National Park Service

U.S. Department of the Interior

Timucuan Ecological and Historic Preserve and

Fort Caroline National Memorial,

Florida

Fire Management Plan

Environmental Assessment

April 2018

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Environmental Assessment

for the Fire Management Plan

Public Comment

Public scoping for the Fire Management Plan (FMP) update and Environmental Assessment (EA) was pursued through the distribution of an informative brochure, including distribution to the preserve's stakeholders via mail and email. In addition, a press release was sent to local and regional media; information was posted on the preserve website; and the project was set up for review and comment on the NPS Planning, Environment, and Public Comment website (PEPC). One open house style meeting was also conducted to offer further opportunities for the public and various agencies to gather information of the proposed addition of the use of fuel treatments, targeted herbicide application, and planting of native plants as fire management tools, and to solicit feedback for direction in the EA.

If you wish to comment on the EA, you may mail comments to the name and address below or post comments online at http://parkplanning.nps.gov/timu. This environmental assessment will be open for public review for 30 days. Before including your address, phone number, email address, or other personal identifying information in your comments, 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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Purpose and Need

Introduction

Timucuan Ecological and Historic Preserve and Fort Caroline National Monument (TIMU or preserve) is located in Duval and Nassau Counties in northeast Florida (Figure 1) and contains varied vegetation communities ranging from upland longleaf pines to coastal salt marshes and hardwood hammocks. The preserve was established in 1988 and encompasses approximately 46,661 acres between the Nassau and St. Johns Rivers. Fort Caroline National Memorial, established in 1950, is also included within the boundary and is administered by the preserve. Much of the preserve is at or near sea level, and the majority of land within existing boundaries is open water or salt marsh that is submerged at mean high tide.

In addition to the National Park Service (NPS), there are numerous landowners within the boundaries of the preserve, including the Florida State Parks, City of Jacksonville, the Nature Conservancy, the North Florida Land Trust, and over 300 private landowners.

The NPS is proposing to develop a new Fire Management Plan (FMP) to replace the 2004 FMP that the preserve currently uses to direct fire management actions. The current plan allows for suppression of wildfire, prescribed fire treatments in one fire management unit (FMU), and maintenance of defensible space around preserve structures and cultural sites. This Environmental Assessment (EA) evaluates three alternatives for fire management activities at the preserve. This EA assesses the impacts that could result from continuing current fire management (No-action Alternative) or implementation of two action alternatives. This EA has been prepared in accordance with the National Environmental Policy Act (NEPA), NPS Director's Order 12, and 2015 NPS NEPA Handbook.

Purpose of and Need for Action

Purpose

The purpose of the proposal is to revise and update the FMP for the preserve to comply with Director's Order 18 (DO-18) (NPS 2008) and Reference Manual-18 (RM-18), which states that all parks with burnable vegetation must have an approved fire management plan" (NPS 2014). In addition, the purpose of the revision is to allow for the use of unplanned ignitions managed for multiple objectives, including resource benefits, and to allow the use of mechanical fuel treatments, targeted herbicide application, and planting of native plants to support resource management objectives across the preserve. Unplanned ignitions are wildland fires that are unplanned, regardless of cause, including unauthorized human- or lightning-caused fire. The 2004 FMP only applies to land within six designated FMUs and defensible space work around preserve structures and cultural sites. The updated FMP would apply preserve-wide and would also include 661 acres of property acquired since the 2004 FMP was written.

Need for Action

The 2004 TIMU FMP needs to be revised to meet current NPS policies. Since the 2004 FMP was written, the NPS has made revisions and updates to RM-18 (NPS 2014) to comply with the 2009 Guidance for Implementing Federal Wildland Fire Management Policy (U.S. Department of the Interior and U.S. Department of Agriculture 2009). The revision of the TIMU FMP is also needed to allow the use of wildland fire management activities to accomplish resource objectives.

Currently, the TIMU fire management program suppresses all wildfires, allows prescribed fires (planned ignitions for resource management objectives) in select fire management units (FMUs), and maintains defensible space around preserve structures and cultural sites. Through research, observation, and monitoring the TIMU fire management staff have learned that more active management of vegetation is necessary to restore, protect, maintain, and perpetuate the natural and cultural values the preserve was created to protect. These measures would also provide more effective protection from high-severity wildfires.

The current FMP also does not adequately reflect updated fire management techniques, strategies, and fire terminology. An updated FMP would provide a management framework for all TIMU wildland fire activities, both planned and unplanned, that would best meet overall resource management and human value protection goals.

Objectives in Taking Action

Objectives are purpose statements that describe what should be accomplished for the action to be considered successful (NPS 2011). Based on consideration for the purpose and need for action, the preserve's enabling legislation, other planning documents, and the NPS mission and policy guidance, the following fire management objectives were developed with preserve staff during internal scoping:

1. Prioritize protection of firefighters, staff, and the public in all fire management activities.

2. Facilitate the protection of cultural resources, infrastructure, recreational values, other fundamental resource values, and private property within and adjacent to the preserve from wildland fires.

3. Promote restoration and enhancement of preserve natural resources and processes and help sustain a diverse and healthy ecosystem. This includes native forest and plant communities, watersheds, and native wildlife.

4. Use wildland fire management strategies that consider the reduction of hazardous fuels and the promotion of preserve resource objectives when and where feasible.

5. Encourage and support fire-related monitoring and research and allow for flexible management within the scope of environmental and cultural compliance.

Relationship to Other Laws, Regulations, and Policies

Numerous laws, regulations, and federal policies guide the decisions and actions regarding this EA. The primary legal and regulatory requirements that relate to fire management in the preserve include the following listed below.

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 visitors, employees, and developed facilities.

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." Director's Order 18 defines what an approved FMP must include, emphasizing that firefighter and public safety is the first priority and that NPS should seek an interagency approach to managing fires on an ecosystem basis across agency boundaries. Director's Order 18 also directs parks to identify, manage, and where appropriate, reduce hazardous fuels. Reference Manual 18 (RM-18) is derived from DO-18 and provides comprehensive, more detailed 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 National Register of Historic Places (NRHP). Director's Order 28 states that FMPs should address cultural resource concerns and protect archeological sites, historic structures, and cultural landscape features.

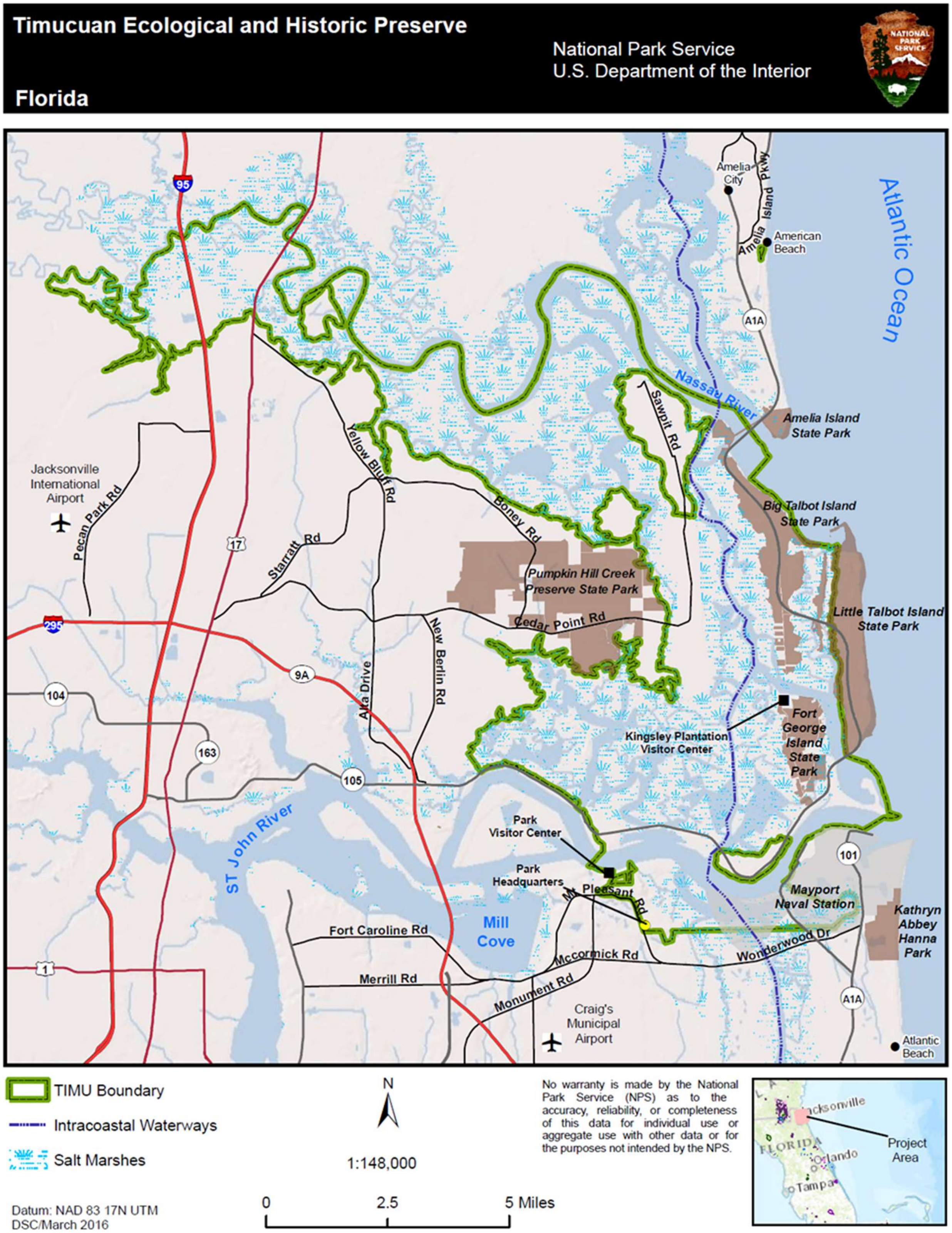

FIGURE 1: TIMU FIRE MANAGEMENT PLANNING AREA

Authority for implementing a fire management program at the preserve originates with the Organic Act of the National Park System (1916). The Organic act mandates that NPS "…promote and regulate the use of Federal areas known as national parks, monuments, and reservations…by such means and measures as to conform to the fundamental purpose of said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations (6 U.S.C. 1)."

Issues and Impact Topics

This section identifies the resources that could be affected by the alternatives. Impact topics are derived from issues identified during internal and public scoping. When determining whether to retain an issue for more detailed analysis in this EA, the interdisciplinary team considered, among other things, whether or not:

- the environmental impacts associated with the issue are central to development of a fire management plan or are of critical importance;
- a detailed analysis of environmental impacts related to the issue is necessary to make a reasoned choice between alternatives;
- the environmental impacts associated with the issue are a big point of contention among the public or other agencies; or
- there are potentially significant impacts to resources associated with the issue.

Ultimately, it is important for decision makers and the public to understand the impacts that each of the alternatives under consideration would have on specific resources. Therefore, the NPS uses *impact topics* as headings to indicate which resources would be affected and to organize the discussions of the affected environment and environmental consequences section.

The impact topics carried forward for analysis in Chapter 4 in this EA include:

- Air quality
- Soils
- Vegetation (including invasive species)
- Water resources (including wetlands)
- Wildlife (including invasive species)
- Special status species
- Cultural resources
- Visitor use and experience
- Human health and safety

Impact Topics Dismissed from Further Analysis

Using the same considerations noted previously, the following impact topics were initially considered but were subsequently dismissed from analysis.

Indian Trust Resources. Secretarial Order 3175 mandates any anticipated impacts to Indian Trust resources from proposed project or action by the Department of Interior agencies be explicitly addressed in environmental documents. The federal Indian Trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes. The NPS consulted with the affiliated Native American tribes to determine whether any trust resources could be impacted by implementing a fire management plan at the preserve. Following consultation, NPS has determined that there are no Indian Trust resources that would be affected by fire management activities. Therefore, Indian Trust Resources was dismissed as an impact topic carried forward for analysis in this EA.

Environmental Justice. Presidential Executive Order 12898," General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (1998) requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing the disproportionately high and/or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities.

According to the Environmental Protection Agency, environmental justice is the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies. The goal of 'fair treatment' is not to shift risks among populations, but to identify potentially disproportionately high and adverse environmental effects and identify alternatives that may mitigate these impacts.

Duval and Nassau counties contain both minority and low-income populations; however, environmental justice was dismissed as an impact topic for the following reasons:

- The park staff and planning team actively solicited public participation as part of the planning process and gave equal consideration to all input from persons regardless of age, race, income status, or other socioeconomic or demographic factors.
- Implementation of any alternative would not result in any identifiable adverse human health effects. Therefore, there would be no direct or indirect adverse effects on any minority or low-income population.
- The environmental impacts associated with implementation of any alternatives would not disproportionately affect any minority or low-income population or community.
- Implementation of any alternatives would not result in any identified environmental effects that would be specific to any minority or low-income community.
- The economic impacts resulting from implementation of any of the alternatives may be adverse, but they would not disproportionately affect minority or low-income populations. In addition, the park staff and planning team do not anticipate that the impacts on the socioeconomic environment would alter the physical and social structure of nearby communities.

Based on this rationale, environmental justice was dismissed and not carried forward for analyses in this EA.

Alternatives

This section describes the three alternatives (two action alternatives and the no-action alternative) that the NPS is considering for fire management in the preserve. Alternatives represent different means for meeting the purpose, need, and objectives described in Chapter 1: Purpose and Need. A range of alternatives were developed that includes a set of reasonable alternatives and other alternatives considered but eliminated from detailed analysis. A reasonable alternative is one that is technically and economically feasible and meets the project objectives to a large degree.

Three alternatives, described below, were developed through internal and external scoping, and will be examined in this EA for fire management in the preserve:

- Alternative A—Continue Current Fire Management (No-action Alternative)
- Alternative B—Use of Additional Vegetation Management Tools and Wildfire Managed for Resource Objectives (Proposed Action and Preferred Alternative)
- Alternative C—Use of Additional Vegetation Management Tools and Wildfire Managed for Resource Objectives in Preserve Natural Zones Only

Elements Common to All Alternatives

Fire management–related activities that already occur at the preserve and may affect or contribute to fire management, fire preparedness, and/or defensible space are described below. These activities are allowed under the 2004 TIMU FMP EA (NPS 2004) within the 2004 boundaries of the preserve.

All fire management activities, regardless of what alternative is selected, would comply with Section 7 of the Endangered Species Act (ESA) and Section 106 of the National Historic Preservation Act (NHPA) and would be compatible with applicable laws and NPS policies, plans, and regulations.

Wildfire Management/Suppression

Wildfires occurring within the boundaries of the preserve have been suppressed at minimum cost, considering firefighter and public safety, resource objectives have not been considered in TIMU wildfire suppression. Under the 2004 TIMU FMP, wildfires may not be managed solely for resource objectives, but resource objectives may be considered when selecting suppression actions and tactics.

The preserve lacks dedicated wildfire response personnel and depends heavily on local and state agencies and interagency cooperators during larger or more complex wildfire incidents. There are cooperative agreements in place with other agencies for fire management. The preserve is a partner in the Tri-agency Annual Operating Plan (https://gacc.nifc.gov/sacc/resources/coopagr/2012-tri-agency-agreement-dispatch-plan-ga-fl.pdf), which includes the NPS (TIMU and Cumberland Island National Seashore), US Fish and Wildlife Service (Okefenokee National Wildlife Refuge), and the US Forest Service (Osceola National Forest).

Consistent with Federal Wildland Fire Management Policy, wildfire response is now described differently from the suppression-focused language used in the past. Today, all wildfires receive a response and are managed for multiple objectives. These objectives include firefighter and public safety, minimizing costs, protecting values at risk (e.g., structures, private property, cultural sites, threatened and endangered species habitat), and others, depending on the location of the fire and its projected movement. When managing a wildfire for multiple objectives, fires may be managed differently on different sections of the same fire. For example, one flank may be actively suppressed where it approaches private property, whereas another flank may not receive suppression action where it is burning into the coastal salt marshes and confined by natural barriers. This objective-based management can change over time. For example, an aggressive suppression response may be abandoned when a tropical storm comes into the fire area and is likely to put the fire out.

Fire management and suppression tactics may include, but are not limited to: application of water, and/or foam/retardant (Superintendent approval required) by ground equipment or aircraft; use of motorized equipment such as chainsaws, leaf blowers, portable pumps; use of hand tools such as shovels, pulaskis, flappers, pruners; off-road use of all-terrain or utility task vehicles (ATVs or UTVs; Superintendent approval required) outfitted with pumps, hoses and fire support tools and equipment; use of wildland fire engines from roads; cutting of vegetation in advance of the fire front by chainsaws and/or tracked/wheeled equipment (mowers, masticators) to construct firelines or create defensible space; "burning out" from firelines or roads; and potential use of heavy equipment, such as bulldozers or fire plows (Superintendent approval required).

Retardant use is rarely considered due to the threat of surface water contamination, high cost, and availability of other more effective strategies; aviation drops with chemical additives must be at least 300 feet from surface waters. Dozers/fire plows could easily cause excessive resource damage in the swampy ground; use is only considered if other options are ineffective, if fires pose serious risk to life and property, and where there is a reasonable chance of effective use of the equipment. Use of UTVs might be allowed to travel short distances off-road for essential fire-fighting missions but not routine and frequent use. An example might be to transport a pump off-road to a pond to allow use of water in hoses for holding on firelines.

Wildfires that pose no threat due to unfavorable burning conditions (wet conditions) may be monitored and confined by location or environmental conditions; this is often termed a confinement strategy. Monitoring is used to provide up-to-date intelligence on fire behavior and location to aid fire managers in decision-making. Fires where the risk to firefighters is unacceptable may not receive direct attack but would be monitored while other strategies are developed.

Throughout the preserve firefighters must consider Minimum Impact Suppression Techniques (MIST) in all fire management activities (National Wildfire Coordinating Group 2014). Tactics often involve the use of natural barriers, vegetation changes, creeks, roads, and trails for firelines (Appendix 1). Other low impact techniques should minimize fire management damage to natural and cultural values.

Indirect and direct attack tactics are often used to suppress wildfires, dependent on conditions and resources available. Direct attack tactics 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. Direct attack is infrequently used at the preserve due to continuous and thick vegetation, lack of safety zones, few roads, swampy and inaccessible terrain, and few available hand crews. Direct attack is mainly used on upland fires with better access and mild fire behavior.

Indirect attack methods could include but are not limited to mowing or masticating around buildings before the fire arrives to reduce fire intensity (defensible space work), or intentional burning out of vegetation along selected roads or other barriers to reduce fuels in advance of the fire front. In addition, point protection could be used, which focuses on protecting a specific value site from fire damage while the fire passes. Specific values might include structures, habitat location of an animal or plant species of management concern, a historic site, or a power line. Indirect attack using burnout tactics is frequently used by firefighters at the preserve.

Wildfire management/suppression success and effectiveness in protecting the preserve resources and local values depends on fire behavior, fuel buildup, firefighter risk, fuel moistures, surface water levels, seasonal trends, availability of firefighting resources, and other circumstances that vary by fire timing and location. Main themes involving TIMU wildfire management are discussed above, but fire response options and guidance are also based on Federal Wildland Fire Management Policy (Interagency Standards for Fire and Fire Aviation Operations 2016, Chapters 9–12).

Prescribed Fire

Prescribed fire (planned ignitions) has been used to reduce fuels and initiate ecological restoration only in the Cedar Point area of the Black Hammock FMU (Figure 2). Prescribed fire has been used primarily to reduce hazardous fuels, to emulate natural fire frequency of one to eight years (Byrd 2007), reduce hardwoods and create openings, control undesirable and non-native plant species, and enhance wildlife habitat. Prescribed fire is currently allowed by the 2004 TIMU FMP EA and FONSI only at the Cedar Point area within the Black Hammock FMU. The equipment often used for prescribed fires includes engines (near roads), pumps, hand-operated motorized equipment (chainsaws), UTVs in certain circumstances, mowers along roads, hand tools, and firing and ignition equipment. Aviation use is allowed but has been rarely used at the preserve.

Limited Mechanical Activities

Defensible space work by mechanical equipment is limited to creating defensible space within 50 feet of preserve buildings and cultural sites. Mechanical equipment could include the use of wheeled or tracked equipment (e.g. mowers, masticators, choppers, skidders), hand tools, and/or handheld motorized equipment (e.g. weed eaters, chainsaws, hand-held brush cutters, leaf blowers); the preserve mainly uses hand tools and handheld motorized equipment. This work is limited to small-scale removal of brush, litter, and dead and down trees. Although allowed, clearing and thinning near structures has rarely been done, because the preserve has sought to balance protection of structures with the natural scene while providing necessary defensible space.

