List of Preparers**

The following persons assisted with the preparation of the EA.

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### **List of Recipients**

The following officials, agencies, American Indian tribes, and organizations were sent a letter announcing the availability of the EA and its location on the Internet. Individuals and non-governmental organizations who received the announcement are not listed.

**Federal Agencies**

National Park Service  
U.S. Fish and Wildlife Service

**Affiliated American Indian Tribes**

Miccosukee Tribe of Indians of Florida  
Seminole Tribe of Florida  
Seminole Nation of Oklahoma  
Poarch Band of Creeks  
Muscogee (Creek) Nation

**State Agencies**

Florida State Clearinghouse  
Florida State Historic Preservation Office  
Florida Forest Service

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## APPENDIX A: PROGRAMMATIC MINIMUM REQUIREMENTS ANALYSIS (MRA)



ARTHUR CARHART NATIONAL WILDERNESS TRAINING CENTER

# **DRAFT** MINIMUM REQUIREMENTS DECISION GUIDE WORKBOOK

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

-- The Wilderness Act of 1964

**Project Title:** **Big Cypress National Preserve Fire Management Plan**

### MRDG Step 1: Determination

*Determine if Administrative Action is Necessary*

#### **Description of the Situation**

*What is the situation that may prompt administrative action?*

The purpose of the federal action is to update the Fire Management Plan (FMP) for Big Cypress National Preserve (“BICY” or the “Preserve”). The update is needed in order for the Preserve to comply with the NPS’s wildland fire policy directives and DO-18, “Wildland Fire Management.” DO-18 requires that a park “with burnable vegetation must have an approved Fire Management Plan that will address the need for adequate funding and staffing to support its fire management program.” In addition, the purpose of the revision is to allow for the use of unplanned ignitions for multiple objectives, including resource benefits.

Federal fire policy allows wildland fires, which consist of either prescribed fire or wildfire, to be managed concurrently for multiple objectives, including resource benefit. This includes the use of wildland fire in wilderness as long as the FMP includes a programmatic Minimum Requirements Analysis (MRA) and documentation as to whether various actions are necessary in wilderness. Wildland fires currently cannot be managed to accomplish resource objectives at BICY until there is an approved and current FMP. This constitutes another reason to revise the Preserve’s FMP.

The Preserve currently has an active prescribed fire program, which is used to reduce the threat of destructive wildfires and to achieve resource objectives. Fire management activities are needed to reduce hazardous fuels and re-establish the historic role of fire in the Preserve, which is demonstrated by the evidence of historic fire occurrence in south Florida over time.

BICY contains fire-dependent habitats, which historically burned with low to moderate burn severity. Fire-dependent communities, such as marl prairies and pine flatwoods, are those where fire is essential for species to reproduce and grow. Natural fire intervals range from as frequent as 3 to 5 years in prairies to as long as 50 to 100 years in mixed hardwood swamps.

Historically, fires played an integral role in the maintenance of south Florida ecosystems. Many of the habitats and species adaptations that exist in the greater Big Cypress area were created from frequent burning by wildland fires. Approximately 70% of plants endemic to south Florida occur in fire-dependent communities. Fire-dependent plant and wildlife communities developed over eons and require burning to maintain unique plant and animal relationships. The Preserve has a total of 32 animal species and 107 plant species that are federally or state-listed or recognized as rare species by the state of Florida.

While there are numerous reasons why these species are imperiled, many of them are related to fire suppression and not enough burning. Without frequent fire, vegetative fuels build up relatively quickly in the subtropical, plant-growth-oriented environment. Absent reduction and restoration by fire, they develop different climactic vegetation communities from those found in a regular fire environment. Nutrients are "locked up" in live and dead vegetation instead of cycling through the active ecosystem. These fuels also develop vegetative accumulations of live and dead fuels that burn with higher severity and intensity outside the natural range of historical fires. These high-intensity fires may destroy the fundamental conditions that allowed fire-dependent species to thrive. Periodic wildfires helped maintain many of the plant communities and their associated wildlife that depend on periodic burning to reproduce and survive.

This MRA addresses proposed fire management activities within the Preserve's proposed or eligible wilderness, collectively referred to as wilderness, that are intended to reinstate wildland fire within landscapes that historically burned and to reduce the risk of high-intensity wildfires.

#### Options Outside of Wilderness

*Can action be taken outside of wilderness that adequately addresses the situation?*

☐ YES

**STOP – DO NOT TAKE ACTION IN WILDERNESS**

☒ NO

**EXPLAIN AND COMPLETE STEP 1 OF THE MRDG**

Explain:

At present, approximately 36% of the Preserve (259,586 acres) is wilderness. (Note: This figure could change in the near future when an ongoing wilderness study of the original part of the Preserve is completed.) Consequently, large parts of many of the Preserve's community types occur within wilderness. Proposed fire management activities occurring

outside wilderness would not actively address the negative trends of vegetation community changes described above.

### Criteria for Determining Necessity

*Is action necessary to meet any of the criteria below?*

#### A. Valid Existing Rights or Special Provisions of Wilderness Legislation

*Is action necessary to satisfy valid existing rights or a special provision in wilderness legislation (the Wilderness Act of 1964 or subsequent wilderness laws) that requires action? Cite law and section.*

☐ YES ☒ NO

Explain:

#### B. Requirements of Other Legislation

*Is action necessary to meet the requirements of other federal laws? Cite law and section.*

☐ YES ☒ NO

Explain:

#### C. Wilderness Character

*Is action necessary to preserve one or more of the qualities of wilderness character, including: Untrammeled, Undeveloped, Natural, Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation, or Other Features of Value?*

##### UNTRAMMELED

☐ YES ☒ NO

Explain:

It is not necessary to take action to preserve this quality. The definition of the Untrammeled quality is the lack of manipulation or control of natural processes by humans, which if allowed to occur, would eventually affect wilderness character. This quality is typically preserved when no action is taken to control, hinder, or manipulate the natural functioning of the ecosystem. In contrast, fire management entails a manipulation of the wilderness environment by its very nature. Such trammeling is necessary to protect adjacent non-wilderness lands and development.

On the other hand, without a revised FMP, naturally ignited fires burning within wilderness would be fully suppressed, which is also a manipulation. Fire and fuel management activities under a revised FMP would allow fires to follow a more natural course, averting the potentially larger-scale manipulation of full fire suppression.

## UNDEVELOPED

☐ YES    ☒ NO

Explain:

It is not necessary to take action to preserve this quality. Preserving this quality keeps areas free from "expanding settlement and growing mechanization" and "with the imprint of man's work substantially unnoticeable" as required by the Wilderness Act. The Undeveloped quality is preserved when wilderness retains its "primeval character and influence" and is essentially "without permanent improvements" or modern human occupation.

Fire management activities are not needed to preserve the Undeveloped quality and prevent adverse impacts from installations, structures, motorized equipment, or the use mechanical transport devices.