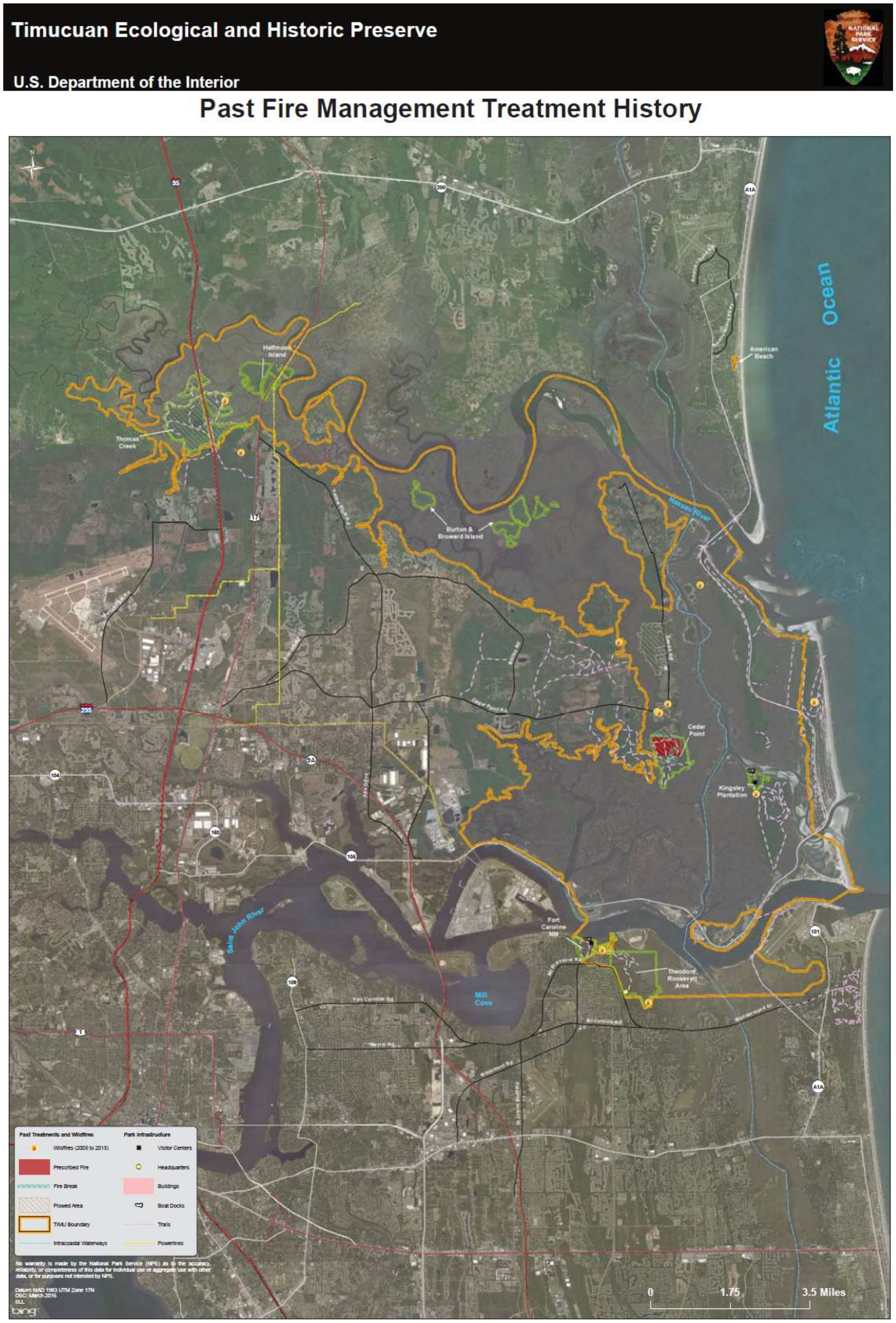

FIGURE 2: PAST TREATMENTS AND WILDFIRES AT TIMU

Alternative A—Continue Current Fire Management at TIMU (No-action Alternative)

Wildfire management focused on suppression, prescribed fire only at the Cedar Point area in the Black Hammock FMU, limited defensible space work (50 feet), and herbicide use for non-native plants would continue at the preserve as discussed in detail in the *Elements Common to All Alternatives* section.

The TIMU fire staff would use their existing FMP strategies in designated areas, add Federal Wildland Fire Management Policy and terminology updates, and continue to use the fire and vegetation management tools approved under the TIMU 2004 FMP EA and FONSI—fire suppression, limited prescribed fire, herbicide use on non-native plants, and 50-foot defensible space work for protection of preserve structures and cultural sites. TIMU would also continue to engage in preserve management administrative and operational activities available under other preserve management documents, such as the Forest Management Plan for the Black Hammock Island and Thomas Creek Preserve Areas within Timucuan Ecological and Historic Preserve (Byrd 2007).

Wildfires would continue to be managed mostly through suppression strategies, which could include a confine/contain approach to be used as a suppression strategy in limited circumstances.

Generally, the preserve would prescribe fire on approximately 25–100 acres annually in the Cedar Point area of the Black Hammock FMU. That acreage would be highly variable, depending on a host of factors each year. Prescribed fire would reduce hazardous fuels and maintain some forest openings and fire-dependent vegetation but may have limited success in restoring parts of the upland pine communities dominated by dense or mature loblolly pines and other hardwoods. Timing of prescribed fires would best mimic restoration and maintenance of fire-adapted ecosystems, balanced with hazard fuel reduction activities. Prescribed fire may use ground or aerial ignition techniques—aerial ignition occurs from helicopter-mounted ignition devices.

Alternative A represents what would occur if the TIMU fire management program continued with the current vegetation/fuels management techniques and wildfire management options. It provides a baseline for comparing and evaluating the impacts to the environment by the action alternatives.

Alternative B—Use of Additional Vegetation Management Tools and Wildfire Managed for Resource Objectives (Proposed Action and Preferred Alternative)

Alternative B would use the fire management activities allowed under Alternative A plus provide additional fuel/vegetation management activities that could be applied throughout all preserve-managed lands. This would include the American Beach parcel that was not included in the 2004 TIMU FMP.

TIMU FMP Organization
The 2004 TIMU FMP divided the preserve into six FMUs. Alternative B would add a 7th FMU: American Beach (Figure 2).

The updated FMP would be organized into seven FMUs. The FMU descriptions are presented below along with the updated FMP objectives for each FMU.

<u>*Fort Caroline Fire Management Unit*</u>: This 121-acre unit includes Spanish Pond, the preserve visitor center, preserve housing, maintenance buildings, and cultural resources such as Ribault Column. It is bordered on the west, south, and east by the Wildland Urban Interface (WUI). FMP objectives for this FMU include:

1. All wildfires in this unit should be suppressed.
2. Maintain defensible space around all NPS buildings. Build/remodel with Firewise materials.
3. Maintain the travel corridor/fuel break along the property boundary fence.
4. Mastication/ chipping/prescribed burning acceptable.

5. Maintain clearance along right-of ways and utility corridors.
6. As much as possible, use resource advisors and Minimum Impact Suppression Tactics (MIST) near cultural sites and sensitive wildlife areas.

<u>Theodore Roosevelt Fire Management Unit</u>: This 361-acre unit contains the preserve headquarters and curatorial storage. It is bordered on the west and south by densely developed WUI. FMP objectives for this FMU include:

1. All wildfires in this unit should be suppressed.
2. Maintain defensible space around all NPS buildings. Build/remodel with Firewise materials.
3. Maintain the travel corridor/fuel break along the property boundary fence.
4. Mastication/ chipping/prescribed burning acceptable.
5. Maintain clearance along boundary fence, right-of ways, and utility corridors.
6. Strategically plan fuels treatments to increase the protection benefit near homes, infrastructure, and cultural sites.
7. Promote prevention planning and techniques to reduce the threat of human caused ignitions.
8. As much as possible, use resource advisors and Minimum Impact Suppression Tactics (MIST) near cultural sites and sensitive wildlife areas.

<u>Kingsley Plantation Fire Management Unit</u>: This 58-acre unit contains an extensive former cotton plantation structure and slave quarter structures listed in the NRHP. FMP objectives for this FMU include:

1. All wildfires in this unit should be suppressed.
2. Maintain defensible space around all NPS buildings. Build/remodel with Firewise materials.
3. Mastication/chipping/ thinning/ no on site prescribed burning in the immediate vicinity of historic buildings.
4. Maintain clearance along right-of ways and utility corridors.
5. As much as possible, use resource advisors and Minimum Impact Suppression Tactics (MIST) near cultural sites and sensitive wildlife areas.

<u>Thomas Creek Fire Management Unit</u>**:** This 649-acre unit, located in the extreme northern portion of Duval County, is bisected by Interstate 95, and is surrounded by lands in current loblolly and slash pine plantations. Jacksonville International Airport is approximately three miles southwest. There are new housing developments less than one mile from the southern boundary of the unit. FMP objectives for this FMU include:

1. Use mechanical treatments, herbicide, and prescribed fire to reduce fuel loading and to restore/maintain longleaf pine in the uplands. Refer to the “Forest Management Plan for the Black Hammock Island and Thomas Creek Preserve Areas Within Timucuan Ecological and Historic Preserve” for specific guidance.
2. **Ignitions in this FMU should be assessed and have the options for full suppression, modified suppression, or management for resource objectives.**
3. Maintain defensible space around improvements and any future buildings.
4. Reduce fuel loads and thin with mastication machinery with emphasis near the WUI.
5. Herbicide invasive plants in restored areas.
6. No treatments are proposed in marsh or hardwood swamp stands, except that fire should be allowed to creep into the edges from adjoining uplands.
7. Maintain clearance along right-of ways and utility corridors. Maintain access to water sources for use during prescribed fires and wildfires. Clear fuel along roads and old skid trails so that they can be used for prescribed fire and wildfire control lines.

<u>Black Hammock Fire Management Unit</u>**:** This 670-acre unit is located on the southern half of Black Hammock Island and includes Cedar Point (at the far end of the island) and several parcels of land along the east bank of

Pumpkin Hill Creek. Scattered parcels of rural WUI are located throughout this FMU. FMP objectives for this FMU include:

1. Use mechanical treatments, herbicide, and prescribed fire to reduce fuel loading and to restore/maintain longleaf pine in the uplands. Refer to the "Forest Management Plan for the Black Hammock Island and Thomas Creek Preserve Areas Within Timucuan Ecological and Historic Preserve" for specific guidance.
2. Interior firelines should be maintained annually. Perimeter firelines near the private land should be reestablished and maintained at a thirty-foot width annually.
3. **Ignitions in this FMU should be assessed and have the options for full suppression, modified suppression, or management for resource objectives.**
4. Reduce fuel loads and thin with mastication machinery with emphasis near the WUI.

*Broward/Burton Island Fire Management Unit***:** This 474-acre unit consists of eight named islands and approximately 40 unnamed islands scattered throughout the preserve. These unnamed islands vary in size from less than one acre to approximately nine acres. Some have been created by the deposition of spoils from dredging operations. The closest distance to adjacent pinelands is approximately 300 yards. There are no known values at risk on these islands. FMP objectives for this FMU include:

1. **Ignitions in this FMU should be assessed and have the options for full suppression, modified suppression, or management for resource objectives.**

American Beach Fire Management Unit: This 8.5-acre unit is located north of the preserve boundary in Nassau County, Florida. It is surrounded by a golf fairway immediately to the west along with suburban WUI on all sides. The unit consists of a pristine sand dune (known as NaNa) and is part of a larger non-TIMU managed, 33-acre Historic District listed on the NRHP. FMP objectives for this FMU include:

1. All wildfires should be suppressed.

Additional Vegetation Management Tools

The NPS has a goal of restoring the historic forest associations and diverse species that occupied the preserve pinelands before European and Anglo alteration. Past experience and data have shown that using prescribed fire solely within one of the FMUs is insufficient to allow for successful restoration in the preserve. This fire management tool, combined with other tools like mechanical and herbicide work, planting of native trees such as longleaf pine, and collecting/planting other native plants such as grass seeds, can be beneficial in other FMUs as well.

Prescribed Fire

Alternative B allows prescribed fire in all FMUs except for Kingsley Plantation, Broward/Burton Islands, and American Beach. Several locations within the preserve were developed as pine plantations in the pre-preserve period and were extensively modified from the native longleaf pine forest. Restoration of these altered lands is a preserve priority (Thomas Creek and Black Hammock FMUs).

The annual acreage burned in prescribed fires depends on many factors, including environmental conditions, funding, staff turnover, difficulty and complexity of burn units, and past treatment history. The TIMU fire management program would expand prescribed fire activities to include up to 500 acres annually throughout all FMUs under this alternative; that's about 10% of the upland vegetation communities.

Mechanical Treatments

Alternative B would allow mastication, mowing and/or manual thinning of brush and trees for ecological restoration in the preserve pinelands, defensible space point protection beyond the 50-foot zone where needed, and development and maintenance of fuel breaks such as along preserve boundaries. Since TIMU is located within a WUI area, developing and maintaining fuelbreaks is especially important in wildland fire situations. Mechanical treatments would be used in all FMUs.

Mechanical equipment includes hand tools, handheld motorized equipment, and wheeled/track equipment such as mowers and masticators. Wheeled/tracked equipment could be considered for use in all pinelands during the initial phases of forest restoration activities. Although wheeled/tracked equipment use may be considered and used where necessary, the preserve intends to minimize its use to lessen impacts on natural and cultural resources.

Mastication, which involves mechanical cutting or chopping of small undesirable trees (e.g., slash or loblolly pine in longleaf restoration areas) and brush into chunks, chips, or strips is done via low ground pressure wheeled or tracked equipment operated off road. Mastication would be used on brush or trees in all FMUs (except Broward/Burton Island and American Beach) to restore the structure of forest stands, which would allow space and time for planting/growth of longleaf pine seedlings and natural restoration of understory grasses and forbs. Overall, the objective would be to gradually thin out dense planted pine plantations, create openings, restore historical forest structure, and increase native plant and wildlife diversity. This would also decrease the likelihood of pine beetle and other forest infestations. Manual thinning could also be completed using hand-operated power equipment (e.g. chainsaws or weed cutters) to cut trees, brush, or grass. Clearcutting would not occur under this alternative.

The annual acreage treated mechanically would be approximately 50–300 upland acres. The actual number of acres treated would depend on many factors, including the vegetation condition of the restoration treatment unit, area environmental conditions, funding, available staff, and past treatment history. It is expected that the need for mechanical treatments would decline over time with successful restoration. Once restored, prescribed fire would be the primary tool for ecosystem maintenance.

<u>Herbicide</u>

The TIMU fire staff would coordinate with the resource management staff to develop treatment plans to target undesirable plant species that hinder successful forest restoration. Treatments may include hand-applied herbicide treatments that would accompany mechanical or fire treatments to slow or stop selected vegetation growth and speed up ecological forest restoration of longleaf pine or help with establishment of grass and herbaceous understory growth. Targeted herbicide techniques include hand or backpack application to specific basal, foliar plant areas, and/or cut stumps.

The annual acreage treated by herbicide as a fuel/vegetation treatment would be approximately 25 acres. The need for herbicide treatments could decrease over time in particular treatment units as desired trees grow taller than the competing vegetation, and the units become maintained mostly by prescribed fire. If periodic prescribed fire did not occur and stand maintenance fell behind, then herbicide may have to be used in later stages to maintain a more open understory and control invasive species.

<u>Restoration</u>

Selective planting of native trees and plants, such as longleaf or specific native hardwoods or grasses, could also occur under Alternative B to speed up restoration of native forest vegetation associations historically present (NPS 2007). Restoration could occur in Thomas Creek and Black Hammock FMUs, and the NPS anticipates planting up to 25 acres annually once a native seedling nursery program is established.

Wildfire Managed for Resource Objectives

Managing wildfires for multiple objectives, including resource objectives (Figure 3), could also be considered on all wildfires. As part of TIMU's mission (NPS 1996) the FMP would be used to protect and restore native vegetation and wildlife communities. Planting of select native trees and plants, such as longleaf or specific native hardwoods or grasses, would be used to speed up restoration of native vegetation associations historically present in the preserve. The FMP would promote more robust growth of grasses and forbs, and more open hardwood, oak, and shortleaf pine uplands. All forest restoration work conducted under the FMP would be supervised and measured by the implementation of fire monitoring plans, post-fire monitoring plans, and inter-agency data and records management databases. Monitoring is the primary means of assessing whether the fire program is meeting management goals and objectives. TIMU would use prescribed fire monitoring plots to help analyze fire effects on preserve restoration efforts. Adaptive management would be used to update and improve fire management through the incorporation of ongoing research into fire management actions.

Wildfires caused by lightning ignitions could be managed for multiple objectives, including resource objectives in the Thomas Creek, Black Hammock, and Broward/Burton FMUs. In the coastal salt marshes, plentiful surface water, abundant vegetation resistant to burning, and dampness make the area unlikely to sustain large fires during most conditions. The TIMU fire staff has used confine/contain tactics to suppress fires in the preserve due to difficult access, firefighter safety, or cost considerations allowed under Federal Wildland Fire Management Policy. These fires were self-limiting and burned out on their own due to environmental factors like moist conditions, fire-resistant vegetation, and natural barriers. Under this alternative, the TIMU fire management staff would evaluate specific conditions associated with a particular wildfire (unplanned) ignition to determine the level of management actions needed, and the capability to manage or partially manage the wildfire for multiple objectives without detriment to preserve values.

Estimating the acres that will burn annually by wildfires for resource objectives is not possible due to the uncertainties of ignitions, area of start, constraints on use, weather, staffing, timing, fire behavior, and a host of other issues. The number of acres burned may vary widely by year, but impacts are expected to be minimal in the floodplain and possible in some years in the pinelands.

All techniques described in Alternative B would be used under carefully prescribed conditions, plans, and objectives to restore, protect, and enhance the preserve resource values. These strategies would be incorporated into a new FMP, along with changes in national fire terminology. The allowed activities would be implemented incrementally over the long term, allowing species time to adapt and adjust to these human-initiated activities. The FMP would also include strategies and mitigations important for sensitive species, historic and cultural sites, adjacent private property, and other preserve values. Implementation of all activities may be limited by available funding.

What is "wildfire managed for multiple objectives?"

Wildfires are managed for multiple objectives, but some wildfires are also managed for resource objectives that allow all or part of a fire to burn in certain areas under certain conditions. This is different than wildfires managed using full suppression strategy. Wildfires managed for multiple objectives are unplanned ignitions, managed by qualified personnel, and have appropriate pre-planning in place. This technique is useful as a management tool for lightning ignitions in natural areas where local values are not threatened. It does not preclude using a full suppression strategy.

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

The goal of managing wildfires for multiple objectives at TIMU, including resource objectives, would be to use fire as a natural disturbance process to help restore and maintain fire-dependent plant and wildlife communities; reduce hazard fuels; and decrease the chance for widespread, uncharacteristically severe wildfires that may impact human and natural values. **Resource objectives included in the TIMU FMP include protection, firefighter safety, cost, fuels reduction, restoration of longleaf pine, and perpetuation of fire dependent species.**

The decision process for all wildfires initially involves the on-duty fire manager using 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, neighbor properties, natural and cultural resources), previous fire history, fire season severity, available firefighting resources, and other factors.

After this initial assessment, the fire manager consults with resource specialists and management staff and a decision is made whether to manage or suppress the fire. While sounding cumbersome, this process occurs very quickly, so there is no delay in initiating firefighter operations. The Superintendent must sign and approve the decision.

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

Since wildfires, including management for resource objectives, have not yet been used at TIMU, the decision process would be developed and formalized in the updated FMPs and other fire operational guidance documents.

FIGURE 3: TIMU FMP RESOURCE OBJECTIVES

Alternative C—Use of Additional Vegetation Management Tools and Wildfire Managed for Resource Objectives in Preserve Natural Zones Only

Under this alternative, the TIMU fire management program would be allowed to use all the fuels and vegetation management techniques described above in the Preferred Alternative in a new FMP, except that these fire management tools would be used in the Natural preserve zones only. Zones are management units that are classified based on resource type. TIMU preserve zones are defined as 1) Historic—significant cultural resources such as shell middens; 2) Development—facility and structures; and 3) Natural—everything else. Currently, the preserve defines Natural zones as coastal marsh areas and islands. Alternative C would preclude use of all fire management tools within Historic and Development preserve zones and only use all fire management tools within the coastal marsh and island Natural zones.

Suppression and protection objectives would continue to guide all wildfire responses. These might include safety, cost, and smoke moving onto other jurisdictions, but resource objectives would only be a principle management objective in the Natural zones. All fuels and vegetation treatment actions allowed under this alternative (prescribed fire, mastication, and limited herbicide use) would be carefully planned to protect and preserve TIMU values to the maximum extent possible.

See the descriptions above in the Elements Common to all Alternatives, Alternative A, and Alternative B sections for more detail on these techniques and activities.

The following fire management strategies that could be used under this alternative would include:

- suppression-related activities permitted under Federal Wildland Fire Management Policy
- management of wildfires for multiple objectives including resource objectives in preserve Natural zones only
- defensible space and fuel breaks work in all preserve zones
- wheeled/tracked equipment use in preserve Natural zones for forest/ecological restoration
- use of handheld motorized equipment use (e.g. weed eaters, chainsaws, hand-held brush cutters, leaf blowers) in support of fire management activities in all preserve zones
- prescribed fire in the preserve Natural zones if ecologically indicated or needed for vegetation community restoration (such as pine plantations in the northern area of the preserve)
- limited herbicide application using targeted spot spraying by hand application to control invasive, non-native (exotic) plants and/or natives that hinder ecological restoration efforts in all preserve zones
- collection of and planting of native tree seedlings, and tree and grass seeds in preserve Natural zones

The estimated acreages to be treated per fire management tool would be similar to Alternative B.

All techniques allowed under Alternative C would be used under carefully prescribed conditions, plans, and objectives to restore, protect, and enhance the TIMU resource values to the maximum extent possible. These strategies would be incorporated into the new FMP, along with changes in national fire terminology. The allowed activities would be implemented incrementally over the long term, allowing species time to adapt and adjust to these human-initiated activities. The FMP would also include strategies and mitigations important for sensitive species, historic and cultural sites, adjacent private property, and other preserve values. Implementation of all activities may be limited by available funding.

Fire Management Actions and Components

Table 1 summarizes alternative actions and TIMU fire management program components. 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. Additionally, Table 1 highlights the primary differences between the alternatives.

TABLE 1. COMPARISON OF FIRE MANAGEMENT RELATED ACTIVITIES FOR EACH ALTERNATIVE

Fire Management Activities and Program Components	Alternative A (No-Action Alternative)	Alternative B (Proposed Action and Preferred Alternative)	Alternative C (Natural Zones Only)
Most wildfires would continue to be suppressed	X	X	X
Direct and indirect attack and confine/contain strategies could be utilized in suppression	X	X	X
Wildfires could be fully managed for resource objectives in defined areas under appropriate conditions		X	X
Wildfire control tactics may include application of foam, water, and/or retardant; off-road use of vehicles 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 fire plows or bulldozers, when approved by the TIMU Superintendent	X	X	X
Protection of adjacent private property would be a priority and considered in all phases of fire management	X	X	X

Fire Management Activities and Program Components	Alternative A (No-Action Alternative)	Alternative B (Proposed Action and Preferred Alternative)	Alternative C (Natural Zones Only)
Minimum Impact Suppression Techniques (MIST) would be used whenever possible to protect TIMU values	X	X	X
BAER could occur after wildfires	X	X	X
Community cooperation and coordination with neighbor and partner agencies would continue	X	X	X
Prescribed fires could be used to achieve identified objectives with approved burn plans	X	X	X
Prescribed fire could occur in limited circumstances on selected FMUs	X	X	X
Planting of native plants, such as longleaf pine, could occur in restoring historical forests		X	X
Approved herbicides could be used to aid in ecological restoration	X	X	X

Mitigation Measures

The following mitigation measures were developed to minimize the degree and/or severity of adverse effects to the TIMU resources and would be implemented with the action alternatives, as needed. The preserve managers would include these mitigation measures in the new FMP. Many of them would be used under any alternative, although their influence may differ depending on which alternative is selected.

Fire managers would work with the TIMU staff and other agencies to ensure that preserve operations and natural and cultural concerns are considered in planned projects and wildfires. These mitigation measures are based on best practices balanced with law and agency regulations. They may be updated over time as TIMU management goals change, new science becomes available, new species recovery actions are developed, new cultural sites are identified, and/or better approaches and efficiencies are learned.

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

General

- For all wildfires and fire management activities TIMU fire staff would consider tools, procedures, and equipment that least impact natural and cultural resources, general undeveloped character, and wilderness. Threats to these values would be balanced with safety, fire, and land/resource management objectives. Managers and firefighters would consider Minimum Impact Suppression Techniques (MIST) on all incidents to minimize impacts of fire response operations (Appendix 1). These tactics would also be used for prescribed fire and vegetation management projects, whenever possible.
- The TIMU fire staff would use indirect/confine–type strategies as preferred tactics in suppressing and managing most wildfires beyond initial attack. Burnouts can help solidify natural and artificial features as barriers to fire spread. Fire staff would consider slow, less intense burnouts, as it is often safer and more efficient and creates lower intensity fires more characteristic of past historic fires.
- Point protection around identified TIMU values would be used in all areas.
- 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 FMP.

- The TIMU fire management staff 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 help develop specific incident/project objectives and mitigations.
- All prescribed fires 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 are to be implemented on each project.
- After major wildfires, BAER would be considered in consultation with regional office and resource specialists.

Air Quality

- The TIMU fire management programs would follow Florida smoke and burning regulations. Burn parameters in permits from Florida Forestry Commission would be followed.
- The air quality monitoring station at the preserve would be protected from wildfire damage; NPS would coordinate with the state if preserve projects are expected to impact readings.
- Fire staff would use the preserve's public and neighbor notification procedures, such as news releases, signage, and personal contacts, for all prescribed fires and wildfires, focusing on residents and activities that might be impacted. Known sensitive receptors would be specifically notified in advance by NPS staff.
- Smoke management tools, such as modeling programs, would be used before prescribed fires and wildfires managed for resource objectives to determine predicted smoke paths and effects. Smoke transport winds would be regularly assessed by prescribed fire and wildfire managers to determine impacts to sensitive receptors, travel and transportation corridors (including aircraft and boats), and populated areas. Coordination would be accelerated with appropriate federal, state, and local agencies.
- Signage, closure, and escorted travel would be considered/coordinated with appropriate state and local agencies if smoke were expected to impact roadways.
- When possible, prescribed fires would be conducted when the weather forecasts indicate favorable conditions to minimize residual smoldering and to aid in smoke dispersion Timing and methods of ignition on prescribed fires would be regularly assessed and reviewed to help minimize smoke impacts. Accelerated mop-up would be used where possible to minimize smoldering.

Soils

- Natural and manufactured features (such as roads, trails, waterways, ponds, pre-existing firelines), or vegetation change barriers would be used whenever possible for wildland fire control lines to minimize the need for line construction and vegetation cutting. This would minimize disturbance to soils, habitat, cultural sites, or vegetation by mechanical or hand line construction.
- 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.
- If constructed, firelines would be rehabilitated as soon as possible after fires are out to prevent erosion, other impacts, and negative visual effects. Hand line disturbances should be pulled back over themselves or covered with brush cut as part of the operation.
- Firelines on the TIMU boundary or TIMU boundary fuel breaks are considered TIMU infrastructure; they are used to prevent fires from leaving/entering the preserve and as prescribed fire control lines. They may be maintained in place with full considerations to minimizing soil, environmental, and visual impacts.
- Fire staff would use 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.

- If equipment is authorized by the Superintendent to be taken off road, resource advisors (READs) will advise equipment operators on techniques 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 may be accompanied by more experienced operators or READs to recommend low-impact techniques.
- Prescribed fire and wildfire suppression burnouts would avoid widespread, intense, and long-duration surface burning if possible to prevent soil damage and erosion.

Water Resources

- If aviation resources are used, fresh water would be used for aviation drops on TIMU wildland fires to minimize contamination of surface waters. Salt water would not be used unless there is an imminent threat to life and property. Use of foam or fire-retardant drops must have Superintendent approval before use and is usually not considered unless life or major property loss appears inevitable.
- It is recommended that helicopters and air tankers pre-wash their buckets/tanks in a disinfectant solution before use to prevent potential transfer of exotic organisms.
- Helicopter dip sites must be approved by the preserve before use.
- If pumps are used on wildland fire operations, appropriate containment systems would be employed to prevent leaks of gas, oil, or other fluids.
- Motorized equipment must be inspected prior to use to ensure that no fluid leaks are found. Refueling, filling, or mixing of gas and other fluids would be avoided in sensitive areas and near surface waters.
- No dozers or tractor plows would be used in the preserve without Superintendent approval. If equipment is authorized, stream or water crossings would be minimized. If necessary, crossings or damages will be promptly restored and rehabilitated in consultation with resource specialists.
- Staff using herbicides would be trained in accordance with NPS integrated pest management policies and procedures related to approved handling, storage, transportation, mixing, spill prevention, and application procedures.
- Widespread high-severity fire will be avoided when possible in prescribed fires and wildfire suppression activities.
- READs would advise fire operation responses and tactics considering the impacts on lakes, creeks, guts, and sloughs from ash, sediment and nutrient loading resulting from fire, and from consumption of plants by fire in wetland communities.

Biological including fish, wildlife, plants, exotic species and special status species

- All appropriate endangered species consultations would be completed prior to any planned fire management activity. Appropriate consultations would be initiated during emergency fire operations.
- Upon notification of a wildfire, TIMU resource staff/READs would examine maps and information resources to assess and discuss potential wildlife/habitat/cultural effects; they would then advise fire managers on protection of wildlife/habitat/cultural values.
- When planning, and before initiating treatments or prescribed fires, TIMU resource/wildlife specialists would be consulted to determine presence of and effects on sensitive species. Specific mitigation actions would be developed to minimize impacts on species of concern.
- The TIMU WFDSS objectives and management requirements would be developed to guide firefighters in protecting sensitive species or habitats from wildfire management impacts.
- Project work, such as mastication, mowing, and brush cutting equipment use, may be curtailed in some areas during sensitive wildlife breeding seasons.
- When possible, firing patterns on prescribed fires should allow refugia or escape routes for wildlife.
- Low-level hovering and helicopter flights would be avoided when possible to lower the risk of bird collisions and protect the character of the preserve.
- If new T&E or sensitive species are identified at the preserve, TIMU management would consult with local specialists and fire managers with the latest science or understanding of those species.

Fire/Resource Management staff would develop best fire management practices related to that species or habitat, and then add new information to the FMP with the goal of keeping fire management activities operational for the good of fire-dependent species and habitat. Fire/Resource Management staff would consult with appropriate wildlife management agencies to get recommendations/keep them abreast of the preserve's efforts.

- Chainsaw work involving bucking and felling of live and dead large, mature trees would only occur if necessary for firefighter safety, public safety, or fire control operations.
- The two identified Champion Trees present within the preserve would be protected from fire or fire suppression impacts when possible. A tough bully (*Sideroxylon tenax*) is located within the Theodor Roosevelt FMU and a loblolly bay (*Gordonia lasianthus*) is within the Fort Caroline FMU (http://championtrees.freshfromflorida.com/home.mvc/Index).
- In stands of older, larger pines, management would consider vegetation/fuels work that reduces risk of high-intensity, stand-replacing fire. The goal would be to develop historical forest structure and openings resembling historical forests/Red-cockaded Woodpecker (RCW) habitat.
- Prescribed fire prescriptions would consider pre-burn habitat evaluations for increasing/improving potential RCW habitat.
- Management would ensure that fire suppression personnel consider low or moderate intensity burnouts for wildfires in mature pine areas to increase/protect possible RCW habitat.
- Additional species-specific fire management measures and considerations would be developed and added to the FMP as resource specialists coordinate with fire managers.

- **<u>Non-Native Species (exotic plant or animal)</u>**
    - Prescribed fire, wildfire management, and non-fire treatments would be used 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.
    - Managing wildfires for resource objectives may be rejected during intense drought/extreme fire risk periods to avoid high-severity, stand-replacing fire behavior beyond the natural range of variation that may create habitat opportunities for invasive species.
    - Mowing or mastication may be used for firelines to avoid scraping or exposing soils, providing fewer soil disturbance opportunities for establishment of invasive plants.
    - TIMU would develop equipment washing (weed washing) procedures in their FMP to minimize the spread of exotic vegetation/seeds via incoming or outgoing equipment.
    - Fire lines will be rehabilitated after fires are declared out to prevent erosion, visual effects, and prevent establishment of invasive plants.
    - 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 specific invasive control/treatment plans as necessary.
    - Prescribed fire would usually use prescriptions that minimize widespread, intense, and long-duration surface burning of soils to prevent opportunities for invasive plant species establishment. Prescribed fire objectives generally require low to moderate fire behavior, which will reduce the potential for exposing bare soil and minimize the potential for soil sterilization and the resulting opportunity for invasive plant species to encroach.
    - Staff would monitor recently burned areas for feral hog use; if such areas are found, the preserve may have to develop a trapping program to protect native seedling growth and prevent soil disturbance in these areas.
    - Off-road equipment operators would be trained or supervised to minimize soil and vegetation disturbance, compaction, and displacement.

<u>Cultural/Historic Resources</u>

- Staff would use databases to identify known cultural sites in advance of wildfires, prescribed fire, or fuels treatment activities whenever possible to consider avoidance and mitigation strategies. Since wildfire was a natural process in the preserve ecosystem for centuries, many pre-European contact sites have had fires burn through them many times. The greater risk may be from firefighter actions rather than from wildfire. However, many of the cultural resources in TIMU are post-European contact and are prone to damage or destruction by fire.
- The Cultural Site list in the 2004 FMP would be updated to include newly documented sites with their planned protective mitigation actions.
- The preserve would educate fire personnel about the significance of cultural sites, how to identify obvious sites, and appropriate actions and notifications to be made if new sites are encountered.
- Firelines and ground disturbance would be avoided in identified cultural site areas.
- If cultural resources are identified while digging firelines, the READ and Chief of Resource Management would be notified immediately, and appropriate protective measures would be taken. The fireline would be relocated to an area with no cultural resources.
- If previously unknown archeological resources were discovered, ground disturbance would be stopped in the area of any discovery, protective measures would be implemented, and procedures outlined in 36 *Code of Federal Regulations* Part 800 would be followed, as applicable. Associated tribes and the Florida State Historic Preservation Officer would be notified of the discovery. Resources would be evaluated for their National Register of Historic Places significance, and adequate mitigation of project impacts (in consultation with appropriate agencies) and adjustment of the project design would take place to avoid or limit the adverse effects on resources.

- Fire personnel will work with cultural resource specialists to develop strategies and tactics that will prevent damage to historic, cultural, archeological, and ethnographic sites and resources. When prescribed fires occur within or near archeologic/historic site areas, the mitigations will be documented and updated in TIMU records to help evaluate protection effectiveness over time. The recorded mitigations would also be immediately available for reference if wildfires occurred in that area.

Human Health/Safety and Visitor Use and Experience

- The preserve would continually emphasize safety to fire and preserve staff and the public as the highest priority in all fire management activities.
- The preserve would develop/use a public evacuation plan that would include processes to evacuate recreational users from backcountry areas and campgrounds. Visitors that may be in the path of a wildfire would be located and escorted out of the risk area.
- 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 preserve would monitor fuel, weather, and fire condition parameters and may limit public access and activities when very high to extreme fire danger indices develop. The Superintendent may authorize temporary closure of risk areas to public and visitors as necessary.
- To prevent exposure to hazards where fire/vegetation management activities are underway, visitors would be kept out of the immediate vicinity of mastication, tree falling, low-level aviation operations, prescribed fires, and other special equipment use.
- The preserve 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 preserve prescribed fires. For long-duration wildfires, regular media releases would inform locals and visitors about the expected impacts of the fire, especially related to smoke and closures or restrictions. Signs or notices may be posted at appropriate places to inform incoming visitors and recreational users of the fire situation.

- The TIMU fire program outreach, interpretive and media releases would continue to emphasize the importance of fire processes to the local ecosystem and would promote the long-term benefits of fire to fire-dependent species, wildlife, recreation activities, and related local economies.
- 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.).
- Chainsaw use would be minimal along trails and adjacent to developed areas. Stumps would be flush cut; butt ends of logs would be turned away from trails and public areas.

Alternatives Considered and Dismissed

The NPS considered several reasonable alternatives for project implementation; the following alternative was dismissed from further analysis. This alternative was determined not to meet preserve fire management goals or the program purpose and need and was not analyzed in this EA. A description of the dismissed alternative and reasons for dismissal are provided below.

Alternative 1 was similar to Alternative C except that the active fuel/vegetation management tools and strategies would be implemented throughout the preserve.

Alternative 1 would include suppression and protection objectives and would continue to guide all wildfire responses, with resource objectives being implemented in all FMUs. All fuels and vegetation treatment actions would be allowed under this alternative (prescribed fire, mastication, and limited herbicide use) and would be carefully planned to protect and preserve TIMU values to the maximum extent possible.

The NPS determined that this alternative would likely hinder accomplishment of existing TIMU management goals and be too dangerous to implement prescribed fire in all areas of the preserve due to the presence of cultural resources. This alternative was dismissed because it would prevent accomplishment of existing TIMU management objectives, reduce visitor use and enjoyment, and hinder TIMU protection efforts.

Affected Environment and Environmental Consequences

This section describes the affected environment and environmental consequences within the project area as they relate to the implementation of the proposed alternatives as described in the Alternatives Chapter. This EA analyzes both beneficial and adverse impacts that could result from implementing the alternatives. This chapter is organized by the impact topics presented in the Purpose and Need for Action Chapter.

Methodology for Analyzing Impacts

In accordance with Council on Environmental Quality regulations, direct, indirect, and cumulative impacts are described (40 CFR 1502.16). General definitions for potential impacts are described as follows:

Direct: An effect that is caused by a proposed action and occurs in the same time and place of implementation (40 CFR 1508.8).

Indirect: An effect that is caused by a proposed action but is later in time or farther removed in distance from the action (40 CFR 1508.8).

Cumulative Impacts Analysis

As defined by NEPA regulations (40 CFR 1508.7), "Cumulative impacts result from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions." Cumulative impacts are considered for both alternatives.

Actions that could contribute to cumulative impacts include:

- Continued development of the Duval County area surrounding TIMU that results in conversion of undeveloped lands to more intense human uses.
- Continued harvest of timber in the Duval County area near TIMU with attendant forestry practices such as prescribed fire and planting.
- Feral hog activity in the Cedar Point area of the Black Hammock FMU.
- Fire management activities on adjacent private lands.

Climate Change

Climate change is affecting forest structure, composition, function, and ecosystem processes in the eastern United States. Increased temperatures, pollution, non-native insect pests, disease, and invasive plants are all contributing to altered ecosystem processes and forest structure and composition (Grimm et al. 2013, Fisichelli et al. 2014). A recent analysis at the preserve shows climatic conditions are already shifting faster than projected rates, especially under low greenhouse gas emission scenarios (Fisichelli et al. 2014). Climate change is affecting all aspects of preserve management from natural and cultural resources to preserve visits (Fisichelli et al. 2014).

Climate change models have been developed that predict how TIMU resources may change based on the predicted change of temperature and precipitation in the future compared to the baseline conditions. These models incorporate current information available for climate change and associated vegetation changes, and the complex and uncertain interactions among climate change, non-native biotic stressors, and vegetation. For example, changes in forest structure, composition, and function could affect habitat suitability, degrading or eliminating habitat for some species in the preserve. Increased temperature could correlate to a drier landscape in the preserve, resulting in decreased water availability of both surface and groundwater, with resulting impacts on aquatic and wetland environments.

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, effects 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 changes (DeVivo et al. 2008). In the preserve, potential forest change in tree species was projected to be 45% to 55% by 2100, with a 45% to 58% uncertainty in forest change projections (Fisichelli et al. 2014). Habitat suitability predictions for some individual tree species in the preserve had mixed results from no change to large decrease or increase depending on the greenhouse gas emissions scenario (Fisichelli et al. 2014).

Near Timucuan, sea level has risen more than eight inches over the past 80 years, and tropical storms frequently pass within 10 miles of the preserve (25 storms since 1842). Sea level is likely to substantially increase over the current century, with projected increases of 1.8 to 5 feet for TIMU (year 2100 compared with 1992). Storm intensity and storm surge heights are also likely to increase. Based on current sea level, storm surge height at Cedar Point in the preserve would reach 12.3 feet at mean tide during a category 3 hurricane (NPS 2016).

Sea level rise and coastal inundation are likely to impact natural resources. Expected reduction in habitat for juvenile estuarine finfish and crustacean shellfish may decrease fisheries production. Changes in temperature, ocean pH, local acidification, sea level rise, and saltwater intrusion could impact molluscan shellfish and change their distribution. Warmer water may contribute to more harmful algal blooms and increases in pathogens in shellfish that affect humans when they are consumed. The combination of sea level rise and increased storm surge could exacerbate shoreline erosion at TIMU (NPS 2016).

It is important to note that climate change and sea level rise is not an exact science; various future scenarios having been developed and modeled in an attempt to quantify future climate change (Solomon et al. 2007, Fisichelli et al. 2014). Annual temperatures predicted for the preserve are forecast to increase from 1.9 to 6.5 degrees Celsius by sometime between 2070 and 2099 compared to the baseline (1961 to 1990; Fisichelli et al. 2014). Precipitation is predicted to increase from 6.2% to 11.9% by the same time period compared to the baseline of 52.1 inches of annual precipitation (Fisichelli et al. 2014).

Alternatives that improve natural resources resiliency (i.e., hazardous fuel reduction and vegetation management; Alternatives B and C), however, would be expected to provide more beneficial impacts than alternatives that improve natural resources to a lesser degree. Currently, the models are not sufficiently precise to address potential impacts of climate change over the short duration of the planning period and the small scale of the project area. Many national studies indicate sea level rise and temperature rise are inevitable; it is just the quantitative numbers that model differently. Therefore, these effects are not analyzed in detail in this EA.