## NATURAL

☒ YES    ☐ NO

Explain:

It is not necessary to take action to preserve this quality; however, undertaking fire management activities within the Preserve's wilderness would help enhance the Natural quality of the area. As referenced above under "Description of the Situation," the suppression of fire within the Preserve has led in places to a buildup of vegetative fuels and a shift toward different climactic vegetation communities from those found in a regular fire environment. As a result, the wilderness functions less naturally than it did prior to modern fire suppression.

A wilderness area is to be "protected and managed so as to preserve its natural conditions," meaning that wilderness ecological systems are substantially free from the effects of modern civilization. To preserve this quality and address the scenic and conservation public purposes of wilderness, it may be necessary to take action to correct unnatural conditions even if they were present at the time the area was determined to be wilderness eligible. Fire is a natural event, and any effects to the wilderness in terms of system disturbance are part of the natural processes that occur in wilderness.



**SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION**☐ YES    ☒ NO

Explain:

It is not necessary to take action to preserve this quality. The Wilderness Act defines wilderness as having “outstanding opportunities for solitude or a primitive and unconfined type of recreation.” This quality is about the *opportunity* for people to experience wilderness in terms of the visitor’s sense of solitude and their expectation for an undeveloped environment with minimal restrictions. This opportunity already exists in the Preserve wilderness, and it is not necessary to implement a fire management plan to provide it. Fire and its effects constitute an existing, natural event in wilderness that can contribute to feelings of solitude or the experience of primitive and unconfined recreation.

**OTHER FEATURES OF VALUE**☒ YES    ☐ NO

Explain:

Archeological and ethnographic sites are located within the wilderness at BICY. These resources are part of the fabric of wilderness character of the area. It is necessary to implement fire management activities in wilderness to protect these resources. Although surface fires have been impacting these resources for hundreds or thousands of years, the likelihood of damage has increased in recent years due to disruptions to the natural fire regime. By taking action to restore more natural fire intensities and return intervals, the likelihood of injury to archeological and ethnographic sites will be diminished.

**Step 1 Decision***Is administrative action necessary in wilderness?***Decision Criteria**

- |  |   |
|--|---|
| A. Existing Rights or Special Provisions | <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO |
| B. Requirements of Other Legislation     | <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO |
| C. Wilderness Character                  |   |
| Untrammeled                              | <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO |
| Undeveloped                              | <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO |
| Natural                                  | <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO |

Outstanding Opportunities

☐ YES☒ NO

Other Features of Value

☒ YES☐ NOIs administrative action necessary in wilderness?☒ YES**EXPLAIN AND PROCEED TO STEP 2 OF THE MRDG**☐ NO**STOP – DO NOT TAKE ACTION IN WILDERNESS**

Explain:

The restoration of fire-adapted communities and the protection of archeological and ethnographic sites within wilderness is necessary to maintain the Natural quality of wilderness and Other Features of Value.

The wilderness at the Preserve encompasses vast stretches of wetlands in an unforgiving climate. The area is very remote and difficult to traverse. Nevertheless, the area has experienced a long history of human occupation and use. Past activities have included logging, farming, and grazing. Since the Preserve was established in 1974, natural vegetative cover in the wilderness has rebounded dramatically, although some natural communities have shifted in composition due to disruptions to the area's natural hydrology and fire regime.

Fire-dependent communities at BICY require surface fires to eliminate competing vegetation, stimulate growth or seed production, create seedbed conditions, and release nutrients. Although periodic surface fires tend to maintain fire-dependent communities, extreme fire conditions can dramatically alter plant, and consequently animal, distribution. Such extreme conditions often develop in association with past human development activities and related fire suppression initiatives. When the fire cycle is retarded, organic materials accumulate and create hazardous fuel levels that can threaten even fire-tolerant species. Such fuel levels can result in intense fires that consume organic soil materials. Peat fires of this type can literally burn the soil out from under established vegetation, radically changing plant composition. Peat fires tend to lower the surface level of the burned area, thereby extending the hydroperiod and affecting the replacement vegetation.

Fire also plays an important role in reducing infestations of exotic plants that may compete with naturally occurring species. This is important in maintaining natural ecosystems and improving the Natural quality of wilderness character.

The revision of the FMP is needed reverse negative resource trends and reduce the risk of high-intensity wildfire within the Preserve, including wilderness.

Per DO-41, "As a result of many factors including past fire management practices within wilderness and the need to control wildfires on adjacent lands, fire may not be adequately functioning as a natural change agent. In those cases, augmenting natural ignitions with prescribed fire or other fuel treatments within wilderness may be necessary to restore or



maintain ecological function if that is a goal identified in the park's Wilderness Stewardship Plan or FMP". This direction has been followed as the Preserve revises its FMP and associated environmental compliance documentation.

**MRDG Step 2***Determine the Minimum Activity***Other Direction**

*Is there “special provisions” language in legislation (or other Congressional direction) that explicitly **allows** consideration of a use otherwise prohibited by Section 4(c)?*

**AND/OR**

*Has the issue been addressed in agency policy, management plans, species recovery plans, or agreements with other agencies or partners?*

☒ YES
**DESCRIBE OTHER DIRECTION BELOW**
☐ NO
**SKIP AHEAD TO TIME CONSTRAINTS BELOW**

Describe Other Direction:

It is expected that Step Two of the MRA will be written for specific projects if those activities described below do not cover the future fire management activity. Step Two for this programmatic MRA looks at use of motorized tools and the use of broadcast, prescribed burning as a tool for hazardous fuel reduction.

According to DO-41, if the proposed treatment is confirmed to be within the framework of the programmatic MRA, the project plan is not required to revisit that decision. However, each project plan must contain an analysis of the minimum methods and techniques necessary to accomplish the specific action with the least negative impact to wilderness character. If the activities necessary in the future fall outside of this analysis, a new MRA will be required.

**Time Constraints**

*What, if any, are the time constraints that may affect the action?*

Timing of burns is a consideration for two state-endangered plant species, Everglades crabgrass (*Digitaria pauciflora*) and Everglades bully (*Sideroxylon reclinatum* subsp. *austrofloridense*). Everglades bully may occur in BICY but needs to be confirmed.

In general, it is assumed that if fire-dependent habitats experience fire at intervals similar to those that occurred historically, fire-adapted species would persist in the landscape over time. Currently, limited information is available on differences in mortality or long-term population impacts resulting from wet or dry season burns. Indirect evidence suggests that burning in either season is suitable to maintain populations of Everglades crabgrass and Everglades bully.

Summer or wet season fires may increase the likelihood that the combined influence of fire and flooding would occur. Ideally, prescribed fire should be conducted during the wet season in an effort to better mimic natural lightning-ignited fire patterns.

### **Components of the Action**

*What are the discrete components or phases of the action?*

Component X: *Example: Transportation of personnel to the project site*

Component 1: Transportation of personnel and equipment to location of fire management activity.

Component 2: Treatment method used to remove vegetation and hazardous fuels.

Component 3: Tools and equipment to be used on-site.

### **Proceed to the alternatives.**

Refer to the [MRDG Instructions](#) regarding alternatives and the effects to each of the comparison criteria.

## MRDG Step 2: Alternatives

### Alternative 1: No Action

#### Description of the Alternative

*What are the details of this alternative? When, where, and how will the action occur? What mitigation measures will be taken?*

Under this alternative, prescribed fire and mechanical treatments could occur within wilderness. Management of wildland fire (unplanned ignitions) for multiple objectives would not occur within wilderness. The application of Minimum Impact Strategy and Tactics (MIST) is required for all fires in wilderness.

#### Component Activities

*How will each of the components of the action be performed under this alternative?*

<u>Component of the Action</u>		Activity for this Alternative
X	<i>Example: Transportation of personnel to the project site</i>	<i>Example: Personnel will travel by horseback</i>
1	Transportation of personnel and equipment to location of fire management activity.	Priority would be given to transporting personnel and equipment within wilderness using non-mechanized methods, i.e., by foot. Helicopters may need to land in wilderness to get personnel close to a fire.
2	Treatment method used to remove vegetation and hazardous fuels.	Prescribed burns and mechanical vegetation removal would be used.
3	Tools and equipment to be used on-site.	Hand tools such as axes, pulaskis, cross-cut saws, pruners, and shovels are preferred where their use is effective and will not compromise safety. Handheld motorized equipment is authorized where necessary to ensure safety and protect resources. Authorized equipment includes weed eaters, chainsaws, leaf blowers, or similar; and brush cutters. Swamp buggies can be used off trail to catch a spot fire, or similar incident, if their use is limited to minimize soil disturbance and compression.

	Construction of fire lines would not be allowed in wilderness using heavy equipment; containment would rely instead on roads, trails, canals and natural features.
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**Wilderness Character**

*What is the effect of each component activity on the qualities of wilderness character? What mitigation measures will be taken?*

**UNTRAMMELED**

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Priority would be given to transporting personnel and equipment within wilderness using non-mechanized methods, i.e., by foot. Helicopters may need to land in wilderness to get personnel close to a fire.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Prescribed burns and mechanical vegetation removal would be used.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Hand tools such as axes, pulaskis, cross-cut saws, pruners, and shovels are preferred where their use is effective and will not compromise safety. Handheld motorized equipment is authorized where necessary to ensure safety and protect resources. Authorized equipment includes weed eaters, chainsaws, leaf blowers, or similar; and brush cutters. Swamp buggies can be used off trail to catch a spot fire, or similar incident, if their use is limited to minimize soil disturbance and compression. Construction of fire lines would not be allowed in wilderness using heavy equipment; containment would rely instead on roads, trails, canals and natural features.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	1	NE
<u>Untrammeled Total Rating</u>		<b>-1</b>		

Explain:

Removing vegetation is an action that would manipulate natural resources and consequently degrade the Untrammeled quality of wilderness character.

## UNDEVELOPED

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Priority would be given to transporting personnel and equipment within wilderness using non-mechanized methods, i.e., by foot. Helicopters may need to land in wilderness to get personnel close to a fire.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Prescribed burns and mechanical vegetation removal would be used.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Hand tools such as axes, pulaskis, cross-cut saws, pruners, and shovels are preferred where their use is effective and will not compromise safety. Handheld motorized equipment is authorized where necessary to ensure safety and protect resources. Authorized equipment includes weed eaters, chainsaws, leaf blowers, or similar; and brush cutters. Swamp buggies can be used off trail to catch a spot fire, or similar incident, if their use is limited to minimize soil disturbance and compression. Construction of fire lines would not be allowed in wilderness using heavy equipment; containment would rely instead on roads, trails, canals and natural features.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		0	3	NE
<u>Undeveloped Total Rating</u>			-3	

Explain:

The use of motorized tools and transport would temporarily negatively impact the Undeveloped quality of wilderness character.

## NATURAL

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Priority would be given to transporting personnel and equipment within wilderness using non-mechanized methods, i.e., by foot. Helicopters may need to land in wilderness to get personnel close to a fire.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Prescribed burns and mechanical vegetation removal would be used.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



3	Hand tools such as axes, pulaskis, cross-cut saws, pruners, and shovels are preferred where their use is effective and will not compromise safety. Handheld motorized equipment is authorized where necessary to ensure safety and protect resources. Authorized equipment includes weed eaters, chainsaws, leaf blowers, or similar; and brush cutters. Swamp buggies can be used off trail to catch a spot fire, or similar incident, if their use is limited to minimize soil disturbance and compression. Construction of fire lines would not be allowed in wilderness using heavy equipment; containment would rely instead on roads, trails, canals and natural features.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		1	0	NE
<b>Natural Total Rating</b>		<b>1</b>		

Explain:

The use of prescribed fire and mechanical treatments would help restore natural ecological processes and forest communities as well as improve cultural landscapes within wilderness.

#### SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Priority would be given to transporting personnel and equipment within wilderness using non-mechanized methods, i.e., by foot. Helicopters may need to land in wilderness to get personnel close to a fire.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Prescribed burns and mechanical vegetation removal would be used.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Hand tools such as axes, pulaskis, cross-cut saws, pruners, and shovels are preferred where their use is effective and will not compromise safety. Handheld motorized equipment is authorized where necessary to ensure safety and protect resources. Authorized equipment includes weed eaters, chainsaws, leaf blowers, or similar; and brush cutters. Swamp buggies can be used off trail to catch a spot fire, or similar incident, if their use is limited to minimize soil disturbance and compression. Construction of fire lines would not be allowed in wilderness using heavy	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

	equipment; containment would rely instead on roads, trails, canals and natural features.			
Total Number of Effects		0	3	NE
<u>Solitude or Primitive &amp; Unconfined Rec. Total Rating</u>			-3	

Explain:

Opportunities for solitude or primitive and unconfined recreation would be temporarily degraded during treatment activities because areas would either be closed to recreation to protect public health and safety, or noise may be heard from nearby areas open to recreation. Use of motorized tools may be heard from longer distances compared to the use of non-motorized tools.

#### OTHER FEATURES OF VALUE

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Priority would be given to transporting personnel and equipment within wilderness using non-mechanized methods, i.e., by foot. Helicopters may need to land in wilderness to get personnel close to a fire.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Prescribed burns and mechanical vegetation removal would be used.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Hand tools such as axes, pulaskis, cross-cut saws, pruners, and shovels are preferred where their use is effective and will not compromise safety. Handheld motorized equipment is authorized where necessary to ensure safety and protect resources. Authorized equipment includes weed eaters, chainsaws, leaf blowers, or similar; and brush cutters. Swamp buggies can be used off trail to catch a spot fire, or similar incident, if their use is limited to minimize soil disturbance and compression. Construction of fire lines would not be allowed in wilderness using heavy equipment; containment would rely instead on roads, trails, canals and natural features.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		1	0	NE
<u>Other Features of Value Total Rating</u>			1	

Explain:

Archeological sites and historic structures within the Preserve's wilderness would benefit from

fire management activities, which would reduce the threat of damaging wildfires.