Air Quality

Affected Environment

The preserve was classified as a Class II area under the 1977 amendments to the Clean Air Act (42 U.S.C. §7401 et seq.). Class II areas are allowed to increase emissions of particulate matter. Sulfur dioxide, nitrogen, and nitrogen dioxide are allowed beyond the baseline concentrations if the National Ambient Air Quality Standards established by the Environmental Protection Agency are not exceeded. Data collected and analyzed by the Southeast Coast Inventory and Monitoring Network from 2011 to 2015 show visibility (TIMU air quality–related value) as a significant concern and total-Nitrogen wet deposition and total-Sulphur deposition as moderate concerns (NPS 2017a). Air quality–related values (AQRVs) are resources that may be affected by changes in air quality. The preserve is currently within a designated attainment area, meaning that the preserve is in compliance with National Ambient Air Quality Standards for criteria pollutants.

The behavior of smoke in the subtropical weather patterns of Florida, and the proximity to the metropolitan of Jacksonville, surrounding communities, and adjacent state parks create a potential for air pollution and public health and safety problems. Interstates 295 and 95 and U.S. 17 are major transportation routes that are of concern with every ignition within TIMU. State Highway A1A along the eastern portion of TIMU is also considered with every ignition and when planning wildfire response.

Prior to prescribing fires, the Florida Forestry Commission would be notified per state law. As part of the approval process, all applicants must provide a written burn plan or prescription that evaluates the anticipated impacts of the prescribed fire on smoke-sensitive areas. Florida limits the amount of smoke emitted into Florida air basins to prevent major air quality deterioration; because of the proximity to Jacksonville, the Florida Forestry Commission pays attention to fires occurring in the Jacksonville area. All prescribed fires in the preserve would comply with the State Smoke Management Guidelines and TIMU Action Plan for Smoke on the Highway (when applicable). In addition, prescribed fire plans would include mitigation measures to minimize impacts on public safety when winds may carry significant smoke that could impact traffic corridors, communities, airports, and visitor safety.

Analysis of Alternatives and Impacts on Air Quality

Impacts of Alternative A—Continue Current Fire Management at TIMU (No-action Alternative)

The TIMU fire program would continue to coordinate prescribed fire activities under their 2004 FMP and federal wildland fire policies in the Cedar Point area of the Black Hammock FMU only. Hazard fuel loads would be retained in untreated upland forest communities (about 4,500 out of 4,700 acres) as dense midstories and may continue to accumulate, which could lead to localized, intense wildfires. Impacts to air quality from particulate matter (ash) and smoke emissions from wildfires and prescribed fires may temporarily impact air quality and visibility within and adjacent to burned areas, therefore impacting a TIMU AQRV. In addition, air quality standards for particulate matter and carbon monoxide may be temporarily exceeded within and adjacent to wildfire areas, which could affect smoke sensitive receptors and communities downwind, such as airports and private residences. The extent of the adverse impacts would depend on fire location, size, fuel type (trees, shrubs), and wind direction. Smoke impacts from wildfires could range from a couple of days during normal precipitation years to a week or longer during severe drought conditions. If needed, aggressive suppression strategies would be implemented to reduce air quality impacts. Prescribed fire smoke situations that threaten smoke-sensitive areas—such as road corridors or homes—in ways beyond what are manageable by mitigation measures may trigger suppression of a prescribed fire.

Low-intensity prescribed fires could impact adjacent communities and roadways through reduced visibility (Hardy et al. 2001, Achtemeir 2009, Hyde et al. 2016). In the Southeast, residual smoke from prescribed fires, combined with high ambient relative humidity conditions, could generate fog that impairs visibility along roads, resulting in traffic-related accidents (Achtemeir 2003, 2009). The preserve would prescribe fires on no more than 1% (140 acres) out of the park unit's entire 46,661 acres annually, which would control the amount of smoke generated.

Prescribed fires would have a prescribed fire plan that would include expected smoke trajectory maps and identify smoke-sensitive areas. Prescribed fires would not be allowed during atmospheric conditions that could permit air quality degradation that negatively affects public health for an extended period of time (federal and state air quality standards would be the basis for this decision). The amount and duration of smoke impacts to air quality would last as long as the prescribed fire activities Mitigation measures would be defined in the burn plan. Arrangements would be made prior to ignition to ensure that designated fire resources are available if mitigation measures are needed. Prescribed fire smoke situations that significantly threaten smoke-sensitive areas may trigger suppression and/or mitigation measures that terminate the prescribed fire.

Fugitive dust generated from fire management activities and increased vehicle traffic associated with fire crews would temporarily affect air quality but would be limited in scale to where fire management activities occur. However, fire management activities would reduce the potential for future intense wildfires, which can produce large particulate matter loads into the air that can degrade the air quality and visibility.

Cumulative Impacts

Wildfires and prescribed fires on adjacent lands (private properties, including agricultural burning), emissions from traffic within and outside the preserve (vehicles, boats), commercial logging operations, and the potential for private development near the preserve all contribute to adverse cumulative impacts on air quality. Development near TIMU could increase the potential for human-caused fires and the spread of a wildfire from flammable housing materials (Stein et al. 2013). Wildfires in the preserve have been infrequent and short in duration and thus negligibly contribute to adverse cumulative impacts. Prescribed fires would occur on 140 acres in the Cedar Point area, with air quality impacts within and adjacent to the burn areas from smoke and particulate emissions lasting as long as the prescribed fire activities. Prescribed fires also could temporarily reduce the visibility along adjacent road corridors, communities, and waterways. The contribution to adverse cumulative impacts on air quality would be negligible because air quality impacts would only last as long as prescribed fire activities.

Impacts of Alternative B—Use of Additional Vegetation Management Tools and Wildfire Managed for Resource Objectives (Proposed Action and Preferred Alternative)

Impacts would be similar as described for Alternative A for wildfires and fire management responses, including emission of air pollutants from the operation of mechanical equipment and vehicles for fire management activities. The ability to manage wildfires for multiple objectives, including resource objectives, and the use of prescribed fire and mechanical work with targeted herbicide could lead to a greater reduction of hazardous fuels compared to Alternative A. Over time, this would increase the likelihood of localized, low intensity surface fires, thus reducing emissions and fire effects to air quality. Since estuarine wetlands and waterways encompass over 75% of the 46,000 acre preserve (NPS 2016), managing wildfires for resource objectives is not likely to lead to burning of more areas. Most wildfires in the preserve have been small in size with little smoke and burned out on their own due to moist conditions, fire resistant vegetation, and natural barriers (water bodies). The management of wildfires for multiple objectives, including resource objectives, would accomplish specific resource management objectives (e.g., improving longleaf pine habitat) through processes outlined in the FMP.

The use of prescribed fires could temporarily impact air quality within and adjacent to burn areas from smoke and particulate emissions but would not be expected to exceed national or state air quality standards. Impacts to visibility would be the same as described for Alternative A, with potential generation of fog and reduced visibility along roadways and waterways from residual smoke. The amount of smoke generated would be controlled because fires would be prescribed in series of smaller, separate events that would total 500 acres, versus one 500-acre fire.

Under Alternative B, the increased use of mechanical work to up to 300 acres annually would temporarily impact air quality from exhaust emissions generated from internal combustion–powered equipment and vehicles. Impacts to air quality from the increased use of mechanical equipment would be temporary in nature, lasting until the treatment was completed.

Targeted herbicide use could result in herbicide in the air temporarily within the treatment area due to spray drift and volatilization (evaporation of liquid to gas). Implementing mitigation measures and the minimal use of herbicide treatments (up to 25 acres annually) would reduce the potential for drift into non-target areas and the amount released into the air through volatilization. Airborne herbicide risks have been documented as insignificant in smoke, even when prescribed fires are applied immediately after herbicide application (McMahon and Bush 1991, Bush et al. 1998).

Cumulative Impacts

Adverse cumulative impacts from wildfires and prescribed fires would be the same as described for Alternative A. Under Alternative B, prescribed fires would occur on up to 500 acres annually across the FMUs, with air quality impacts within and adjacent to the burn area from smoke and particulate emissions lasting as long as the prescribed fire activities. Fire management activities under Alternative B would reduce hazard fuel loads in the forest stands by opening the canopy, thus reducing the potential for localized, intense wildfires that could adversely affect air quality and visibility (a TIMU AQRV) within and around the preserve. Therefore, Alternative B would also contribute to beneficial cumulative impacts to air quality.

Impacts of Alternative C—Use of Additional Vegetation Management Tools and Wildfire Managed for Resource Objectives in Preserve Natural Zones Only

Impacts to air quality would be the same as described under Alternative B for the use of the proposed fire management tools in the other zones. Under Alternative C, the Cultural and Development zones within the preserve would not benefit from wildfires managed for multiple objectives including, resource objectives, mastication, prescribed fire, or forest restoration. Hazardous fuel loads in the upland areas would remain, which could lead to high-intensity wildfires producing amounts of particulate matter that could exceed national or state air quality standards. The generation of large amounts of particulate matter would reduce the air quality and visibility (a TIMU AQRV) within the burn area and surrounding lands. Impacts to visibility would be the same as described for wildfires under Alternative A. The degree of impacts would vary depending on fire size, behavior, location, extent, timing, and other factors. Smoke impacts from wildfires could range from a couple of days during normal precipitation years to a week or longer during severe drought conditions.

Cumulative Impacts

Implementing proposed fire management tools in all zones except the Cultural and Development zones would negligibly contribute to adverse cumulative impacts of air quality because impacts to air quality from fire management activities would last as long as the treatments, which are designed to be short in duration (i.e. prescribed fires would burn a small area for one day). Potential risk for intense wildfires could increase in the Cultural and Development zones with no fuel or vegetation treatments. However, wildfires in the preserve have been infrequent and short in duration, thus negligibly contributing to adverse cumulative impacts.

Soils

Affected Environment

The soils throughout the preserve are comprised of very deep, poorly drained soils that formed in sandy marine sediments. Estuarine wetlands and waterways encompass over 75% of the 46,661-acre preserve (NPS 2016). The soils found along upland flats, depressions, and tidal areas are poorly drained with slow runoff and permeability. Lower areas, including hammocks, have nearly level, very poorly drained soils that formed in decomposed organic matter underlain by sandy marine sediments. Under normal conditions, the water table is at or above the surface for six to nine months out of the year, and soils are moist most of the time due to the frequent flood events.

Wildland fires that burn with uncontrolled intensity could result in the loss of regenerative plant tissues in the soils (Brown and Smith 2000) and, ultimately, reduced species diversity. During dry conditions, an intense wildfire could damage organic soils in the coastal marshes or uplands. Wet soils ensure that an organic layer remains. Moisture not only protects the duff layer adjacent to the soil, but also prevents the fire from consuming soil humus. If the forest floor is completely consumed, the microenvironment of the upper soil layer would be drastically changed, making conditions for near-surface roots very inhospitable.

Wildfires would be suppressed when possible during drought conditions to reduce impacts to organic soils in the floodplains. In addition, prescribed fire plans would include mitigation measures to minimize impacts to soils.

Analysis of Alternatives and Impacts on Soils

Impacts of Alternative A—Continue Current Fire Management at TIMU (No-action Alternative)

The TIMU fire program would continue to coordinate prescribed fire activities under their 2004 FMP and federal wildland fire policies in the Cedar Point area of the Black Hammock FMU only. Continued use of prescribed fire in only a portion of one FMU to reduce hazardous fuel loads increases the likelihood that wildfires at that site would burn with lower intensities. Lower-intensity wildland fires would release nutrients and minerals into the soil, which stimulates seed production and helps to perpetuate fire-dependent vegetation communities, including the longleaf pine community (Neary et al. 2005, Rau et al. 2007). In addition to recycling nutrients back into the soils, raising pH, and increasing minerals and salt concentrations in the soil, the ash, charcoal, and vegetation residue resulting from incomplete combustion aids in soil buildup and soil enrichment by adding organic matter to the soil profile. The added material works in combination with living and dead and dying root systems to make the soil more porous, better able to retain water, and less compact, while increasing needed sites and surface areas for essential microorganisms, mycorrhizae, and roots (Vogl 1979, Wright and Bailey 1982).

The use of prescribed fires could temporarily impact soils within the burn areas from the heat generated but would not be expected to adversely impact the soils and the impact would be temporary. The amount of heat generated would be controlled because fires would be prescribed in series of smaller, separate events that would total 500 acres, versus one 500-acre fire. Prescribed fire and wildfire suppression burnouts would avoid widespread, intense, and long-duration surface burning if possible to prevent soil damage and erosion.

Prescribed fires would benefit the soil by rejuvenating them with nutrients, which would help to perpetuate grasses and seedlings; reduce competition from invasive plants; maintain open vegetation structure in fire-influenced vegetation communities; and enhance the diversity, structure, composition, and integrity of fire-dependent vegetation communities.

Wildland fire suppression actions, such as constructed firelines and the use of vehicles, could compact soils and cause erosion. Compact soil doesn’t drain as well, and lack of drainage could cause excessive runoff leading to erosion. MIST tactics would be used to reduce suppression action impacts. These could include selection of procedures, tools, and equipment that would least impact the environment (e.g., use of water diversion devices on firelines to reduce erosion risk). Following a wildland fire, wind and water erosion may increase temporarily until revegetation occurs.

Cumulative Impacts

Under Alternative A, cumulative impacts to soil resources from other activities include continued maintenance and construction activities within the preserve and continued growth in Duval County—particularly construction development, which could contribute to the overall disturbance and loss of soils in the greater area. Other cumulative impacts include wildland fires originating from adjacent lands (i.e. private agricultural burning or other landowner prescribed fires). Implementation of Alternative A would continue to suppress wildfire which increases the risk for higher intensity wildfire that could adversely affect soils. There would be a negligible contribution to adverse cumulative impact because the increased potential for wildfires, which could temporarily increase soil erosion until growth of vegetation occurs, would remain under this alternative.

Impacts of Alternative B—Use of Additional Vegetation Management Tools and Wildfire Managed for Resource Objectives (Proposed Action and Preferred Alternative)

Impacts to soils would be the same as described under Alternative A for prescribed fires and wildland fire suppression actions. Fires would be prescribed in a series of smaller, separate events that would total 500 acres, versus one 500-acre fire. Wildfires managed for multiple objectives would include resource objectives. Wildfires managed for resource objectives could have less impact on soils from ground disturbance compared to full suppression of wildfires. Wildfires managed for resource objectives would only be allowed under conditions that would limit threats to preserve resources.

Using prescribed fire as the primary vegetation/fuels management tool on a frequent rotation would have beneficial impacts on portions of the pinelands, which include the slash/loblolly pine plantations in the northern area of the preserve. Beneficial impacts include reduction of hazardous fuels, increased cover of grass and forbs, decreased density of some forest stands, and increased forest openings, although these impacts vary with the season of fire (Hodgkins 1958, Platt et al. 1988, Boyer 1990, Waldrop et al. 1991, Glitzenstein et al. 1995, Brockway and Lewis 1997, Brockway et al. 2004). The decreased density of forest stands, and the creation of some forest openings have reduced the competition for longleaf pine seedlings and could continue to improve the health and vigor of the longleaf pine savanna. However, areas in the pinelands with mature, dense loblolly pine and hardwoods would maintain the thick canopy cover because prescribed fire is not efficient in thinning these mature trees or preventing multiple resprouts of hardwoods. The perpetuation of these forest stands would increase the risk for pine beetle infestation, which could increase the hazardous fuel load from dead standing or downed woody debris. These fuel conditions would increase the likelihood of wildfires to burn with higher intensities in these areas, which could lead to increased soil erosion from the loss of vegetation. Soil erosion has the potential to increase surface runoff of rainfall. When surface runoff increases after burning, it may carry suspended soil particles, dissolved inorganic nutrients, and other materials into adjacent streams and lakes reducing water quality.

Mechanical equipment used during hazardous fuel reduction treatments (e.g., defensible space, fuel breaks, thinning) and collection of longleaf pine seeds could impact soils in treatment areas due to increased erosion from vegetation removal, rutting, or compaction of soils. Masticators and mechanical tree shakers generally are tracked, which distributes the weight of the machine over a wider area and reduces the potential for rutting. Tracks from mechanical equipment would be expected to last until the following growing season. Implementing appropriate mitigation measures (see Mitigation Measures Section), such as using mechanical equipment when soils are dry and using existing trails or roads when possible, would help reduce potential impacts to soils. Mechanical treatments would be small in scale (up to 200 acres annually; less than 1% of the total land in the preserve) but would help to restore flatland pine habitat and promote the germination and growth of an abundant ground layer that is lacking in some areas, thus increasing soil stability and production. Additionally, removed trees would be cut or chopped into chunks, chips, or strips and could be scattered onsite, releasing nutrients back into soils. Creating forest patches, as well as planting longleaf pine seedlings or seeds, native hardwoods, and grasses, would increase soil stability and production in treated areas by initially providing ground cover that would prevent erosion from water and wind.

The use of wheeled/tracked equipment, such as masticators in the dense, mature pine and hardwood forests, would decrease the risk for pine beetle infestation and the attendant increase in hazardous fuels. Decreased hazardous fuel loads would result in lower-intensity wildfires because there is less fuel to burn. Soils may benefit from low-intensity wildfire because the release of nutrients and minerals into the soil may promote the germination and growth of ground cover in the opened areas.

Cumulative Impacts

Cumulative impacts would be similar to those described for Alternative A. Prescribed fires and mechanical treatments could cause temporary, localized, increased erosion until revegetation occurred. However, the use of prescribed burns and mechanical treatments would reduce hazard fuel loads, increasing the potential for lower intensity ground fires that would aid in soil buildup and enrichment from increased nutrient and mineral availability. Targeted herbicide application, such as hand application, could result in herbicide migration into the soil. However, the NPS plans to use herbicides that do not have short- or long-term residual implications to soil, water, wildlife, or humans. Mitigation measures (Mitigation Measures Section), limited use as follow-up treatment with prescribed fire and mechanical treatments, and low volume/low acreage application of herbicide to specific basal or foliar plant areas would all help minimize chances for overspray and migration into the soil.

Alternative B could be expected to contribute negligibly to adverse cumulative impacts as soil impacts would be distributed throughout the preserve rather than being concentrated in one large area or conducted all at one time.

Impacts of Alternative C—Use of Additional Vegetation Management Tools and Wildfire Managed for Resource Objectives in Preserve Natural Zones Only

Impacts to soils would be the same as described under Alternative B for wildland fire suppression actions. However, use of vegetation management tools (such as prescribed fire and mechanical treatments) and wildfires managed for resource objectives would be limited to preserve Natural zones only. Wildfires managed for resource objectives could have less impact on soils from ground disturbance compared to full suppression of wildfires. Wildfires managed for resource objectives would only be allowed under conditions that would limit threats to preserve resources.

Cumulative Impacts

Alternative C would have similar adverse cumulative impacts as described for Alternative B. Alternative C would have similar cumulative impacts to Alternative B except that soil resources outside the preserve Natural zones could have increased adverse cumulative impacts due to the increased risk of intense fires.

Vegetation (Including nonnative and exotic species)

Affected Environment

TIMU has a variety of habitats. As delineated by the Florida Game and Fresh Water Fish Commission (1991), 23.3% is open water, 5.1% is pinelands, 4.7% is hardwood hammocks and forests, and 3.8% is barren (largely unvegetated areas including roads, cleared land, and beaches). As delineated by TIMU (NPS 2016), 63.9% of the preserve is coastal salt marsh. TIMU has 638 known vascular-plant species, subspecies, and varieties. Coastal salt marsh, pinelands, and hardwood hammocks and forest are discussed below.

Coastal salt marsh is an herbaceous and shrubby wetland community that occurs in brackish waters along protected low energy estuarine shorelines of the Atlantic Coast. The largest continuous areas of salt marsh occur north of the range of the mangroves and border tidal creeks, bays, and sounds. Plant distribution within salt marshes is largely dependent on the degree of tidal inundation, and many large areas are completely dominated by one species. The salt marsh at the preserve is dominated by saltmarsh cordgrass (*Spartina alterniflora)* and black needlerush (*Juncus roemerianus*).

Natural disturbances on coastal salt marshes include fires, storms, hurricanes, floods, and drought. These events usually have short-term, localized effects on salt marsh habitat, and the community is generally able to recover quickly. Fires usually do not permanently affect salt marshes but may temporally affect soil composition, species composition, and biomass.

Pinelands are an upland community that includes pine flatwoods and commercial pine plantations. Pine species represented across the area are longleaf (*Pinus palustris*), slash (*Pinus elliottii*), sand (*Pinus clausa*), loblolly (*Pinus taeda*), and pond pine (*Pinus serotine*), depending on the preferred site and planting history. Understory and surface cover include saw palmetto (*Serenoa repens*), gallberry (*Ilex coriacea*), wax myrtle (*Myrica* spp.), and a variety of grasses and other herbaceous plants.