### Traditional Skills

*What is the effect of each component activity on traditional skills?*

#### TRADITIONAL SKILLS

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Priority would be given to transporting personnel and equipment within wilderness using non-mechanized methods, i.e., by foot. Helicopters may need to land in wilderness to get personnel close to a fire.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Prescribed burns and mechanical vegetation removal would be used.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Hand tools such as axes, pulaskis, cross-cut saws, pruners, and shovels are preferred where their use is effective and will not compromise safety. Handheld motorized equipment is authorized where necessary to ensure safety and protect resources. Authorized equipment includes weed eaters, chainsaws, leaf blowers, or similar; and brush cutters. Swamp buggies can be used off trail to catch a spot fire, or similar incident, if their use is limited to minimize soil disturbance and compression. Construction of fire lines would not be allowed in wilderness using heavy equipment; containment would rely instead on roads, trails, canals and natural features.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		3	0	NE
<u>Traditional Skills Total Rating</u>		3		

Explain:

Hiking and non-motorized tool use would help maintain traditional skills.

### Economics

*What is the estimated cost of each component activity?*

#### COST

<u>Component Activity for this Alternative</u>		Estimated Cost
X	<i>Example: Personnel will travel by horseback</i>	\$1,900
1	Priority would be given to transporting personnel and equipment within wilderness using non-mechanized methods, i.e., by foot. Helicopters may need to land in wilderness to get personnel close to a fire.	Cost estimate not available.
2	Prescribed burns and mechanical vegetation removal would be used.	Cost estimate not available.
3	Hand tools such as axes, pulaskis, cross-cut saws, pruners, and shovels are preferred where their use is effective and will not compromise safety. Handheld motorized equipment is authorized where necessary to ensure safety and protect resources. Authorized equipment includes weed eaters, chainsaws, leaf blowers, or similar; and brush cutters. Swamp buggies can be used off trail to catch a spot fire, or similar incident, if their use is limited to minimize soil disturbance and compression. Construction of fire lines would not be allowed in wilderness using heavy equipment; containment would rely instead on roads, trails, canals and natural features.	Cost estimate not available.
<u>Total Estimated Cost</u>		






Explain:

Cost estimates are not available at the programmatic level. Cost estimates could be developed during the site-specific treatment planning process (i.e., during the development of a prescribed burn plan).

### Safety of Visitors & Workers

*What is the risk of this alternative to the safety of visitors and workers? What mitigation measures will be taken?*

RISK ASSESSMENT Severity of Accident	Probability of Accident				
	Frequent	Likely	Common	Unlikely	Rare
Catastrophic: Death or permanent disability	1	1	2	2	3
Critical: Permanent partial disability or temporary total disability	1	2	2	3	4
Marginal: Compensable injury or illness, treatment, lost work	2	3	3	4	4

Negligible: Superficial injury or illness, first aid only, no lost work	3 	4 	4 	4 	4 
<a href="#">Risk Assessment</a>	High risk				

Risk Assessment Code

1 = Extremely High Risk	2 = High Risk	3 = Moderate Risk	4 = Low Risk
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Explain:

Firefighter safety is of primary concern, and its procedures are dictated by laws, regulations, policies, and guidelines. National fire policy states that firefighter safety is the first priority in fire management activities. DO-18 makes similar commitments. Firefighter safety procedures are updated frequently and would be followed. Because aggressively suppressing fire inherently puts people into harm's way, and access to medical care would be limited in wilderness, the risk assessment related to activities in wilderness is high.

### Summary Ratings for Alternative 1

Wilderness Character	
<a href="#">Untrammeled</a>	-1
<a href="#">Undeveloped</a>	-3
<a href="#">Natural</a>	1
<a href="#">Solitude or Primitive &amp; Unconfined Recreation</a>	-3
<a href="#">Other Features of Value</a>	1
<b>Wilderness Character Summary Rating</b>	<b>-5</b>
Traditional Skills	
<a href="#">Traditional Skills</a>	3
Economics	
<a href="#">Cost</a>	Cost estimates not available.
Safety	
<a href="#">Risk Assessment</a>	High

## MRDG Step 2: Alternatives

### Alternative 2: Revise the Preserve's FMP

#### Description of the Alternative

*What are the details of this alternative? When, where, and how will the action occur? What mitigation measures will be taken?*

Under this alternative, prescribed fire and mechanical vegetation removal could occur within wilderness. The application of Minimum Impact Strategy and Tactics (MIST) is required for all wildland fires in wilderness. Management of wildland fire (unplanned ignitions) for multiple objectives would be allowed to occur within wilderness when conditions related to firefighter and public safety as well as species conservation are appropriate.

#### Component Activities

*How will each of the components of the action be performed under this alternative?*

<u>Component of the Action</u>		Activity for this Alternative
X	<i>Example: Transportation of personnel to the project site</i>	<i>Example: Personnel will travel by horseback</i>
1	Transportation of personnel and equipment to location of fire management activity.	Priority would be given to transporting personnel and equipment within wilderness using non-mechanized methods, i.e., by foot. Helicopters may need to land in wilderness to get personnel close to a fire.
2	Treatment method used to remove vegetation and hazardous fuels.	Prescribed burns and mechanical vegetation removal would be used. Wildland fire (unplanned ignitions) would be allowed to continue burning to achieve multiple objectives when conditions related to safety and species conservation allow.
3	Tools and equipment to be used on-site.	Hand tools such as axes, pulaskis, cross-cut saws, pruners, and shovels are preferred where their use is effective and will not compromise safety. Handheld motorized equipment is authorized where necessary to ensure safety and protect resources. Authorized equipment includes



	weed eaters, chainsaws, leaf blowers, or similar; and brush cutters. Swamp buggies can be used off trail to catch a spot fire, or similar incident, if their use is limited in scope to minimize soil disturbance and compression. Construction of fire lines would not be allowed in wilderness using heavy equipment; containment would rely instead on roads, trails, canals and natural features.
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**Wilderness Character**

*What is the effect of each component activity on the qualities of wilderness character? What mitigation measures will be taken?*

**UNTRAMMELED**

<a href="#">Component Activity for this Alternative</a>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Priority would be given to transporting personnel and equipment within wilderness using non-mechanized methods, i.e., by foot. Helicopters may need to land in wilderness to get personnel close to a fire.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Prescribed burns and mechanical vegetation removal would be used. Wildland fire (unplanned ignitions) would be allowed to continue burning to achieve multiple objectives when conditions related to safety and species conservation allow.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Hand tools such as ax, pulaskis, cross-cut saws, pruners, and shovels are preferred where their use is effective and will not compromise safety. Handheld motorized equipment is authorized where necessary to ensure safety and protect resources. Authorized equipment includes weed eaters, chainsaws, leaf blowers, or similar; and brush cutters. Swamp buggies can be used off trail to catch a spot fire, or similar incident, if their use is limited in scope to minimize soil disturbance and compression. Construction of fire lines would not be allowed in wilderness using heavy equipment; containment would rely instead on roads, trails, canals and natural	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

features.			
Total Number of Effects	0	1	NE
<u>Untrammeled Total Rating</u>		-1	

Explain:

Removing vegetation is an action that would manipulate natural resources and consequently degrade the Untrammeled quality of wilderness character.

#### UNDEVELOPED

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Priority would be given to transporting personnel and equipment within wilderness using non-mechanized methods, i.e., by foot. Helicopters may need to land in wilderness to get personnel close to a fire.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Prescribed burns and mechanical vegetation removal would be used. Wildland fire (unplanned ignitions) would be allowed to continue burning to achieve multiple objectives when conditions related to safety and species conservation allow.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Hand tools such as axes, pulaskis, cross-cut saws, pruners, and shovels are preferred where their use is effective and will not compromise safety. Handheld motorized equipment is authorized where necessary to ensure safety and protect resources. Authorized equipment includes weed eaters, chainsaws, leaf blowers, or similar; and brush cutters. Swamp buggies can be used off trail to catch a spot fire, or similar incident, if their use is limited in scope to minimize soil disturbance and compression. Construction of fire lines would not be allowed in wilderness using heavy equipment; containment would rely instead on roads, trails, canals and natural features.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		0	3	NE
<u>Undeveloped Total Rating</u>			-3	

Explain:

The use of motorized tools and transport would temporarily negatively impact the

Undeveloped quality of wilderness character.

#### NATURAL

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Priority would be given to transporting personnel and equipment within wilderness using non-mechanized methods, i.e., by foot. Helicopters may need to land in wilderness to get personnel close to a fire.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Prescribed burns and mechanical vegetation removal would be used. Wildland fire (unplanned ignitions) would be allowed to continue burning to achieve multiple objectives when conditions related to safety and species conservation allow.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Hand tools such as axes, pulaskis, cross-cut saws, pruners, and shovels are preferred where their use is effective and will not compromise safety. Handheld motorized equipment is authorized where necessary to ensure safety and protect resources. Authorized equipment includes weed eaters, chainsaws, leaf blowers, or similar; and brush cutters. Swamp buggies can be used off trail to catch a spot fire, or similar incident, if their use is limited in scope to minimize soil disturbance and compression. Construction of fire lines would not be allowed in wilderness using heavy equipment; containment would rely instead on roads, trails, canals and natural features.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		1	0	NE
<u>Natural Total Rating</u>			1	

Explain:

The use of prescribed fire, mechanical treatments, and wildland fire for multiple objectives would help restore natural ecological processes and forest communities as well as improve cultural landscapes within wilderness.

#### SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

1	Priority would be given to transporting personnel and equipment within wilderness using non-mechanized methods, i.e., by foot. Helicopters may need to land in wilderness to get personnel close to a fire.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Prescribed burns and mechanical vegetation removal would be used. Wildland fire (unplanned ignitions) would be allowed to continue burning to achieve multiple objectives when conditions related to safety and species conservation allow.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Hand tools such as axes, pulaskis, cross-cut saws, pruners, and shovels are preferred where their use is effective and will not compromise safety. Handheld motorized equipment is authorized where necessary to ensure safety and protect resources. Authorized equipment includes weed eaters, chainsaws, leaf blowers, or similar; and brush cutters. Swamp buggies can be used off trail to catch a spot fire, or similar incident, if their use is limited in scope to minimize soil disturbance and compression. Construction of fire lines would not be allowed in wilderness using heavy equipment; containment would rely instead on roads, trails, canals and natural features.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		0	3	NE
<u>Solitude or Primitive &amp; Unconfined Rec. Total Rating</u>		-3		

Explain:

Opportunities for solitude or primitive and unconfined recreation would be temporarily degraded during treatment activities because areas would either be closed to recreation to protect public health and safety, or noise may be heard from nearby areas open to recreation. Use of motorized tools may be heard from longer distances compared to the use of non-motorized tools.

#### OTHER FEATURES OF VALUE

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Priority would be given to transporting personnel and equipment within wilderness using non-mechanized methods, i.e., by foot. Helicopters may need to land in wilderness to get personnel close to a fire.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

2	Prescribed burns and mechanical vegetation removal would be used. Wildland fire (unplanned ignitions) would be allowed to continue burning to achieve multiple objectives when conditions related to safety and species conservation allow.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Hand tools such as axes, pulaskis, cross-cut saws, pruners, and shovels are preferred where their use is effective and will not compromise safety. Handheld motorized equipment is authorized where necessary to ensure safety and protect resources. Authorized equipment includes weed eaters, chainsaws, leaf blowers, or similar; and brush cutters. Swamp buggies can be used off trail to catch a spot fire, or similar incident, if their use is limited in scope to minimize soil disturbance and compression. Construction of fire lines would not be allowed in wilderness using heavy equipment; containment would rely instead on roads, trails, canals and natural features.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		1	0	NE
<u>Other Features of Value Total Rating</u>		1		

Explain:

Archeological sites and historic structures within the Preserve's wilderness would benefit from fire management activities, which would reduce the threat of damaging wildfires.

### Traditional Skills

*What is the effect of each component activity on traditional skills?*

#### TRADITIONAL SKILLS

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Priority would be given to transporting personnel and equipment within wilderness using non-mechanized methods, i.e., by foot. Helicopters may need to land in wilderness to get personnel close to a fire.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Prescribed burns and mechanical vegetation removal would be used. Wildland fire (unplanned ignitions) would be allowed to continue burning to achieve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



	multiple objectives when conditions related to safety and species conservation allow.			
3	Hand tools such as axes, pulaskis, cross-cut saws, pruners, and shovels are preferred where their use is effective and will not compromise safety. Handheld motorized equipment is authorized where necessary to ensure safety and protect resources. Authorized equipment includes weed eaters, chainsaws, leaf blowers, or similar; and brush cutters. Swamp buggies can be used off trail to catch a spot fire, or similar incident, if their use is limited in scope to minimize soil disturbance and compression. Construction of fire lines would not be allowed in wilderness using heavy equipment; containment would rely instead on roads, trails, canals and natural features.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		3	0	NE
<b><u>Traditional Skills Total Rating</u></b>		<b>3</b>		

Explain:

Hiking and non-motorized tool use would help maintain traditional skills.