Many of the upland communities evolved with frequent fires. Longleaf pine communities at the preserve typically had fire-return intervals of two to five years, and increasing fire suppression over the last several decades has had a marked impact on some of the uplands at the preserve by increasing woody/shrub species density, reducing understory diversity, and increasing the likelihood of high-intensity fires (Byrne et al. 2012).

Hardwood hammocks and forests are an upland community with a species distribution driven largely by soil moisture, soil type, and geographic location. The mesic (wet) hammock type consists of a mix of beech (*Fagus grandifolia*), magnolia (*Magnolia grandiflora*), live oak (*Quercus virginiana*), laurel oak (*Q. hemisphaerica*), hickory (*Carya* spp.), ash (*Fraxinus caroliniana*), mulberry (*Moras* spp.), and longleaf pine. The xeric (dry) hammock type, where fire has not played a role for a long period of time, contains typical species such as a variety of oaks and hickory. The coastal and hydric hammock type occurs between uplands and true wetlands. The canopy is dominated by swamp laurel oak or live oak with varying amounts of American elm (*Ulmus americana*), sweetbay (*Magnolia virginiana*), red cedar (*Juniperus virginiana*), red maple (*Acer rubrum*), sugarberry (*Celtis laevigata*), sweetgum (*Liquidambar styraciflua*), and water oak (*Q. nigra*). Cabbage palm

(*Sabal palmetto*) is a common to dominant understory component of hydric hammock throughout most of Florida. Loblolly pine may be frequent in some areas, and slash pine is less frequently encountered.

Hammocks are not tolerant of fire. Hammocks tend to occur in locations where fire is not common, or where there is some protection from fire in neighboring ecosystems. Hammocks began developing in historic times in areas where fire was suppressed through human intervention, or where elevations above wetlands were created by dredging, mining, road and roadway building, and other human activities.

Eighty-five exotic plant species have been identified in the preserve. Exotic plants are species not native to the U.S., many of which are invasive and are likely to cause economic or environmental harm; NPS 2017b). Species identified as of concern for spreading include Chinese tallow (*triadica sebifera*), camphor (*Cinnamomum camphora*), Chinese box orange (*Severinia buxifolia*), asparagus fern (*Protasparagus densiflorus*), sword fern (*Polystichum munitum*), and Boston fern (*Nephrolepis exaltata*).

Analysis of Alternatives and Impacts on Vegetation

Impacts of Alternative A—Continue Current Fire Management at TIMU (No-action Alternative)

Growth occurs year-round in southern coastal salt marshes and the lush vegetation is more likely to burn with high intensities within three to four years (Lynch 1941). Prescribed fire emulates a natural fire regime that perpetuates the species diversity and composition and structure of the fire-dependent and fire-influenced marsh communities. The TIMU fire staff would continue to use prescribed fire to achieve resource management in the Cedar Point area of the Black Hammock FMU. Hazardous fuel reduction objectives would be achieved through the use of mechanical fuel treatments, targeted herbicide application, and replanting of native species in other FMUs. Objectives include reducing fuel loads, maintaining the natural ecological function, and controlling non-native species in pinelands, coastal salt marshes, and hardwood hammocks and forests. Impacts of prescribed fires and wildfires are similar with the degree of impact depending on the fire behavior and intensity, which depends on a variety of factors, such as the time of year, fuel composition, soil moisture, and relative humidity.

In the Cedar Point area of the Black Hammock FMU, the use of prescribed fire could result in the alteration of native plant communities. Prescribed fires are typically low-intensity surface fires that help to maintain and enhance the survival of fire-dependent vegetation communities and seedbeds. Overtime in pineland communities, the dominant understory plant species may shift from non-fire dependent to fire dependent, although some encroaching hardwoods may remain depending on season of fire. Prescribed fires would benefit the native vegetation communities by rejuvenating soils with nutrients, which would help to perpetuate grasses and seedlings; reduce competition from invasive plants; maintain open vegetation structure in fire-influenced vegetation communities; and enhance the diversity, structure, composition, and integrity of fire-dependent vegetation communities. Overtime, the use of prescribed fires would be expected to decrease the potential size and intensity of wildfires by reducing hazardous fuel loads. Establishing and maintaining a prescribed fire regime that replicates/mimics the natural fire regime of low intensity, frequent fires would lead to increased vigor and health of the Cedar Point area of the Black Hammock FMU. Other FMUs would not be treated with prescribed fire.

Prescribed fire treatments are ineffective in reducing mature loblolly pine, thus pineland forests would continue to have dense stands of loblolly/slash pines and hardwoods (Waldrop et al. 1987). Prescribed fires are also ineffective in reducing the root systems of hardwoods, which can produce multiple sprouts (Waldrop et al. 1991). The hardwood sprouts can grow faster than longleaf pine seedlings and herbaceous cover (e.g., gallberry), shading out the ground layer and competing for water and nutrients. However, overtime with periodic fires, grasses and forbs could replace the sprouts (Waldrop et al. 1991), although the effect of fire on understory varies greatly by fire season; dormant-season fires are typically less effective in removing hardwood shrubs and saplings (Hodgkins 1958, Platt et al. 1988, Boyer 1990, Waldrop et al. 1991, Glitzenstein et al. 1995, Brockway and Lewis 1997, Brockway et al. 2004)

The existing mature, dense loblolly pine stands in areas outside Cedar Point would have an increased risk for pine beetle infestations. This could increase tree mortality or require trees to be cut and left on site to limit the spread of the infestation. The spatial extent of pines affected from a pine beetle attack would depend on how quickly the stand was treated and climatic conditions (drought conditions). Additionally, hazardous fuels could increase from the dead standing and downed woody debris. This additional fuel loading would increase the potential for high-intensity wildfires. High-intensity wildfires could remove most of the vegetation and soil organic matter (duff/litter), altering soil resources (e.g., kill rhizomes and mycorrhizae) and leading to changes in vegetation species composition, structure, and diversity. Removing most standing vegetation and organic matter could also create bare and burned soils susceptible to establishment of invasive and non-native plant species. Overall, the acres restored successfully and the health and vigor of fire-dependent vegetation communities, including longleaf pine savannas, may be reduced in these areas. Furthermore, over time, fire-dependent vegetation communities could continue to decline in species composition and diversity.

Wildfires would be managed for multiple objectives, with an emphasis on suppression objectives per the 2004 FMP. Wildfires in the coastal salt marshes and hardwood hammocks and forests would continue to be managed with confine/contain strategies rather than aggressive suppression actions, as wildfires would be self-limiting and typically burn out on their own due to the moist soils and wet conditions. Wildland fire management actions in the pineland areas could remove, cut, or trample vegetation from line cutting operations along control lines. Tracked or wheeled equipment approved by the Superintendent, or vehicles that carry fire personnel and equipment, could also trample or remove vegetation. Constructing new firelines is not typically required, as most wildland fires would be contained using existing natural barriers, roads, or trails. When necessary, new firelines would be constructed utilizing MIST tactics to minimize impacts to vegetation and other resources.

Potential spread of invasive, non-native plants and seeds could occur from equipment used by fire crews on wildland fire suppression efforts (e.g., fireline construction equipment, carried on equipment from outside the area) or naturally distributed by wind or animals. Soil disturbance and bare areas from fireline construction could lead to increased opportunities for establishment or spread of invasive, non-native plant species. Mitigation measures would include cleaning equipment before and after use, rehabilitating firelines, utilizing targeted herbicide application, and post-fire monitoring to minimize potential impacts.

Mechanical treatments (typically hand tools or handheld motorized equipment) around TIMU buildings would remove small areas of vegetation to avoid creating large areas of bare ground. Vehicles and crews associated with mechanical work could temporarily trample or remove vegetation adjacent to the 50-foot buffer for defensible space work. The trampled vegetation is expected to recover after the mechanical work is completed and vegetation outside the 50-foot buffer is expected to regrow. Vegetation within and adjacent to the 50-foot zone around buildings is or has been disturbed in the past by infrastructure development and daily staff activities.

Cumulative Impacts

Activities that could cumulatively impact vegetation include feral hogs, fire management activities within the preserve and on adjacent private lands, resource management plans that provide guidance for vegetation management, timber harvesting on adjacent private lands, and growth and development in Duval County.

Due to the history of wildfire suppression and the accumulation of hazard fuel loads within the preserve uplands, these areas are vulnerable to spread of wildfire from adjacent lands. In the event of a spreading wildfire, the fire could adversely impact the forest, and the magnitude of impact would be dependent upon the characteristics of the fire. Impacts could range from minor alterations to the vegetation resulting in negligible impacts to substantial modifications of vegetation resulting in removal of large tracts of vegetation and soil organic matter (duff/litter), alteration of soil resources (e.g., kill rhizomes and mycorrhizae), which could lead to changes in vegetation species composition, structure, and diversity.

Impacts of Alternative B—Use of Additional Vegetation Management Tools and Wildfire Managed for Resource Objectives (Proposed Action and Preferred Alternative)

Impacts to vegetation communities would be similar to those described under Alternative A for prescribed fires and wildfire management/suppression actions. Wildfires managed for multiple objectives, including resource objectives, could increase the number of acres treated by fire and the ability to reduce hazardous fuel loads, thus over time reducing the number of wildfires requiring active suppression actions. Including resource objectives in wildfire management that incorporates prescribed fires could transition high-fuels vegetation communities to low-fuels fire-adapted communities. This would increase species diversity, resilience, and sustainability of fire-dependent vegetation communities. Wildfires managed or partly managed for resource objectives could use natural or manufactured features as containment boundaries that are more distant from the fire, depending on the resource objectives and values to be protected, rather than immediate direct suppression.

These vegetative communities often inhibit the spread of wildfires due to vegetative structure and the presence of natural fuel breaks, thus reducing the need for suppression actions and resultant impacts to vegetation. During drought conditions, the TIMU fire staff may have to take more aggressive fire management actions to prevent spread into non-fire–adapted vegetation communities.

The increased ability to use mechanical treatments preserve-wide would reduce hazardous fuels, help to restore the health, vigor, and species diversity of pinelands, coastal salt marshes, and hardwood hammocks and forests, and create defensible space and fuel breaks where necessary. The use of wheeled/tracked equipment such as masticators to improve the structure, species composition and diversity, and resilience of the pinelands (up to 200 acres annually) could result in damage to non-targeted trees or spread invasive plant species if not managed carefully. The preserve would implement mitigation measures to reduce potential impacts to non-target trees. However, a more open stand would increase sunlight and moisture availability for growth and germination of remaining longleaf pine seedlings, grasses, forbs, and shrubs. Mechanical thinning would be used in the pinelands, in combination with the other fuel/vegetation management tools, to help accomplish ecological restoration.

Planting of longleaf pine seedlings, native hardwoods, and grasses could occur to promote longleaf pine and pineland restoration efforts; seeds would be used in areas that do not have longleaf pine seed sources. Collection of viable, local longleaf pine seeds could be done using a mechanical tree shaker that would travel off-road to collect the best seeds. Individual trees would be shaken to collect pine seeds. Mitigation measures would be taken to avoid damaging crowns, limbs, and trunks of longleaf pine trees and to minimize vegetation damage by the shaker traveling off-road.

Cumulative Impacts

Activities that could contribute to cumulative impacts to vegetation resources within the preserve include fire management activities on adjacent lands as described under Alternative A. With the proposed actions under Alternative B, in time, the risk of the spread of wildfires from adjacent lands would decrease as fuel loads within the preserve become more actively managed. Alternative B would temporarily impact larger areas of vegetation from the use of prescribed fire and mechanical treatments until regeneration of vegetation occurred (typically within a growing season). With time, Alternative B would contribute to beneficial impacts to vegetation resources by reducing hazard fuel loads, thus reducing the potential for intense wildfires and restoring structure and diversity of native forest stands with the return of a natural fire regime in combination with mechanical and herbicide treatments. Implementation of Alternative B would be expected to improve vegetation conditions and contribute to beneficial cumulative impacts. Forest structure and composition as well as health and vigor would be expected to improve over the current conditions, thus improving vegetation conditions.

Impacts of Alternative C—Use of Additional Vegetation Management Tools and Wildfire Managed for Resource Objectives in Preserve Natural Zones Only

Impacts would be the same for prescribed fires and wildfire management/suppression actions as described for Alternative B. However, less acreage would be affected since wildfires managed for multiple objectives, including resource objectives, would not be used in preserve areas outside Natural zones. There is a risk for increases in hazardous fuel loads (dead standing trees, downed woody debris, leaf and needle casts) in preserve areas outside Natural zones. These areas would have an increased potential for high-intensity fires that could result in the removal of large tracts of vegetation, altering the structure, composition, and species diversity of vegetation communities. The degree of impacts would vary depending on fire size, location, extent, timing, and other related factors. Restricted use of all fire management tools outside preserve Natural zones would prevent many ecological restoration efforts.

Cumulative Impacts

Alternative C would have similar cumulative impacts to Alternative B except that vegetation resources outside the preserve Natural zones could have increased adverse cumulative impacts due to the increased risk of intense fires.

Water Resources (Water Quality, Floodplains, Wetlands)

Affected Environment

Approximately 75%, or 35,000 acres, of the lands within the preserve boundaries are wetlands and open water (Wright et al. 2013). Water resources include numerous tidal creeks, portions of the Nassau and St. Johns Rivers, Sisters Creek/Intracoastal Waterway, Fort George River, and freshwater resources (Spanish Pond). Seven types of wetlands have been mapped as part of the National Wetlands Inventory by the U.S. Fish and Wildlife Service in TIMU. The surface waters of TIMU are designated as Outstanding Florida Waters Aquatic Preserve and Other Outstanding Waters. This is a state designation delegated by the EPA under the Clean Water Act and is intended to protect existing high-quality waters.

Generally, TIMU's water quality is considered good compared to other Florida surface waters (Anderson et al. 2005). Tidal flushing and the coastal salt marshes are considered to be important contributing factors in water quality because upstream areas of the Nassau and St. Johns rivers are degraded. There are current and potential stressors to water quality in the preserve. Water quality monitoring conducted in 2013 identified 70% of sampled sites as fair and 30% as good (Wright et al. 2013). In general, sites with good water quality were located in inlets, sounds, or open water, while fair ratings were found in salt marshes. Potential stressors that fire management activities could contribute to include erosion, turbidity, and sedimentation. There could be increased turbidity after rain events on recently burned areas near the Nassau and St. Johns Rivers. Stressors outside the preserve include nonpoint-source pollution from urban and agricultural areas, elevated metal concentrations in the sediments of the St. Johns River, impacts of several Superfund sites and landfills, and pollution from malfunctioning septic systems within and adjacent to TIMU.

Analysis of Alternatives and Impacts on Water Resources

Impacts of Alternative A—Continue Current Fire Management at TIMU (No-action Alternative)

Under Alternative A prescribed fires would not be used in the preserve coastal salt marsh. Hazardous fuel loads within upland forested areas would remain and continue to accumulate, which would increase the potential for high-intensity wildfires in untreated areas. Wildfires could impact waterbodies in salt marshes by burning adjacent vegetation during extreme fire conditions. Removal of vegetation along salt marsh banks and immediately adjacent to salt marshes could increase sediment deposits from soil erosion and water temperatures, as well as temporary increased surface flow during precipitation events until regrowth of vegetation. However, wildfires are expected to continue to be rare events in the preserve coastal salt marsh and small in size, as they are typically self-limiting due to moist conditions (e.g., moist soils, surface water that acts as a natural barrier). Thus, salt marshes would continue to be managed using confine/contain strategies.

In the hardwood hammocks and upland forest wetlands and waterbodies, prescribed fires and wildfires may remove or reduce vegetation along banks. Vegetation removal or reduction could cause a temporary increase in water temperatures, soil erosion, and sediment and nutrient yield. This could lead to a temporary increase in turbidity and sedimentation of surface waters along impacted banks until regrowth of herbaceous cover. Vegetation would be expected to recover within one or two years, with hydrological conditions returning to pre-fire conditions.

Prescribed fires and wildfires could provide a temporary influx of nutrients to the banks of water resources from burned plant biomass. The influx of nutrients stimulates seed production and new vegetation growth, helping to perpetuate the vegetation and wildlife species associated with water resources in the preserve, such as wetlands (Craft and Casey 2000, Battle and Golladay 2001). The influx of nutrients, especially nitrate, into surface waters may be a concern following a fire. However, studies have found no change in nitrate concentrations from pre– to post–prescribed fire conditions in pine-mixed hardwood forests and longleaf pine savannas in the Southeast (Elliott and Vose 2005, Vose et al. 2005). A wildfire simulation with 100% overstory mortality showed only an increase of nitrate into surface waters, which was attributed to the reduced nitrogen uptake from lack of vegetation (Vose et al. 2005). Therefore, the intensity and duration of impacts to water quality from the temporary influx of nutrients would depend on the fire intensity, amount and frequency of precipitation events following a fire, and the ability of the remaining or new vegetation to act as a filter.

In the pinelands, wildfires would be more aggressively managed due to their potential to spread into drier fuels. In most cases, the NPS would use indirect tactics to contain fire at nearby roads, trails, or natural barriers, depending on conditions. Wildfire suppression tactics could impact water quality because gas-powered equipment may release oil or other petroleum products, and wheeled vehicles could increase turbidity in standing water. The use of fire retardants, gels, or foams, by fire engines, helicopters, or fixed-winged aircraft could also temporarily alter the water quality of surface waters if misapplied or mishandled. These fire suppression chemical agents contain detergents or fertilizer-type chemicals that temporarily change water quality, interfering with the ability of fish gills to absorb oxygen and other aquatic organism functions. These impacts are temporary, as dilution occurs with stream flow and mixing with fresh water downstream. The degree of impact would depend on the amount of foam or retardant dropped into the waterbody, the size of the waterbody, and the volume of flow. However, mitigation measures would limit the use, type, and proximity to waterbodies (i.e., no use within 300 feet of waterbodies), making potential impacts to water quality minimal.

Use of equipment or ATVs and UTVs for off-road travel (with Superintendent approval) could destabilize banks of waterbodies. These impacts would be mitigated by minimizing off-road travel, utilizing READs, and prompt rehabilitation of any damaged stream banks.

Water drops used to suppress fires may be obtained from freshwater resources within the preserve, such as the Nassau or St. Johns Rivers, which ensures that the water quality of dropped water is of the same as existing surface water resources. In addition, air tankers and helicopters used for water drops must rinse out tanks prior to responding to fires in the preserve. The use of water resources in the preserve for water drops is expected to temporarily reduce flow in the surface water used on an hourly timeframe. Saltwater resources would only be used if there was imminent threat to life or property.

Cumulative Impacts

Actions that contribute to adverse cumulative impacts include existing practices at the preserve and adjacent private facilities (septic tanks), roads leading to waterbodies, adjacent upstream forestry and industrial operations, and agricultural practices. The proposed fire management activities under Alternative A would continue to reduce hazardous fuels, thus reducing the risks for intense, large wildfires on about 140 acres in the Cedar Point area. The contribution to adverse cumulative impacts from prescribed fires would be negligible to upland water sources because impacts would occur on 140 acres and would last until regrowth of herbaceous cover along stream banks. Wildfires are expected to continue to be rare events in the preserve and small in size, as they are typically self-limiting due to moist conditions. Therefore, contribution to adverse cumulative impacts from wildfires would be negligible.

Impacts of Alternative B—Use of Additional Vegetation Management Tools and Wildfire Managed for Resource Objectives (Proposed Action and Preferred Alternative)

Impacts would be the same for management of wildfires and prescribed fires as those described under Alternative A. These would include the temporary increase in temperature, erosion, and sediment and nutrient yields from the removal of vegetation in pinelands. However, wildfires managed for multiple objectives, including resource objectives, could decrease the potential for intense, large wildfires over time. Wildfire impacts would move within the range of naturally occurring wildfires, thus reducing impacts from fire suppression activities in near-by water resources. Additionally, wildfires managed for resource objectives may be managed under less rigorous fire conditions than suppression-oriented wildfires, thus containment boundaries could be more distant (natural barrier), and vegetation impacts should not be as intense.

The increased ability to use mechanical treatments preserve-wide is not expected to increase ground disturbance near waterbodies from that associated with current fire management strategies. This is because wheeled/tracked equipment (i.e., masticators, mechanical tree shaker) would be used in the pinelands to support ecological restoration efforts and not in marsh areas. Furthermore, TIMU fire managers plan mechanical treatments to minimize water quality impacts. Mechanical treatments would not occur near streams or surface waters, thus impacts would be mitigated by avoidance, where possible. If mechanical work is unavoidable near a stream or surface water, immediate rehabilitation would occur using appropriate restoration measures. Appropriate measures could include but are not limited to scarification and seeding with native seeds, brushing, or placing slash over the disturbed areas to prevent soil erosion. Given the annual acreage treated by mechanical works could be up to 300 acres spread across the pinelands landscape and along preserve boundaries, the use of mechanical treatments for additional reasons would not be expected to have much effect on water resources.