### Economics

*What is the estimated cost of each component activity?*

### COST

<u>Component Activity for this Alternative</u>		Estimated Cost
X	<i>Example: Personnel will travel by horseback</i>	<i>\$1,900</i>
1	Priority would be given to transporting personnel and equipment within wilderness using non-mechanized methods, i.e., by foot. Helicopters may need to land in wilderness to get personnel close to a fire.	Cost estimate not available.
2	Prescribed burns and mechanical vegetation removal would be used. Wildland fire (unplanned ignitions) would be allowed to continue burning to achieve multiple objectives when conditions related to safety and species conservation allow.	Cost estimate not available.
3	Hand tools such as axes, pulaskis, cross-cut saws, pruners, and shovels are preferred where their use is effective and will not compromise safety. Handheld motorized equipment is authorized	Cost estimate not available.























where necessary to ensure safety and protect resources. Authorized equipment includes weed eaters, chainsaws, leaf blowers, or similar; and brush cutters. Swamp buggies can be used off trail to catch a spot fire, or similar incident, if their use is limited in scope to minimize soil disturbance and compression. Construction of fire lines would not be allowed in wilderness using heavy equipment; containment would rely instead on roads, trails, canals and natural features.	
<b>Total Estimated Cost</b>	

Explain:

Cost estimates are not available at the programmatic level. Cost estimates could be developed during the site-specific treatment planning process (i.e., during the development of a prescribed burn plan).

### Safety of Visitors & Workers

*What is the risk of this alternative to the safety of visitors and workers? What mitigation measures will be taken?*

RISK ASSESSMENT	Probability of Accident				
	Frequent	Likely	Common	Unlikely	Rare
Catastrophic: Death or permanent disability	1 	1 	2 	2 	3 
Critical: Permanent partial disability or temporary total disability	1 	2 	2 	3 	4 
Marginal: Compensable injury or illness, treatment, lost work	2 	3 	3 	4 	4 
Negligible: Superficial injury or illness, first aid only, no lost work	3 	4 	4 	4 	4 
<b>Risk Assessment</b>	<b>Moderate risk</b>				

Risk Assessment Code

<b>1 = Extremely High Risk</b>	<b>2 = High Risk</b>	<b>3 = Moderate Risk</b>	<b>4 = Low Risk</b>
--------------------------------	----------------------	--------------------------	---------------------

Explain:

Firefighter safety is of primary concern and its procedures are dictated by laws, regulations, policies, and guidelines. National fire policy states that firefighter safety is the first priority in fire management activities. DO-18 makes similar commitments. Firefighter safety procedures are updated frequently and would be followed; therefore, the risk assessment related to activities in wilderness is moderate.

<b>Summary Ratings for Alternative 2</b>
--

Wilderness Character	
<a href="#">Untrammeled</a>	-1
<a href="#">Undeveloped</a>	-3
<a href="#">Natural</a>	1
<a href="#">Solitude or Primitive &amp; Unconfined Recreation</a>	-3
<a href="#">Other Features of Value</a>	1
<b>Wilderness Character Summary Rating</b>	<b>-5</b>
Traditional Skills	
<a href="#">Traditional Skills</a>	3
Economics	
<a href="#">Cost</a>	Cost estimates not available.
Safety	
<a href="#">Risk Assessment</a>	Moderate

## MRDG Step 2: Alternatives Not Analyzed

### Alternatives Not Analyzed

*What alternatives were considered but not analyzed? Why were they not analyzed?*

No other alternatives were considered.

## MRDG Step 2: Alternative Comparison

[Alternative 1:](#) No Action

[Alternative 2:](#) Revise the Preserve's FMP

Wilderness Character	<a href="#">Alternative 1</a>		<a href="#">Alternative 2</a>	
	+	-	+	-
Untrammeled	0	1	0	1
Undeveloped	0	3	0	3
Natural	1	0	1	0
Solitude/Primitive/Unconfined	0	3	0	3
Other Features of Value	1	0	1	0
Total Number of Effects	2	7	2	7
<b>Wilderness Character Rating</b>	<b>-5</b>		<b>-5</b>	
Traditional Skills	<a href="#">Alternative 1</a>		<a href="#">Alternative 2</a>	
	+	-	+	-
Traditional Skills	3	0	3	0
<b>Traditional Skills Rating</b>	<b>3</b>		<b>3</b>	
Economics	<a href="#">Alternative 1</a>		<a href="#">Alternative 2</a>	
Cost	Not Available		Not Available	
Safety of Visitors & Workers	<a href="#">Alternative 1</a>		<a href="#">Alternative 2</a>	
Risk Assessment	High		Moderate	

## MRDG Step 2: Determination

Refer to the [MRDG Instructions](#) before identifying the selected alternative and explaining the rationale for the selection.

### Selected Alternative

- |                          |                                |                           |
|--------------------------|--------------------------------|---------------------------|
| <input type="checkbox"/> | <a href="#">Alternative 1:</a> | No Action                 |
| <input type="checkbox"/> | <a href="#">Alternative 2:</a> | Revise the Preserve's FMP |

Explain Rationale for Selection:

Describe Monitoring & Reporting Requirements:

### Approvals

Which of the prohibited uses found in Section 4(c) of the Wilderness Act are approved in the selected alternative and for what quantity?

Prohibited Use	Quantity
<input type="checkbox"/> Mechanical Transport:	
<input checked="" type="checkbox"/> Motorized Equipment:	Where necessary, handheld motorized equipment such as weed eaters, chainsaws, leaf blowers, or similar; and brush cutters
<input checked="" type="checkbox"/> Motor Vehicles:	Swamp buggies to catch a spot fire, or similar incident, if their use is limited in scope to minimize soil disturbance and compression
<input type="checkbox"/> Motorboats:	
<input checked="" type="checkbox"/> Landing of Aircraft:	Helicopter landings when needed to get personnel close to a fire
<input type="checkbox"/> Temporary Roads:	
<input type="checkbox"/> Structures:	

☐ Installations:

Record and report any authorizations of Wilderness Act Section 4(c) prohibited uses according to agency policies or guidance.

Refer to agency policies for the following review and decision authorities:

Prepared	Name	Position	
	Signature		Date

Recommended	Name	Position	
	Signature		Date

Recommended	Name	Position	
	Signature		Date

Approved	Name	Position	
	Signature		Date



## APPENDIX B: GLOSSARY

*Aerial Ignition* Ignition of fuels by dropping incendiary devices or materials from an aircraft.

*Appropriate Response* Specific actions taken in response to a wildland fire to implement protection and incident objectives.

*Burned Area Emergency Rehabilitation (BAER)* An agency process following wildfires where planned emergency actions are authorized and funded to minimize post-fire damage to resources, structures, and values. The funding and actions are limited to planned and prioritized activities.

*Benefits* Fire effects with positive value or that contribute to organizational goals. Benefits should be explained as a desired outcome focusing on successfully meeting resource or protection objectives, depending on location and conditions.

*Burn Plan* A plan required for each prescribed fire application ignited by managers. It must be prepared by qualified personnel and approved by the appropriate agency administrator (Superintendent/Refuge Manager) prior to implementation. Each plan will follow specific agency direction and must include critical elements described in agency manuals.

*Burning Period* The part of each 24-hour period when fires spread most rapidly, typically from 10:00 AM to sundown.

*Categorical Exclusion (CE)* Certain pre-defined exceptions to the NEPA that allow activities to occur without full, detailed environmental analysis, or where a general analysis for certain actions has been done in advance.

*Cultural Values* All historic structures, ethnographic, cultural landscapes, and archeological areas. May be documented or undocumented, may be a site where something occurred with no physical remains, and/or may be site-specific or more general in location.

*Defensible Space* Refers to the size or type of vegetation clearing, thinning and/or fuel reduction needed to protect a structure or other identified value from wildfire during defined fire conditions. The work needed varies widely depending on type and amount of vegetation, vulnerability and value of the structure or site, and the range of fire conditions expected. Good defensible space is not an absolute guarantee that the value will not burn but greatly increases the likelihood that it will survive a wildfire. Defensible space usually must be maintained over time, as vegetation tends to grow back after reduction.

*Direct Attack* Fire tactic where firefighters or firefighting equipment take actions right on the edge of the fire to stop its advance as close to the fire as safely possible, depriving the fire of additional vegetative fuels to burn. Direct attack is difficult or not feasible when flame lengths exceed 4 feet, or in thick vegetation where firefighter safety zones are not present.

*Environmental Assessment (EA)* A NEPA document that is prepared to (a) help determine whether the impact of a proposal or alternatives could be significant; (b) aid federal agencies in compliance with NEPA by evaluating a proposal that will have no significant impacts but that may have measurable adverse impacts; or (c) evaluate a proposal that either is not described on the list of categorically excluded actions or is on the list but exceptional circumstances apply.

*Escaped Prescribed Fire* Prescribed fires are intentionally ignited fires that burn under specified conditions and a written plan. If the fire escapes the burn unit, the Contingency Plan component of the Prescribed Burn Plan is activated. If it is successful in bringing the fire back within the scope of

the Prescribed Burn Plan, the project may continue. If prescribed fire objectives are exceeded or no longer met and the fire continues, it could be converted to a wildfire and appropriate suppression occurs.

*Fire-Adapted Ecosystems* Inter-related relationships where the plants and animals are adapted to periodic wildfires. Some species depend on wildfire to initiate their renewal, growth, or propagation. Numerous species exploit the changed conditions after a fire to expand their range or increase their numbers due to change in the status of resources, space, or other changed environmental factors after fires.

*Fire-Adapted Species* Plant or animal species that depend on fire to initiate their renewal, growth, or propagation. Some species cannot exist without periodic fires to change the vegetative or physical environment. Some fire-adapted species have gone extinct in areas where fire suppression has prevented periodic fire.

*Fire Management* All activities related to the management of wildland fires.

*Fire Management Officer (FMO)* NPS/FWS official under the direction of the Superintendent/Refuge Manager or staff, with responsibility to implement the Fire Management Plan and supervise unit fire management activities, preparedness, prevention, and response. Ensures all NPS and national safety standards are followed and develops and maintains communications with interagency cooperators.

*Fire Management Plan (FMP)* A plan that identifies and integrates all wildland fire management and related activities within the context of approved land/resource management plans. It defines a program to manage wildland fires (wildfire and prescribed fire). The plan is supplemented by operational plans, including but not limited to preparedness plans, preplanned dispatch plans, prescribed fire burn plans and prevention plans. Fire Management Plans assure that wildland fire management goals and components are coordinated.

*Fire Management Units* Designated areas within a park or refuge unit where similar fire management activities and responses occur. They help fire managers determine pre-planned response actions and fuels management work within the constraints of the FMP, fire policy, park objectives and values, protection of private property, etc.

*Fire Regime* A generalized description of the role natural fire plays in an ecosystem. It is characterized by fire frequency, predictability, seasonality, intensity, duration, scale (patch size), as well as regularity or variability.

*Fire Retardant* In wildland firefighting, a compound made by mixing chemicals with water to form a slurry that is dropped on vegetation to reduce flammability or delay its combustion. Dropping is usually performed by fixed wing air tankers but can also be done by helicopter if a mobile retardant mixing station is set up nearby. Typical retardant consists of ammonium phosphate compounds dyed red to aid in determining effectiveness of drops. To be effective in suppressing wildland fire, retardant must be followed up by ground firefighting resources.

*Foam* Chemical or dispersant additive to water, usually detergent based, that allows the water-foam mix to be more effective when used on vegetation for wildland fire. The mix smothers or cools the fire, allows it to better penetrate vegetative fuels, and/or does direct extinguishment of flame. Usually applied either by fire engines with automatic mixing equipment, helicopter bucket drops, or (rarely) ground pumps using fixed water sources.

There are additional products now being used, such as “structural foam,” which is applied by some engines directly to structures in advance of wildfire impact to prevent fire from igniting the structure. This foam is usually longer-lasting and is usually washed off the structure after the fire threat is over.

*Fuels Management Activities* Often used interchangeably with vegetation management activities, (see below).

*Hazard Fuels* Excessive live and/or dead wildland fuel accumulations (either natural or created) that have the potential for the occurrence of intense wildland fire.

*Hazard Fuel Reduction* Removal of excessive live or dead fuel to protect life, property, cultural, and natural resource values. This could include structures and private properties; natural resources, including critical native plant communities and their processes, and threatened and endangered species; and important cultural, historic, and/or archeological resources. These treatments include prescribed fire and wildfire managed for resource objectives, mechanical vegetation cutting and removal, targeted herbicide application, and manual methods.

*Incident Objectives* Incident-specific guidance and direction necessary for the selection of the appropriate strategies for the tactical direction of resources.

*Indirect Attack* Tactic utilized to stop fire advance away from the fire perimeter but defining limits to the fire’s advance. Indirect tactics include constructing fireline, utilizing existing roads or natural barriers, and changes in vegetation type. Often safer in thick fuels or where flame lengths are high. Allows firefighters to construct fireline and/or burn out fuels in advance of the fire’s arrival, thus depriving the fire of fuels and stopping its advance. Distance from the fire depends on vegetation, fire behavior, anticipated and actual weather, values at risk, time, and available firefighting resources.

*Initial Action* The actions taken by the first resources to arrive at a wildfire.

*Initial Attack* First action(s) taken to put the fire out, consistent with firefighter and public safety and values to be protected. Describes the initial response and actions used on most fires where the intent from the onset is to suppress the fire as quickly and cost effectively as possible. Usually used where the focus is on full perimeter control and extinguishment in the first burning period.