The increased ability to reduce hazardous fuels and thinning dense forest stands could increase the likelihood that future fires would burn with lower intensities. Lower-intensity surface fires could burn or remove some vegetation along banks but would be expected to leave adequate vegetation along banks to act as filters for water resources. Prescribed fires could produce increased localized erosion and sedimentation, but the amount and duration of impacts to water quality would depend on the timing and intensity of precipitation events before re-establishment of burned vegetation, and the ability of the remaining vegetation to act as a filter. Vegetation would be expected to recover quickly as hydrological conditions returning to pre-fire conditions.

Prescribed fires could be used in coastal salt marshlands. Prescribed fire use in these island areas would only be used if modeling and analysis show that it would be effective in helping restore these areas to typical coastal salt marsh vegetation types. Potential water quality impacts to the surrounding waters from prescribed fires would be the same as described above for lower-intensity surface fires.

All herbicide treatment areas would have individual treatment plans. These would be developed by the TIMU fire staff, employing specific mitigation measures (see Mitigation Measures section), after approval of herbicide use by the NPS regional office. Approvals may be given after considering numerous factors including: the target use, location where the application will occur, potential threatened and 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). Furthermore, all herbicides used in or near waterbodies or wetlands would be applied according to the labels to reduce the potential for herbicide drift.

Cumulative Impacts

Adverse cumulative impacts to water resources would be similar to Alternative A. However, Alternative B would contribute to beneficial cumulative impacts to water resources due to the increased ability to reduce hazardous fuel loads and thinning of dense, mature forest stands, which increases the likelihood for localized, lower-intensity fires. Lower-intensity wildfires would be expected to leave vegetation along the banks of water resources to serve as filters to protect water quality and could produce less sedimentation and erosion compared to Alternative A.

Impacts of Alternative C—Use of Additional Vegetation Management Tools and Wildfire Managed for Resource Objectives in Preserve Natural Zones Only

Under Alternative C, water resource impacts would be the same as described for Alternative B. However, the Cultural and Development zones within the preserve would not benefit from fire managed for resource objectives, mastication, prescribed fire, or forest restoration. This may increase fuel loadings and result in high-intensity wildfire that could impact nearby water resources by temporarily increasing the transport of sediment and nutrients, water temperature, and erosion of banks of waterbodies. Additionally, the increased potential for local, high-intensity fires could decrease the overall health and vigor of vegetation communities that serve as filters for water resources. The degree of impacts to water resources would vary depending on fire size, behavior, location, extent, timing, and other related factors.

Cumulative Impacts

Alternative C would have cumulative impacts similar to Alternative B, except that water resources within Cultural and Development zones could have increased adverse cumulative impacts due to the increased potential risk for fires to burn at high intensities.

Wildlife

Affected Environment

The preserve provides exceptional terrestrial and aquatic habitat for a variety of native mammal, reptile, amphibian, bird, and fish species. The preserve hosts 25 species of mammals (NPSpecies database) including bobcat (*Lynx rufus*), eastern gray squirrel (*Sciurus carolinensis*), common gray fox (*Urocyon cinereoargenteus*), white-tailed deer (*Odocoileus virginianus*), hispid cotton rat (*Sigmodon hispidus*), and Virginia opossum (*Didelphis virginiana*).

A diverse array of tree and shrub species provides abundant production of fruits, including acorns and habitat communities on the preserve provide valuable breeding and stopover habitat for birds. Approximately 312 avian species (NPSpecies database) have been recorded in the preserve, and the forest habitats support species such as red-shouldered hawk (*Buteo lineatus*), red-headed woodpecker (*Melanerpes erythrocephalus*), brown-headed nuthatch (*Sitta pusilla*), Swainson's warbler (*Limnothlypis swainsonii*), and pine warbler (*Dendroica discolor*).

Twenty-three amphibian species and 43 reptile species have been documented at TIMU. Most amphibian species documented at TIMU prefer more aquatic habitats; however, the oak toad (*Anaxyrus quercicus*) and gopher frog (*Lithobates capito*) are two species commonly found in sandy pine flatwoods, open pine, and pine–oak woods. Both the oak toad and the gopher frog prefer open-canopied pine flatwoods with grassy ground cover (Greenberg 2002).

The sandy pine flatwoods and the variety of aquatic habitats in TIMU support 43 species of reptiles including southeastern five-lined skink (*Eumeces inexpectatus*), six-lined racerunner (*Cnemidophorus sexlineatus*), pine woods snake (*Rhadinaea flavilata*), eastern diamondback rattlesnake (*Crotalus adamanteus*) and pygmy rattlesnake (*Sistrurus miliarius*).

Non-native invasive species in the preserve include wild pigs (*Sus scrofa*) and feral dogs (*Canis domesticus*) and cats (*Felis catus*). These non-native species pose threats to a variety of preserve resources, including native plant and wildlife species.

Analysis of Alternatives and Impacts on Wildlife

Impacts of Alternative A—Continue Current Fire Management at TIMU (No-action Alternative)

Wildlife response to fire is primarily influenced by fire season, behavior, size, location, fuel composition, and soil moisture. Wildland fire suppression tactics would temporarily increase disturbance to individuals within and near the fire due to noise from human presence and equipment, smoke, fire, and vegetation removal. Loss of habitat or displacement may occur for individuals within wildfire areas. The length of displacement may be temporary or permanent depending if the habitat is permanently altered. Temporary displacement of species due to disturbances related to suppression tactics would have a short-lived effect on wildlife and would unlikely result in any permanent changes to wildlife populations at TIMU. If habitat is permanently altered, some species may be displaced permanently, which would result in a loss of that species from areas affected by suppression tactics. Depending on the intensity and size of wildfire area, habitat alterations due to the fire may benefit some species (e.g., southeastern five-lined skink), while other species would be negatively impacted (Greenberg 2002). This means that some populations of species, such as the five-lined skink, may increase due to fire-induced habitat alterations resulting in more favorable habitat for the skink. Disturbances to wildlife within a wildfire area could result from helicopters transporting firefighter personnel and low-level fixed-winged aircraft and retardant drops that could be used in fire suppression actions. In addition, reproduction and survival for individuals could be impacted from increased stress and loss of foraging opportunities from removal of vegetation after a high-intensity wildfire. Mortality to small and less mobile wildlife species, such as turtles, snakes, and small mammals, may also occur from wildfires, while larger wildlife species may become disoriented and unable to move out of the fire path in time. Disturbances due to aircraft (helicopter or fixed wing) could result in a temporary displacement of species but is unlikely to impact the population dynamics of species at TIMU. Mortality due to wildfire of small or less mobile species such as turtles, snakes, or small mammals may suppress population growth immediately following wildfire event; however, it is unlikely, unless wildfire is catastrophic, that species would not be able to bounce back from the fire event.

Prescribed fire in the Cedar Point area would continue to benefit wildlife. Prescribed fire emulates the natural fire regime, creates a more historic and natural vegetation pattern, and provides more nesting habitat (standing dead and downed debris), thus benefiting species like the brown-headed nuthatch and six-lined race runner (Greenberg 2002, Slater et al. 2013). Prescribed fire could create some localized areas of early successional vegetation and enhance the diversity of vegetation communities and wildlife habitat present in the preserve. Following a prescribed fire, there would be an influx of nutrients in the soils, which could increase vegetation growth, ground cover for security and escape cover, and the nutritional quality of forage for wildlife species. The burned areas generally green up earlier than non-burned areas, providing earlier foraging opportunities (Redmon and Bidwell 2003). The effects of treatments on forest understory composition and growth vary. Overall, the use of fire and other tools to recreate historic forest conditions is recommended for wildlife because it helps restore a mosaic of ecosystem types that can benefit multiple species (Van Lear and Harlow 2000).

Prescribed fires could impact nesting resident and migratory birds if conducted during breeding/nesting season (generally March to August) through mortality of nestlings and fledglings at ground level or in the lower canopy that are unable to fly to avoid the smoke and fire. Effects on overall breeding success would vary by species and is difficult to predict, as bird abundance and species richness often do not show changes until several years post-fire (King et al. 1998, Greenberg et al. 2007). Some nesting birds could become more susceptible to predators, such as raccoons, due to the opening of the understory and increased open areas, habitat that favors racoons (Jones et al. 2004). However, fires have played a long-term integral role in the maintenance of vegetation communities in the preserve, with avian species in the preserve evolving with periodic fires; some avian species require periodic fires to maintain suitable habitat conditions and viable populations (e.g., red-cockaded woodpecker, red-headed woodpecker, and brown-headed nuthatch). 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 may result in beneficial impacts on birds that inhabit fire-adapted vegetation communities, such as increase in food availability (increased insect abundance) and improved breeding and foraging habitat by maintaining preferred vegetation structure, such as a more open canopy or sufficient vegetative ground cover.

In portions of the pinelands, the dense mature loblolly pine would persist due to the ineffectiveness of prescribed fire to restore stands to a more open structure. Without sufficient ecological restoration, portions of the pinelands would remain in a homogenous state of diversity, thus limiting wildlife habitat quality. Additionally, dense, mature loblolly pine stands would have an increased risk for pine beetle infestations, which could increase hazardous fuels from dead standing or downed pine trees. This could result in wildfires burning with higher intensities and negatively impacting vegetation, causing habitat loss and displacement of wildlife species in these pinelands.

Increased pine beetle infestation could also impact wildlife habitat and food availability. An infestation could change the forest structure and species composition and abundance, with cavity nesters increasing and security and escape cover for small mammals increasing. Food availability could increase for insectivorous birds as pine beetle populations increase. Sunlight penetration through dead trees could increase production of grasses and forbs and browse for wildlife. Individual wildlife species responses would differ significantly based on their ecological requirements and their ability to use the modified habitat.

Impacts to fish-bearing streams in the preserve from prescribe fires would not occur and impacts from wildfires are unlikely, as most occur in the coastal salt marsh where wildfires are rare and self-limiting due to wet conditions. During drought conditions, fish-bearing waterbodies could be impacted by wildfires that spread into marsh areas from removal of streamside vegetation that provides shade, increasing the water temperature until revegetation occurs. Impacts to fish populations would depend on fire severity, size, location, and proximity to fish populations, as downstream reaches could cool rapidly if vegetation is present (Johnson 2004). Waterbodies 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.

Cumulative Impacts

Actions that could contribute to cumulative impacts on wildlife species and their habitat under Alternative A include the ongoing development adjacent to the preserve, fire management actions in the preserve, traffic along roads, and wildland fires on neighboring lands. All of these actions could temporarily or permanently disturb or displace local wildlife species. Additionally, the continued growth and development in the surrounding area could contribute to the conversion of wildlife habitat to developed lands outside the preserve. This would increase habitat fragmentation and loss of habitat in the area, which has caused habitat degradation and degradation to ecosystem function in the region. Alternative A would contribute negligibly to adverse cumulative impacts due to increased disturbance to individual wildlife species.

Impacts of Alternative B—Use of Additional Vegetation Management Tools and Wildfire Managed for Resource Objectives (Proposed Action and Preferred Alternative)

Impacts to wildlife and their habitat would be similar to those described under Alternative A; however, the spatial extent of reducing hazardous fuels and restoring fire-dependent habitats in the preserve would increase because managing wildfires for resource objectives, prescribed fires in coastal salt marsh areas, mechanical treatments, planting of longleaf pine and native trees and grasses, and targeted herbicide application are allowed. Prescribed fire would be used in the pinelands, as described in Alternative A, and could be supported with the additional vegetation management tools, resulting in a more effective restoration of historic pineland conditions. Restoring pinelands to historic conditions would benefit many wildlife species at TIMU. Species such as the six-lined racerunner, oak toad, brown-headed nuthatch, and red-headed woodpecker have been shown to respond well to pineland restoration resulting in mixed stand-sized, open-canopied savannas with grassy ground cover (Greenberg 2002, King et al. 2005, Slater et al. 2013) Overall, under Alternative B, more acres could be treated in fire-adapted vegetation communities, which would benefit associated wildlife species by improving habitat quality.

Managing wildfires for multiple objectives, which could include resource objectives, may help further reduce hazardous fuel loads by treating more acres with wildland fire. Wildfires managed for multiple objectives over time would further decrease the potential for intense, large wildfires and the associated impacts to wildlife species from displacement and disturbance within and adjacent to the burn areas. Over time, wildfire behavior would move within the range of naturally occurring fires across the landscape, thus reducing impacts to wildlife species and their habitat from fire suppression activities. Furthermore, wildfire containment boundaries (existing natural or human made barriers) could be more distant, depending on the resource objectives and values to be protected.

Prescribed fires in the coastal salt marsh areas would likely be low-intensity surface fires because the soils are moist almost year-round. Prescribed fires would help restore the marsh grasses, thus benefitting associated wildlife species like wading birds and fish. Prescribed fire use in the coastal salt marsh would only be used if modeling and analysis shows that it would be effective in helping to restore these areas to typical TIMU coastal salt marsh vegetation types.

The increased ability to use mechanical treatments to reduce hazardous fuels, thin dense, mature pine and hardwood stands, and to create defensible space and fuel breaks would decrease the probability of intense wildfires. Mechanical treatments would be small in scale (up to 200 acres annually, which is less than 1% of the total land in the preserve) but would help restore longleaf pine habitat and associated wildlife species by reducing the potential for pine beetle infestation and opening the understory to sunlight and reducing competition for nutrients, both of which would benefit grasses, forbs, and longleaf pine seedlings (Van Lear et al. 2005). Over time, species abundance and diversity of the herbaceous layer would increase, which would improve the habitat for many wildlife species and could influence species diversity outcomes. Additionally, collection of viable, local longleaf pine seeds could be done using a mechanical tree shaker that would travel off-road to collect the best seeds. Mechanical treatments and seed collection could displace or disturb wildlife species temporarily within the treatment area until the work is completed. However, restoring pineland habitat and longleaf pine communities would have an overall positive effect on native wildlife species counteracting the temporary disturbance related to seed collection actions.

Planting of longleaf pine seeds, saplings, and other native plants could occur to promote the restoration of longleaf pine savannas. Speeding up restoration could shorten the period where mechanical and herbicide treatments are needed to reduce competition for successful establishment of longleaf pines. Restoring longleaf pine savannas would beneficially impact resident species of longleaf pine savannas due to improved habitat for these species.

Targeted herbicide application as a follow-up treatment to mechanical and fire treatments—such as foliar application to specific basal or foliar plant areas—would minimize chances for overspray and impacts to non-target plants. Additionally, mitigation measures, limited use, low-volume application of herbicide, and adherence to label warnings and instructions would minimize chances of impacts to non-target plants. Herbicides commonly used for vegetation management (e.g., triclopyr [Garlon® 4/Element™ 4], glyphosate, imazapyr, sulfometuron, metsulfuron methyl, hexazinone) have been designed to target biochemical processes unique to plants and have low levels of direct toxicity or risk to wildlife and fish when used in accordance with label specifications (Tatum 2004). Herbicides commonly used for vegetation management also degrade quickly upon entering the environment and are neither persistent nor bioaccumulate (Tatum 2004). Over time, using targeted herbicide as a follow-up treatment to mechanical work or prescribed fire would reduce and/or cease the need for repetitive mechanical work, thus minimizing a reoccurring disturbance to wildlife species and their habitat.

Cumulative Impacts

Adverse cumulative impacts to wildlife for Alternative B would be the same as described for Alternative A. However, over time, aggressive wildfire suppression actions may be less than Alternative A as less fireline construction and holding may be used. Alternative B would also treat and restore more acres of native pinelands, coastal salt marsh, and hardwood hammock and forest habitat, thus contributing beneficial impacts to wildlife by improving habitat quality.

Impacts of Alternative C—Use of all Fire Management Tools in Fire Management Units Only Use of Additional Vegetation Management Tools and Wildfire Managed for Resource Objectives in Preserve Natural Zones Only

Under Alternative C, impacts to wildlife and their habitat would be similar as described under Alternative B. However, pine beetle infestations and hazardous fuel loads could increase over time in Cultural and Development zones. This would result in the perpetuation of dense forest stands with increased risk for pine beetle infestations, which could contribute to hazardous fuel loads as standing or fallen dead trees. These conditions would likely increase the intensity of wildland fires that originate and/or spread into the other preserve zones. Higher-intensity wildland fires could remove large tracts of vegetation and reduce the resilience and integrity of native wildlife and their habitat. In addition, without successful ecological restoration (i.e., lower intensity, surface fire mimicking natural fire cycles), fire-dependent vegetation may decrease in prevalence and vigor, with negative effects on native wildlife species. The degree of impacts to wildlife and their habitat would vary depending on fire size, location, extent, timing, and other related factors.

Cumulative Impacts

Adverse cumulative impacts for Alternative C would be the same as described for Alternative B. However, over time, wildlife habitat outside the natural zone could have increased risk for wildfires to be high-intensity that would be more likely to spread into adjacent areas. This could lead to slightly more aggressive wildfire suppression actions than under Alternative B, as fireline construction and holding actions would most likely be needed outside the natural zone.

Special Status Species

Affected Environment

Under the Endangered Species Act (ESA), the NPS has the responsibility to address impacts to federally listed threatened or endangered species. National Park Service policy dictates that an assessment of impacts for federal candidate species, proposed federal species, and state-listed species occur during the NEPA process.

Thirteen animal species could occur in TIMU that are protected at the federal or state level. Of the thirteen species, ten are listed as either federally threatened or endangered, and one is listed as a candidate for listing. The Florida Fish and Wildlife Conservation Commission has listed two additional species, not listed federally, as threatened and one species as endangered (candidate for federal listing). There are eight species of plants listed as threatened in Florida, but they are not protected by federally. Additionally, there are four plant and 54 animal species (one amphibian, 49 birds, one mammal, two reptiles, and one insect) recognized as species of concern by the NPSpecies database. Typically, species listed as species of concern 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 TIMU was obtained from the USFWS IPAC website (http://ecos.fws.gov/ipac/) on January 16, 2017 (consultation tracking numbers 04EF1000-2017-SLI-0170); 2) TIMU official species list from NPSpecies; and 3) state-listed species that may occur in or near TIMU. Species that were eliminated from detailed analysis in this EA include: 1) species that were extirpated or are not believed to occur within TIMU; 2) species that occur in areas that would not be affected by fires, such as estuarine areas, mangroves, and coastal areas; 3) species that occur in rivers, bottomland hardwood forests, and floodplains as these areas would not be affected by fires (wildfires are expected to continue to be small and burn out on their own in the floodplain); and 4) species that are not a resident or breeding species or are a rare visitor during bird migration. Table 2 summarizes federal and state special status species that are known to occur within TIMU. There were eight animal species and five plant species retained for analysis. There is no designated critical habitat, as defined by the USFWS, within the preserve.

Table 2. Federal and State-Listed Endangered, Threatened, And Species of Concern with Potential to Occur in the Preserve.

Species	Federal Status*	State Status*	Habitat	Threats
Mammals				
West Indian Manatee (***Trichechus manatus***)	T	E	Coastal waters, estuaries, and warm water outfalls. No impacts expected; this species will not be discussed further.	Initial decreases probably due to overharvesting for meat, oil, and leather. Current mortality due to collisions with boats and barges and from canal lock operations. Declines also related to coastal development and loss of suitable habitat, particularly destruction of sea grass beds.
Birds				
Wood stork (***Mycteria americana***)	T	T	Primarily feed in fresh and brackish wetlands and nest in cypress or other wooded swamps. Active rookeries are located in Duval County.	Decline due primarily to loss of suitable feeding habitat, particularly in south Florida. Other factors include loss of nesting habitat, prolonged drought/flooding, raccoon predation on nests, and human disturbance of rookeries.
Snowy plover (***Charadrius nivosus***)	-	T	Nests on the ground on broad open beaches or salt or dry mud flats where vegetation is sparse or absent. Rare winter visitor to Florida's Atlantic coast. No impacts expected; this species will not be discussed further.	Poor reproductive success and probable negative effects on roosting and foraging plovers due to human disturbance (including recreational beach use and mechanical raking of beaches; USFWS 2007, Küpper et al. 2011).
Piping plover (***Charadrius melodus***)	T	T	Winter on Florida's Atlantic coast; prefer areas with expansive sand or mudflats (foraging) in close proximity to a sand beach (roosting).	Habitat alteration and destruction and human disturbance in nesting colonies. Recreational and commercial development has contributed greatly to loss of breeding habitat.
Red knot (***Calidris canutus rufa***)	T	T	Winter on Florida's Atlantic coast; found primarily in intertidal, marine habitats, especially near coastal inlets, estuaries, and bays.	Overall reduction in food resources including declining horseshoe crab populations.