*Initial Response* Immediate decisions and actions related to an ignition. All fires receive a response, which may not involve taking action on the ground but may include a management or initial decision to postpone taking action on the ground to a later time based on conditions, safety, and competing priorities. A planned response, based on fire management objectives, initiated on every fire.

*Manual Treatments* Activities that occur through the use of hand tools (ax, pulaski, cross-cut saw, pruners, shovel). It is a method of reducing hazardous accumulations of wildland fuels and is used to create defensible space near structures or values. Does not include motorized equipment in this analysis.

*Mechanical Treatments* Vegetation management activities that include using wheeled or tracked equipment (mowers, masticators, choppers, skidders, bulldozers, etc.) and/or handheld motorized equipment (weed eaters, chainsaws, handheld brush cutters, leaf blowers). It is a method of reducing accumulations of wildland vegetative fuels and is used to create defensible space near structures and fuel breaks.

*Minimum Impact Suppression Tactics (MIST)* Minimum Impact Suppression Tactics (also referred to as Minimum Impact Suppression Techniques) are guidelines that assist fire personnel in the

choice of procedures, tools, and equipment used in fire suppression and post-fire rehabilitation. These techniques reduce soil disturbance, impacts to water quality and wildfire, noise disturbance, intrusions in the wilderness, and cutting or trampling of vegetation. MIST policy is primary guidance in NPS-managed natural areas, especially wilderness.

*Minimum Requirements Analysis (MRA)* A process that would be utilized in advance of fire management activity in wilderness to help determine 1) whether the proposed management action is appropriate or necessary for administration of the area as wilderness and does not cause a significant impact to wilderness resources and character, in accordance with the Wilderness Act; and 2) the techniques and types of equipment needed to ensure that impacts on wilderness resources and character are minimized.

*National Environmental Policy Act (NEPA) Process* The objective analysis of a proposal to determine the degree of its environmental and interrelated social and economic impacts on the human environment, alternatives and mitigation that reduce that impact, and the full and candid presentation of the analysis to, and involvement of, the interested and affected public.

*National Fire Policy* The interagency policy that guides management of all aspects of wildland fire for all federal agencies and most states. Includes direction on safety, ecosystem sustainability, response, use of wildland fire, rehabilitation and restoration, protection priorities, WUI, planning, science, preparedness, suppression, etc. See [http://www.nifc.gov/policies/policies\\_documents/GIFWFMP.pdf](http://www.nifc.gov/policies/policies_documents/GIFWFMP.pdf) for more detail.

*National Park Service (NPS)* A bureau of the Department of the Interior which manages a nationwide system of units dedicated to protecting and preserving areas with diverse natural, historical, and cultural values while allowing for visitor use and enjoyment that does not impair those values.

*Planned Ignition* The intentional initiation of a prescribed fire in the wildland by handheld, mechanical or aerial devices (see prescribed fire).

*Prescribed Fire* Fires originating from a planned ignition to meet specific objectives identified in a written, approved, prescribed burn plan. NEPA requirements have been met prior to ignition (see planned ignition). Any fire intentionally ignited by management under an approved plan to meet specific incident objectives.

*Protection* The actions taken to limit the adverse environmental, social, political, and economical effects of fire.

*Resource Advisor (READ)* Assigned position on many longer and larger wildfire incidents. Usually a resource specialist who assists the incident commander and fire organization by providing focus and specialized knowledge related to protecting and preventing damage to unit natural and cultural values and resources within the context of the incident objectives.

*Response to Wildland Fire* The mobilization of the necessary services and responders to a fire based on ecological, social, and legal consequences, the circumstances under which a fire occurs, and the likely consequences on firefighter and public safety and welfare, natural and cultural resources, and values to be protected.

*Superintendent* In the context of these documents, the senior NPS management official with responsibility for approving general direction in the Fire Management Plan (and other park planning documents) and ensures that it receives annual review and update. Provides appropriate and

reasonable review and oversight of fire management program and operations and ensures that they are integrated with other park goals and objectives. Has other fire-related responsibilities such as approving retardant use in the unit, approving equipment use in wilderness, approving prescribed fire burn plans, and fiscal responsibilities.

*Suppression* All the work of extinguishing a fire or confining fire spread. This tactic can be used on a whole fire or part of a fire.

*Unplanned Ignition* The initiation of a wildland fire by lightning, volcanoes, unauthorized and accidental human-caused fires (see wildfire).

*Use of Wildland Fire* Management of either wildfire or prescribed fire to meet resource objectives specified in the Fire Management Plan.

*Vegetation Management Activities* Actions taken to reduce or thin the amount of vegetative fuels available for burning. Vegetative fuels include dead vegetation and logs, live trees, brush and shrubs, grass and all live and dead vegetation that can burn. Actions can be by hand tools (ax, pulaski, cross-cut saw, pruners, shovel, etc.), handheld equipment (weed eaters, chainsaws, leaf blowers, etc.), and wheeled or tracked equipment (mowers, masticators, choppers, skidders, bulldozers, etc.). The type of equipment available to use is usually set by policy and the Fire Management Plan. The specifics are usually laid out in a written, site-specific fuels management or defensible space plan, unless occurring under emergency wildfire conditions.

*Wildfire* Unplanned ignition of a wildland fire (such as a fire caused by lightning, volcanoes, unauthorized and accidental human-caused fires) and escaped prescribed fires. (See unplanned ignition and escaped prescribed fire).

*Wildland Fire* A general term describing any non-structure fire that occurs in the wildland; includes prescribed fires.

*Wildfire Managed for Resource Objectives* A term used to describe a fire started by lightning (unplanned ignition) and allowed to burn under written, defined conditions for resource management objectives. Examples of resource objectives include returning fire to a fire-adapted ecosystem, reduction of vegetative fuels, opening up areas for fire-adapted species, decreasing brush, renewing grassland habitat for herbivores, opening up the tree canopy for endangered bird species, and reducing the chance of stand-replacing fire in more extreme conditions. Utilizing this tool is only permitted where pre-planned in an approved FMP. Use may also be limited by availability of firefighting resources, safety, weather, vegetation conditions, fire behavior, national and regional fire preparedness levels, values at risk (natural, cultural, and private property), and other factors. A fire may be managed for resource objectives in one area while being suppressed in another area.

*Wilderness* Refers to lands protected under the Wilderness Act of 1964 and includes the terms eligible, study, proposed, recommended, and designated wilderness. The basic requirement is to preserve the wilderness character in those areas. Congress designates wilderness areas through legislation that often allows some variation in the character and uses of those areas. All fire management actions in wilderness will be consistent with the “minimum requirement” concept (see section 6.3.5 of NPS Management Policies 2006), which is a process to determine the tools that will have the least effect on the character of the wilderness, balanced with the need to accomplish some activity and to minimize impacts of that needed activity.

*Wildland Urban Interface (WUI)* An area where structures and other human development meet or intermingle with undeveloped wildland or vegetation fuels.