Species	Federal Status*	State Status*	Habitat	Threats
Least Tern (***Sterna antillarium***)	-	T	Breeds on sandy, gravelly beaches and banks of rivers or lakes. No impacts expected; this species will not be discussed further.	Human use and development of nesting habitat.
Red-cockaded woodpecker (***Picoides borealis***)	E	E	Nest in mature pine with low understory vegetation (<1.5m); forage in pine and pine hardwood stands > 30 years of age, preferably > 10" DBH.	Reduction of older-age pine stands and encroachment of hardwood mid-story in older-age pine stands due to fire suppression.
Fishes				
Shortnose sturgeon (***Acipenser brevirostrum***)	E	E	Atlantic seaboard rivers. No impacts expected; this species will not be discussed further.	Construction of dams and pollution, habitat alterations from discharges, dredging or disposal of material into rivers, and related development activities.
Amphibians				
Frosted flatwoods salamander (***Ambystoma cingulatum***)	T	T	Occupies seasonally wet, pine flatwoods and pine savannas in the southern U.S. Typically found under logs near small cypress ponds.	Conversion of pine flatwoods habitat, drainage of breeding ponds, and habitat alteration resulting from fire suppression.
Reptiles				
Hawksbill sea turtle (***Eretmochelys imbricate***)	E	E	Pantropical, warm temperate regions. Nests on beaches with deep sand, infrequently along central and southern Atlantic Florida coasts. No impacts expected; this species will not be discussed further.	Commercial shell trade, subsistence (meat) and loss of suitable nesting habitat due to beach development.
Leatherback sea turtle (***Dermochelys coriacea***)	E	E	Nests in Florida; migrates through Florida’s coastal waters. No impacts expected; this species will not be discussed further.	Human exploitation, beach development, high predation on hatchlings, and drowning when caught in nets of commercial shrimp and fish trawls and long-line and driftnet fisheries.
Gopher tortoise (***Gopherus polyphemus***)	C (eastern portion of their range)	T	Prefers well-drained sandy areas with a sparse tree canopy and abundant low-growing vegetation. Commonly found in sandhill, pine flatwoods, scrub, scrubby flatwoods, dry prairies, xeric hammock, pine–mixed	Threats include urbanization, forest management practices that have resulted densely planted sand pine or slash pine; the dense canopy shades the understory and prevents the growth of grasses and herbaceous plants that provide food.

Species	Federal Status*	State Status*	Habitat	Threats
			hardwoods, and coastal dunes habitat.	
Eastern indigo snake (***Drymarchon corais couperi***)	T	T	During winter, den in xeric sand ridge habitat preferred by gopher tortoises; during warm months, forage in creek bottoms, upland forests, and agricultural fields.	Habitat loss due to uses such as farming, construction, forestry, and pasture and to over collecting for the pet trade.
Plants				
Bartram's ixia (***Calydorea coelestina***)	-	E	Endemic to northern Florida and is found in wet to mesic flatwoods.	Urban development, agriculture, fire suppression, and soil disturbance/drainage.
Godfrey's swamp privet (***Forestiera godfreyi***)	-	E	Upland hardwood forests with limestone at or near the surface, often on slopes above lakes and rivers.	Invasion of Chinese privet, other invasive exotic shrub species, and residential development.
Incised agrimony (***Agrimonia incisa***)	-	T	Found in fire-maintained longleaf pine–oak, longleaf pine–deciduous scrub oak, sandy or sandy loam habitat.	Loss of habitat through exclusion of fire or conversion to intensively managed pine plantations.
Plumed rockcap fern (***Pecluma plumula***)	-	E	Found growing on tree branches or limestone in hammocks, wet woods, and lime sinks.	Habitat has been reduced by drainage, logging, and development.
Southern lipfern (***Cheilanthes microphylla***)	-	E	Found growing in rock crevices of limestone outcrops and on coastal shell mounds. No impacts expected; this species will not be discussed further.	Exotic pest plant invasions, sea-level rise, and poaching.
Spoonleaf sundew (***Drosera intermedia***)	-	T	Occurs in moist habitats including bogs, fens, wet sandy shorelines, and wet meadows.	Unknown

*E = endangered, T = threatened, C = candidate for listing

Analysis of Alternatives and Impacts on Special Status Species

Impacts of Alternative A—Continue Current Fire Management at TIMU (No-action Alternative)

Impacts Common to All Species

Under this alternative, the current fire management program would continue. Special status species would respond to wildfires and prescribed fires in the same manner, with the degree of impacts depending on the time of year, fire behavior, size, location, fuel composition, and other variables. Wildland fire suppression tactics—such as fireline construction, use of portable pumps, fire engine use on roadways, and noise from human presence and fire equipment—could temporarily displace or stress special status wildlife species within and near the burn area.

Continuing to utilize prescribed fires within the Cedar Point area to reduce hazardous fuel loads would reduce the intensity of future wildfires, which are easier to manage/suppress and have less impact on special status species and their habitats. Many of the special status species and habitats are fire-dependent; low-intensity ground fires emulate the historic variety/range of fire behavior and fire effects. In addition, continued use of prescribed fires may reduce hazardous fuels, increase cover of grass and herbaceous layers, decrease density of forest stands, and increase forest openings in some treated areas. The decreased density of forest stands and the creation of some forest openings would reduce the competition for available resources for longleaf pine seedlings and could improve the health and vigor of longleaf pine stands. Prescribed fire plans would include mitigation measures to minimize any potential impacts to known special status species and their habitats. Overall, Alternative A would benefit special status species by restoring fire-dependent vegetation communities and minimizing the potential for future severe wildfires only in the Cedar Point area of the Black Hammock FMU.

However, relying on prescribed fires alone as the primary vegetation/fuels management tool would be ineffective in fully restoring fire-dependent ecosystems, including the longleaf pine community. Prescribed fires are ineffective in reducing/thinning mature loblolly pine and larger sweetgums (Waldrop et al. 1987). Thinning is needed to create patches of open canopy to promote the establishment of a diverse and abundant herbaceous layer and longleaf pine seedlings. Without restoration of the fire-dependent vegetation communities, the habitat integrity for special status species would likely continue to degrade. In portions of the upland forests, ladder fuels would continue to accumulate in the dense, mature pine and hardwood stands with closed overstories and mid-stories. The increased hazardous fuel could lead to increased potential for localized, high-intensity wildfires. Such wildfires could remove large tracts of vegetation, causing habitat loss and displacement of special status species. Furthermore, these pinelands would have an increased potential for pine beetle infestations, which would degrade the vigor and health of forest stands, thus reducing pine-associated wildlife habitat. Pine beetle–infested trees could also contribute to hazardous fuel load as standing or downed dead trees. Without sufficient ecological restoration in fire-adapted habitats, these mature, dense pine and hardwood stands would continue to lack the highly diverse habitat components that comprise the functional fire-adapted ecosystems of south Florida.

Birds

Wood Stork— Wood storks are, in general, not highly susceptible to the effects of fire. While there are no known nesting pairs of storks in TIMU management units, pairs have been documented over the years in Duval County. Under Alternative A, if prescribed fires are carried out during stork nesting season (May–July, Rodgers 1990), and, depending on conditions that are required to successfully accomplish the objectives of prescribed fires in the Cedar Point area of the Black Hammock management unit, breeding/nesting storks could be impacted by smoke. However, these prescribed fires would be conducted with mitigations to avoid potential impacts to stork nesting areas if nesting storks should occur or are discovered in the area. 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 to 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 and currently do not occur in TIMU.

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; thus, Alternative A is not expected to have an effect on wood stork use in the preserve.

Piping Plover—Piping plovers spend the winter on beaches along the Gulf of Mexico, the southern Atlantic Coast, and in the Bahamas. They inhabit sandy beaches, sand flats, and mudflats along coastal areas. This is a migratory species that does not breed in Florida and are in general not highly susceptible to the effects of fire. They would likely move away from a fire or fire management disturbance, and they tend to forage in shallow water with only sparse emergent vegetation that would not likely burn.

Fire management, aviation, wildfire operations, effects monitoring, and other fire-related activities could temporarily disturb piping plovers. Disturbance resulting from aviation activities and the presence of fire management and monitoring personnel may cause temporary changes in behavior that may affect normal feeding and sheltering. Foraging birds are likely to respond to disturbance by moving out of the area; thus, Alternative A is not expected to have an effect on piping plover use in the preserve.

Red Knot—The red knot migrates annually between its breeding grounds in the Canadian Arctic and several wintering regions, including the southeastern U.S., the northwest Gulf of Mexico, northern Brazil, and Tierra del Fuego at the southern tip of South America. This is a migratory species that does not breed in Florida, and in general, are not highly susceptible to the effects of fire. In the event of a fire or fire management disturbance, red knots would likely move away from the fire or fire-related activity. Because red knots forage along coastlines where sparse emergent vegetation exists, it is likely their foraging and wintering habitat would not burn or be significantly impacted from a low-intensity surface fire.

Fire management, aviation, wildfire operations, effects monitoring, and other fire-related activities could temporarily disturb red knots. Disturbance resulting from aviation activities and the presence of fire management and monitoring personnel may cause temporary changes in behavior that may affect normal feeding and sheltering. Foraging birds are likely to respond to disturbance by moving out of the area; hence, Alternative A is not expected to have an effect on red knot in the preserve.

Red-cockaded Woodpecker—Prescribed fire would continue to be used to maintain existing open, park-like stands of mature longleaf and loblolly pine in which this species has evolved, although none have been recorded in the preserve. Prescribed fires have the ability to control hardwoods and shrubs without damaging the herbaceous layer and soils (USFWS 2003), to an extent. Prescribed fire will not suffice to restore areas highly encroached by hardwoods. In addition, season of fire influences the effectiveness of prescribed fire in restoring longleaf pine habitats. Prescribed fire as a restoration tool, often combined with other restoration methods, does emulates historic fire regimes and aids in the reproduction, growth, and maintenance of longleaf pine and other species and aids in reestablishing highly diverse native groundcovers, all important factors of healthy and suitable red-cockaded woodpecker habitat (USFWS 2003).

Under Alternative A, dense, mature pine and hardwood stands would persist in the preserve due to the inability of prescribed fire alone to reduce/thin these species, thereby reducing the ecological restoration needed to successfully create a more open, park-like longleaf pine community. Low- and mid-story brush and trees would continue to increase in density and abundance within a season or two of prescribed fire. This brush could compete with longleaf pine establishment and prevent growth of an herbaceous layer with grasses and forbs. Under Alternative A, the spatial extent needed to support a viable red-cockaded woodpecker colony would not likely occur as the amount of open, park-like stands of mature longleaf and loblolly pine would not support the required nesting and foraging habitat for recolonizing by red-cockaded woodpeckers (minimum cluster area size is 10 acres; USFWS 2003). While it is unlikely that red-cockaded woodpeckers are common in TIMU, actions proposed under Alternative A would not likely benefit the woodpecker or its preferred habitat in TIMU.

Fishes

Shortnose Sturgeon—Historically found in major rivers along the Atlantic seaboard from the St. John River, in Canada extending south to the St. Johns River in Florida, current populations are generally much larger in northern rivers. It is unlikely that any sizable population of shortnose sturgeon currently exists in the St. John River. Shortnose sturgeon reproduction generally requires rocky or gravel substrate or limestone outcroppings—habitat rarely found in the St. Johns River or its tributaries. No reproduction of sturgeon in the St. Johns River has ever been documented, and no large adults have been positively identified (all known specimens have been less than ten pounds).

If prescribed fire is used in areas adjacent to waterways, this could affect water quality as nutrients are released from the site. Bare soils may also be exposed, leading to increases in erosion potential. Following a rain event, transport of soils after a fire would increase sedimentation and turbidity in areas with submerged aquatic vegetation, which can impact the ability of submerged aquatic vegetation, such as seagrasses, to survive and grow. However, because of the rapid recovery of the vegetation and the low slopes in the region, there would be little transport of soils to the aquatic environment. Effects from TIMU wildland fire activities are unlikely to impact the shortnose sturgeon.

Amphibians

Frosted Flatwoods Salamander—This salamander is endemic to mesic flatwoods habitats within the vanishing longleaf pine–wiregrass community. Nearly all flatwoods salamander sites currently dominated by slash pine were converted from historic longleaf pine stands. Pine flatwoods are fire-dependent communities, requiring periodic fires to promote grasses and forbs while limiting shrubs and hardwoods. Breeding sites are typically shallow, ephemeral cypress and/or swamp tupelo ponds or "domes," although flooded borrow pits, roadside ditches, and deep firebreaks are occasionally used. Breeding sites are also dependent on periodic dry-season fires, which maintain an open canopy conducive to the luxuriant growth of emergent and submerged grasses, sedges, and forbs necessary for sheltering the aquatic larvae.

Avoidance of mechanical disturbance to the soil is critical, especially within at least a one-mile radius from the edge of all known breeding wetlands. Periodic lightning-season fires should be prescribed in pinelands inhabited by flatwoods salamanders, and these fires should be allowed to burn into isolated wetlands. The frosted flatwoods salamander may benefit from prescribed fire and would not likely be killed during prescribed fires, which are typically low-intensity surface fires. Mechanical disturbance should not be used within documented salamander areas.

Fire management, aviation, wildfire operations, effects monitoring, and other fire-related activities could temporarily disturb frosted flatwoods salamanders. 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. Disturbance of salamanders is unlikely because of mitigation measures to avoid active salamander areas. Alternative A is not expected to have an effect on the salamander in the preserve.

Reptiles

Gopher Tortoise—These dry-land turtles usually live in well-drained, sandy soils generally associated with longleaf pine and dry oak sandhills (USFWS 2011). Gopher tortoises require such soils for burrowing and nest construction, an abundance of herbaceous ground cover for food, and an open canopy (Ashton et al. 2008, USFWS 2011). Historically, open-canopy savannas were maintained by frequent, lightning-generated fires. Fire suppression in longleaf pine ecosystems can lead to structural habitat changes including increased canopy cover and fewer open areas (Ashton et al. 2008). Gopher tortoise densities are typically highest in longleaf pine and then scrub and xeric hammock (Ashton et al. 2008).

Gopher tortoises burrow underground and seek shelter in their burrows during low-intensity fires; thus, it is unlikely that gopher tortoises would be directly adversely impacted by prescribed fire or wildfire. Gopher tortoise and numerous other wildlife species seek shelter from fires in the tortoises' burrows. Under this alternative, wildfire suppression actions would continue. Continued wildfire suppression activities would perpetuate suboptimal habitat for gopher tortoises. Wildfire suppression would negatively impact gopher tortoise habitat by maintaining a dense canopy and/or dense layer of woody debris on the forest floor. Gopher tortoise habitat may benefit from wildfire by opening up the canopy.

Eastern Indigo Snake—In Florida, eastern indigo snakes prefer pine flatwoods 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 (USFWS 2017).

The eastern indigo snake may benefit from prescribed fire and would not likely be killed during prescribed fires, which are typically low-intensity surface fires, unless burning occurs during shedding. Denning snakes are not likely to be impacted, but summer habitat could be temporarily impacted because the snakes prefer leaf litter and woody debris, which could be reduced. Summer habitat conditions may improve between fire intervals when debris and litter accumulate. Data on effects of fire on eastern indigo snakes are lacking, in general.

The increased potential for local, intense wildfires over time within and adjacent to the dense, mature upland pine and hardwood forests could remove leaf litter and woody debris that eastern indigo snakes prefer, which could lead to loss of summer habitat until revegetation. Following a wildfire, burned areas may support better foraging habitat due to increased prey habitat (i.e., rodents), with increased woody debris from dead trees and grass production. Although snakes move across the landscape quickly and retreat to burrows or other refugia when disturbed, some snakes may become caught in fires, and these individuals may be injured or killed, especially with long-duration, high-intensity wildfires.

Plants

Bartram's Ixia—Bartram's ixia is a perennial herb and a member of the iris family. This species grows in wet to mesic flatwoods, preferring sandy soils and/or shell middens. Bartram's ixia is a rare plant and endemic to northeastern Florida, with only a few known populations occurring within its range. There is limited information on this species, likely due to its rare status. Bartram's ixia grows in fire-dependent natural communities such as longleaf pine–wiregrass ecosystems found within TIMU.

Bartram's ixia grows in fire-adapted ecosystems, so it is unlikely to be adversely impacted by prescribed fire. Low-intensity cyclic fire patterns in flatwood ecosystems maintain an open canopy and reduce understory growth that could pose as a fire hazard to the stand (Brockway and Lewis 1997). This species thrives when flatwoods burn on a two- to three-year cycle because fire opens up the canopy, maintaining an ideal habitat for Bratram's ixia. Note, however, that fire alone may not suffice to restore areas heavily encroached by woody plants.

Godfrey's swamp privet—This shrub is found in calcareous upland hardwood forests (Florida Natural Areas Inventory 2000). This species is threatened by invasive species, particularly Chinese privet (*Ligustrum sinense*). A rare plant survey in the late 1990s did not detect this plant (Conway Conservation, Inc. 1996). Alternative A could benefit Godfrey's swap privet by continued herbicide use on invasive plants if upland habitats are treated. Prescribed fire in limited areas would not impact upland hardwood habitats. Continued wildfire suppression, coupled with limited fuels reduction options under Alternative A, would maintain risks of local, intense wildfires in upland forests.

Incised Agrimony—Incised agrimony is an herbaceous perennial in the rose family with hairy leaves and stems and numerous small yellow flowers (NatureServe 2017). Incised agrimony is most commonly found in fire-maintained longleaf pine–oak communities and has been shown to sprout back rapidly after fire (NatureServe 2017). Regular fire disturbances in longleaf pine flatwoods maintains an open canopy suitable for fire-maintained groundcover grasses and other forb species like the incised agrimony. Forbs are mostly absent in mature, dense pine forests, as they have closed canopies and prevent ground cover from growing due to lack of sunlight.

It is anticipated that reproduction of individual plants may be hampered with prescribed fire, especially if it occurs during the growing season. However, about 65% of rare native plants in the South have evolved with fire creating or maintaining their habitat (Frost and Wilds 2001). Overall, incised agrimony would benefit from low-intensity surface fires. Mortality is not expected because the below-ground perennial organs are assumedly adapted to light ground fires. Continued wildfire suppression under Alternative A would continue to maintain a more closed-canopy forest structure, reducing habitat suitability for this species in those areas. The increased potential for local, intense wildfires over time within and adjacent to the dense, mature upland pine and hardwood forests could temporarily reduce population of incised agrimony; however, this species has been shown to sprout back after a fire event.

Plumed rockcap fern—This fern is typically epiphytic, growing on tree branches, but also occurs less commonly on limestone (Weakly 2015). Voucher specimens exist from northeast Florida, including Duval County, to the Keys (Wunderlin et al. 2018). Polypody ferns tend to grow on adult hardwood trees where there is ample shade and established substrate. It is not likely to occur in pinelands unless encroached by mature hardwoods. Continued use of limited prescribed in the Cedar Point area would not likely impact this species since the target area is pinelands. Risks of intense wildfire due to limited management options under Alternative A and continued wildfire suppression would continue. Wildfires could burn into upland and ecotone habitats thus impacting local populations of this fern. Even wetter areas may burn from intense fires, especially during dry years or seasons.

Spoonleaf sundew—This carnivorous plant occurs in savannas, ditches, pocosins, and the margins of pools or streams (Weakly 2015). Its distribution is circumboreal—in North America it ranges from Newfoundland to Florida into tropical America (Weakly 2015). It has been collected in Ducal County (Wunderlin et al. 2018). Benefits to this species would be limited under Alternative A because pineland restoration tools are limited. The prescription of fire in the Cedar Point area helps improve habitat for this species, but no other realistic restoration would occur, and risks for intense wildfire would continue.

Cumulative Impacts

Actions that could contribute to cumulative impacts on special status species and their habitat under Alternative A include the ongoing development adjacent to the preserve, fire management actions in the preserve, traffic along roads, and wildland fires on neighboring lands. All of these actions could temporarily or permanently disturb or displace local wildlife species. The continued growth and development in the surrounding area could contribute to the conversion of wildlife habitat to developed lands outside the preserve. This would increase habitat fragmentation and loss of habitat in the area, which has caused habitat degradation and degradation to ecosystem function in the region. Alternative A would contribute negligibly to adverse cumulative impacts to special status species due to increased noise and disturbance to individuals.

Impacts of Alternative B—Use of Additional Vegetation Management Tools and Wildfire Managed for Resource Objectives (Proposed Action and Preferred Alternative)

Impacts to special status species and their habitat would be similar to those described under Alternative A, with the spatial extent of reducing hazardous fuels and restoring fire-adapted habitats in the preserve increasing. This increase would result because managing wildfires for resource objectives, mechanical treatments, prescribed fires in coastal salt marsh areas, planting of longleaf pines, hardwoods, and grasses, and targeted herbicide application are allowed. Prescribed fire use in the coastal salt marsh areas would only be used if modeling and analysis shows that it would be effective in helping restore these areas to typical TIMU coastal vegetation types. Pineland prescribed fire would be used as described in Alternative A, except that it could be combined with the additional tools resulting in a more effective restoration of forests to historical flatwood forest conditions. Restoration of these pineland flatwood forests would benefit numerous special status species that have evolved under historical fire conditions, such as the red-cockaded woodpecker, frosted flatwoods salamander, gopher tortoise, and eastern indigo snake.

The management of wildfires for multiple objectives, which could include resource objectives, may help to further reduce hazardous fuels by treating more acres with wildland fire. Wildfires managed for multiple objectives, over time under this alternative, would further decrease the potential for intense, large wildfires. Wild fires would move further toward emulating a natural fire regime, with impacts in the range of naturally occurring fires across the landscape. Hence, over time, they would require less suppression activities and reduce attendant impacts from fire suppression activities. Furthermore, wildfire containment boundaries (existing natural or human made barriers) could be more distant depending on the resource objectives and values to be protected.

Mechanical treatments to reduce hazardous fuel loads, thin dense, mature pine and hardwood forests, and create/maintain defensible space and fuel breaks would increase the probability for lower-intensity ground fires. This would help to protect and maintain special status species and their habitat. Note, however, that Godfrey's privet, a shrub, could be directly impacted by mechanical thinning, which is described as a method to avoid for management of this species (Florida Natural Areas Inventory 2000). This would be mitigated by pre-treatment investigations outlined in the mitigation measures. Known populations could be specifically avoided, and pre-thinning surveys could determine presence of the shrub, which can be identified year-round. Thinning would mainly occur for pineland restoration; plumed rockcap fern habitat would be minimally impacted. Additional mechanical treatments would be small in scale (up to 200 acres annually, less than 1% of the total land in the preserve) but would help to restore longleaf pine habitat and associated special status. Mechanical treatments would also reduce competition for sunlight and nutrients from hardwoods, which would help to promote recruitment of longleaf pine and ground cover growth (Van Lear et al. 2005). Additionally, collection of viable, local longleaf pine seeds could be done using a mechanical tree shaker that would travel off-road to collect the best seeds. If collection would occur near known longleaf rosette grass-form sapling locations, then mitigation measures would be implemented to reduce and/or avoid potential impacts. Mechanical treatments could displace or disturb special status animal species within the treatment area from human presence and equipment until work is completed. However, restoring longleaf pine habitat would benefit associated special status species like the red-cockaded woodpecker and gopher tortoise.

Planting of longleaf pine seedlings and other native plant species could enhance longleaf pine restoration efforts. Speeding up restoration shortens the period for mechanical and herbicide intervention. The sooner longleaf pine savannas are restored, the better for associated special status species.

Herbicide would be applied in ways that would maximize restoration efforts and minimize negative impacts. Mitigation measures, targeted application limited use, low-volume application of herbicide to specific basal or foliar plant areas, and adherence to labels would minimize chances for overspray and impacting non-target plants. In addition, herbicides commonly used for vegetation management (e.g., triclopyr [Garlon 4®/Element™ 4], glyphosate, imazapyr, sulfometuron, metsulfuron methyl, hexazinone) have been designed to target biochemical processes unique to plants and have low levels of direct toxicity or risks to wildlife species when used in accordance with label specifications (Tatum 2004). Herbicides commonly used for vegetation management also degrade quickly upon entering the environment and are neither persistent nor bioaccumulate (Tatum 2004). Over time, using targeted herbicide as a follow-up treatment to mechanical work or prescribed fire would reduce and/or cease the need for repetitive mechanical work, thus minimizing reoccurring disturbances to special status species.

Cumulative Impacts

Adverse cumulative impacts would be the same as described for Alternative A. However, over time aggressive wildfire suppression actions may be less than compared to Alternative A due to fewer constructed firelines, equipment use, and holding may be needed due to decreased hazardous fuel loads, resulting in lower-intensity wildfires. More acres of fire-dependent habitat may be treated and restored; thus, habitat integrity for special status species would improve within the preserve. Under Alternative B, special status species would benefit from habitat improvements and the availability of more suitable breeding habitat for species like the red-cockaded woodpecker.

Section 7 Determination of Effect

Alternative B may affect but is not likely to adversely affect the wood stork, red-cockaded woodpecker, frosted flatwoods salamander, eastern indigo snake, Bartram's ixia, Godfrey's swamp privet, incised Agrimony, plumed rockcap fern, and spoonleaf sundew because actions would likely benefit the species and their habitats by restoration and reduced wildfire risks. Alternative B would have no effect on the piping plover, or red knot because proposed actions would not occur in species-specific habitats. Concurrence in this determination will be sought from the U.S. Fish and Wildlife Service under section 7 of the Endangered Species Act.

Impacts of Alternative C—Use of Additional Vegetation Management Tools and Wildfire Managed for Resource Objectives in preserve Natural Zones Only

Under Alternative C, impacts to special status species and their habitat would be similar as described under Alternative B; however, fewer acres would be treated than under Alternative B. Without the use of mechanical treatments, increased fuel loading could occur in the Cultural and Development zones with no wheeled/tracked equipment (e.g., masticators) to aid in ecological restoration efforts. Pinelands would not be thinned, which would perpetuate dense forest stands with increased risk for pine beetle infestations. The increased risk for pine beetle infestations could increase hazardous fuel loads (dead standing or down woody debris). These conditions would likely result in high-intensity fires. High-intensity wildland fires could remove large tracts of vegetation that could reduce the resilience and integrity of special status species and their habitat. In addition, without successful ecological restoration (i.e., lower intensity, surface fire mimicking natural fire cycles) fire-dependent vegetation may decrease in prevalence and vigor. The degree of impacts to special status species and their habitat would vary depending on fire size, location, extent, timing, and other related factors. An intense wildfire could also kill a substantial portion of canopy trees, further hindering the long-term objective of creating habitat for the red-cockaded woodpecker.

Cumulative Impacts

Adverse cumulative impacts would be the same as described for Alternative B. However, over time, aggressive wildfire suppression actions may be slightly more than Alternative B, as fireline construction and holding actions would be more likely within the Cultural and Development zones. Additionally, high-intensity wildfires would be more likely to spread into other preserve areas, damaging the edges of those habitats. Overall, fire-dependent habitat would improve and benefit the associated special status species, but benefits are expected to be less than those anticipated under Alternative B.

Cultural Resources

Affected Environment

TIMU archeological sites provide physical evidence of 6,000 years of human occupation and some of the earliest, national level-significant sixteenth-century settlement sites in the U.S. According to Russo *et al* (1993), occupation of the coastal estuaries within the preserve began about 3620 B.C. The earliest inhabitants were well adapted to a maritime economy. They were active on the islands, estuaries, and marshes. This adaptation probably means the area was occupied earlier than 3620 B.C., but any archaeological evidence is likely submerged due to much higher sea levels presently. The next major occupation of the area began about 2300 B.C. Traces of those activities remain today within the preserve and can be seen in the mounds of shell and bone they left throughout the preserve. By A.D. 500, ceremonial mounds were being constructed on what is now Fort George Island FMU, Black Hammock FMU, and Broward/Burton Island and Marshlands FMU.

Only 10% of preserve managed lands have been inventoried for cultural resources. Kingsley Plantation FMU, located on Fort George Island, has had more than 20 archaeological studies conducted there since the 1950's (Prettyman and Whitehurst 2012), and twenty-eight archaeological sites have been identified (FMSF 2018).

In addition to the archeological sites, TIMU also manages a curation facility and a variety of historic buildings, structures, landscapes, and ethnographic resources.

Prominent TIMU cultural resources include the Kingsley Plantation complex on Fort George Island. Kingsley Plantation is a cultural landscape located completely within the boundary of TIMU. This resource consists of a former plantation house, support buildings (such as a separate kitchen), and slave cabins constructed in 1796. The complex is listed on the NRHP and is a very popular visitor attraction. Kingsley is a TIMU ethnographic resource associated with slavery in the Americas. The complex hosts ongoing scholarly research through university-sponsored archaeological field schools each summer. Since 2006, research has focused on excavations at the slave cabins. Recently, an unmarked slave cemetery was discovered not far from the cabins. The primary focus of interpretation on the site is the plantation era from 1760 to 1895. Also included within the Kingsley Plantation landscape is the surviving Fort George Club clubhouse and bungalow. These two structures are associated with the twentieth century recreational/resort development on the island. Other

NRHP-listed sites on Fort George Island include the San Juan del Puerto. This is a Spanish mission and associated village site that dates to the 16th, 17th, and 18th centuries. The Kingsley Plantation FMU contains all of the TIMU managed cultural resources on Fort George Island.

Located within the Fort Caroline FMU is the St. Johns Bluff Work Camp/Town, an 18th century military archaeological resource. Another NRHP-listed archaeological resource on St. Johns Bluff is the Spanish–American War Military Earthworks. This resource dates to the 19th century. Other NRHP-listed resources in the Fort Caroline FMU include the 19th century Yellow Bluff Fort site (a military fortification), the Ribault Column (commemorative memorial), and Fort Caroline (Spanish-American 16th century military earthwork).

American Beach FMU has one resource on the NRHP. American Beach is part of a National Historic District, although the District is not owned or managed by the NPS. The TIMU-managed section contains an eight plus acre sand dune- the tallest dune in Florida. The resource is part of a landscape, archaeological site, and ethnographic resource. It was purchased by, and for the use of, the African American population in 1935 when public spaces were still segregated.

The preserve commissioned a historic resource study in 1996 (Stowell) that addressed resource condition and integrity, archaeological significance, and management of the historic resources throughout the preserve. Stowell (1996) found 204 prehistoric or historic sites that have been documented within the preserve, of which seven are listed on the NRHP. There are 32 historic structures managed by the preserve, and all of these have been fully documented. The preserve has a modern storage facility for the museum collections, and over 82% of TIMU museum collections have been cataloged.

Analysis of Alternatives and Impacts on Cultural Resources

Impacts of Alternative A—Continue Current Fire Management at TIMU (No-action Alternative)

TIMU cultural resources are extremely vulnerable to wildland fire. At a minimum, fire could cause discoloration of surface artifacts and features, burning of perishable materials, checkering or cracking of glass and ceramic artifacts, melting of metals, and distortion of historic structures from expansion of materials (Ryan et al. 2012). Wildland fire suppression activities could result in displacement of surface materials, exposure of surface materials due to ground disturbance, or disturbance to materials immediately below the surface from vehicles due to earth moving or compaction. The effects on TIMU cultural resources within a wildland fire area could range from minor surface artifact discoloration to complete historic structure loss. Effects of wildland fire on cultural resources are permanent due to loss of an irreplaceable resource.

Prescribed fire's effect on cultural resources is similar to wildland fire. However, intensity is generally less, and prescribed fires are conducted under the strict management of a prescribed fire plan. . Prescribed fires would benefit the cultural landscape by rejuvenating soils with nutrients, which would help to perpetuate grasses and seedlings; reduce competition from invasive plants; maintain open vegetation structure in fire-influenced vegetation communities; and enhance the diversity, structure, composition, and integrity of fire-dependent vegetation communities. This is important to cultural resources, because prescribed fire would help to restore native forest and plant communities to their historical state, thereby strengthening TIMU cultural resource integrity by matching the historical setting that would have surrounded the resources. All prescribed fire plans would allow for advance clearance and mitigation measures for cultural resources. The TIMU fire management staff would consult with the in-house cultural resource staff (from TIMU, NPS Southeast Regional Office, and NPS Southeast Archeological Center), Florida SHPO, and appropriate tribal groups to avoid known cultural sites. All cultural resources, whether listed or eligible for listing in the National Register, would be treated the same under each alternative.

Should new archaeological resources be identified during prescribed fires, all activity would cease in the immediate vicinity until the resource could be identified, documented, and an appropriate mitigation strategy developed in consultation with Florida SHPO. Any known archaeological resources would be marked with special flagging, and mitigation measures would be taken to protect identified resources from prescribed fires.

Resource protection measures included in the 2004 FMP protect cultural resources by limiting ground disturbance intensity through the use of hand tools, blowers, and hand saws or chainsaws to construct firelines instead of using fire retardant. The current fire management tool used in the Cedar Point area includes hazardous fuels reduction to reduce the intensity of future wildfires. Lower-intensity wildfires would be easier to manage/suppress and would have less impact on cultural resources within this area of the Black Hammock FMU.

Indirect adverse impacts to cultural resources could include exposure of artifacts from erosion and loss of vegetation near cultural sites, which could increase looting. Mitigation measures (see Mitigation Measures Section) would reduce or eliminate many impacts from wildland fire suppression actions.

Portions of the uplands with mature loblolly pine and hardwoods would remain dense forest stands with increased hazardous fuel loads (i.e., ladder fuels and ground cover) as prescribed fire alone would not effectively thin these areas. This could lead to increased potential for wildfires that are high intensity. Overall impacts would depend on the timing, location, intensity, and extent of the wildfire and the mitigation efforts that could be implemented.

Cumulative Impacts

Activities that could contribute to cumulative impacts to cultural resources include feral hogs, existing road construction and maintenance, logging, agricultural development, and natural erosion along river and coastal areas. Cultural resources are nonrenewable, so damage or loss from any activity would gradually diminish the types and numbers of cultural resources present. Alternative A would continue to reduce hazardous fuel within a limited area of Black Hammock FMU, reducing the potential risk to cultural resources by intense wildfires. Alternative A would contribute negligibly to adverse cumulative impacts due to minimal soil disturbance associated with fireline construction and vehicles.

Impacts of Alternative B—Use of Additional Vegetation Management Tools and Wildfire Managed for Resource Objectives (Proposed Action and Preferred Alternative)

Impacts to cultural resources would be similar to those described under Alternative A for wildland fire suppression actions and prescribed fires, with the exception that prescribed fire would not occur near historic structures. The additional use of mechanical treatments, wildfires managed for multiple objectives, including resource objectives, and targeted herbicide application would increase the degree and range of protection for cultural resources by reducing hazardous fuel loads adjacent to cultural resources, maintaining/creating defensible space around and near cultural resources, and increasing the ability to achieve desired resource conditions.

As discussed under Alternative A, wildfire management activities have the potential for ground disturbance in and near cultural resources. However, wildfires managed for multiple objectives, including resource objectives, would have less impact on soils and vegetation from ground disturbance compared to full suppression of wildfires.

Ground disturbance from vehicle use and/or compaction associated with the use of mechanical treatments to thin the mature, dense pineland forests, and the use of a mechanical shaker to collect longleaf pine seeds, could physically damage, disturb, or expose artifacts. Erosion and looting of cultural resources could be augmented from the exposure of these artifacts. Mechanical treatments could also result in the displacement of cultural resources from their original spatial context. However, impacts would be minimized with avoidance of known cultural resources and implementation of mitigation measures.

Herbicide use could reduce impacts of mechanical treatments. Herbicide use could minimize impacts to cultural resources by reducing the need for mechanical vegetation cutting and associated ground disturbance. Mitigation measures would assure proper application of herbicides. Targeted manual herbicide application to specific basal or foliar plant areas would minimize chances for overspray and migration into the soil and eventually the artifacts. Targeted herbicide application would use herbicides that do not have short- or long-term residual implications to soils.

Cumulative Impacts

Adverse cumulative impacts would be the same as described for Alternative A. However, Alternative B would reduce hazardous fuels within the preserve, reducing the potential risk to cultural resources by intense wildfires. More acres of fire-dependent habitat may be treated and restored, thus improving defensible space around cultural resources within the preserve. Alternative B would contribute negligibly to adverse cumulative impacts on cultural resources due to the soil disturbance associated with compaction, erosion, and displacement of subsurface material caused by vehicles and equipment.

Overall, Alternative B would benefit cultural resources by protecting historic structures from intense wildland fire and restoring the preserve to a more historic landscape. These benefits are expected to exceed those anticipated under Alternative A.

Impacts of Alternative C—Use of Additional Vegetation Management Tools and Wildfire Managed for Resource Objectives in Preserve Natural Zones Only

Impacts to cultural resources would be similar to those described under Alternative B. However, the hazardous fuel loads could increase in the cultural zones due to the exclusion of wheeled/tracked equipment. These areas would have an increased potential for intense wildland fires that could impact both unrecorded and known cultural resources. Intense wildland fires could require full suppression activities, which could increase ground disturbance that could impact cultural resources. The degree of impacts is difficult to estimate and would vary depending on fire size, behavior, location, extent, timing, and other factors.

Cumulative Impacts

Adverse cumulative impacts would be the same as described for Alternative B. However, over time, aggressive wildfire suppression actions may be slightly more than Alternative B, as fireline construction and holding actions would be more likely within the Cultural zone. Additionally, high-intensity wildfires would be more likely to spread into other preserve areas, damaging the edges of those habitats. Overall, fire-dependent habitat would improve and benefit TIMU cultural resources, but benefits are expected to be less than those anticipated under Alternative B.

Visitor Use and Experience

Affected Environment

TIMU receives a lot of visitors, because it is adjacent to and increasingly within a metropolitan area. The NPS strives to provide an enjoyable and safe visitor experience while protecting the preserve's fundamental resources and values. People visit the preserve to experience the nature and solitude that exists close to a large metropolitan area. Visitor activities include hiking, fishing, kayaking, canoeing, birding, interpretive exhibits, and historic structure tours.

Preserve use in 2013 (1,384,345) was slightly higher than the ten-year average for 2003 to 2012 (980,929; NPS 2016). Visitor satisfaction was measured at 98% in 2013, and this was higher than the previous ten years. Due to staff cuts, educational programs at TIMU have decreased in number. However, despite reduced staff levels, program attendance by visitors has continued to increase.

The percentage of visitors satisfied in 2013 was 98.0% of those surveyed, which is higher than the average for the previous five years (97.0%). Since 2009, TIMU has made great strides in improving its interpretive media. TIMU personnel have been instrumental in engaging community via website and social media. 88% of interpretive exhibits have been replaced or newly created in the past few years (NPS 2016).

TIMU was a recipient of the National Park Service Programmatic Accessibility Achievement Award for creating an accessible interpretive experience that won first place in the Digital Media category for the 2013 National Association for Interpretation Interpretive Media Awards Competition. Using GPS and wireless internet, this immersive experience uses technology that allows visitors with visual disabilities to move freely and explore TIMU in any order or direction while receiving an audio description tied to their location. This innovation lets the user remain focused on the content rather than the technology. This project will serve as a model for others to follow in the future. This award congratulated the park on their efforts to ensure that visitors with disabilities have improved access to the park (NPS 2016).

Analysis of Alternatives and Impacts on Visitor Use and Experience

Impacts of Alternative A—Continue Current Fire Management at TIMU (No-action Alternative)

There would be temporary visitor use restrictions within treatment areas. The majority of visitors access the Fort Caroline FMU and the Kingsley Plantain FMU. Kingsley would not have any prescribed fire treatments, but that FMU would receive mechanical treatments. Visitors would not be allowed near active fuel management and/or restoration areas (i.e., prescribed fire, mechanical treatments) or where wildfires are present. Noise associated with mechanical treatments near the preserve buildings, such as chainsaws or masticators, could temporarily disrupt the visitor experience (e.g., solitude). The noise disturbance would cease once the treatment was completed.

Wildland fires produce smoke that could alter or reduce scenic views, produce odors, and create blackened areas that could affect visitor experience. However, the presence of fire, smoke, and burned areas could present an opportunity for education and interpretive programs on the benefits of prescribed fire as emulating a natural process to aid in restoration of fire-dependent ecosystems such as longleaf pine.

Portions of the pineland forests would continue to have dense stands as prescribed fire treatments are ineffective in reducing mature loblolly pine and larger hardwoods (Waldrop et al. 1987). These areas would remain vulnerable to pine beetle infestations and attendant hazardous fuels from standing dead and downed woody debris. These conditions would increase the likelihood for intense wildfires that could result in longer closures in portions of the preserve to visitors, increased smoke emissions to visitors and surrounding lands, and the removal of large tracts of vegetation in the pineland forests, thus reducing the visitor experience until revegetation occurred.

Prescribed fire and/or mechanical would rejuvenate soils with nutrients, which would help to perpetuate grasses and seedlings; reduce competition from invasive plants; maintain open vegetation structure in fire-influenced vegetation communities; and enhance the diversity, structure, composition, and integrity of fire-dependent vegetation communities. These fuel treatments would benefit visitor use and experience by better immersing the visitor in a historic setting, adding to the sense that the preserve is a unique and special place.

Cumulative Impacts

Activities that could impact visitor use and experience include fire management activities planned by other agencies and landowners, wildfires occurring on adjacent lands, noise from vehicles and boats, and maintenance activities within the preserve. Continued population growth in the Duval County area could increase the number of local visitors to the preserve. Increased visitation during fire management activities could have beneficial impacts by educating more visitors about the fire-adapted ecosystems and the importance of fire in resource management (e.g., restoration). The impacts of Alternative A would contribute negligibly to adverse cumulative impacts to visitor use and experience, as the closures would be temporary and site-specific. Additionally, the use of prescribed fires to reduce hazardous fuel loads, in combination with defensible space work around Preserve infrastructure, would likely decrease the potential for intense wildfires in treated areas.

Impacts of Alternative B—Use of Additional Vegetation Management Tools and Wildfire Managed for Resource Objectives (Proposed Action and Preferred Alternative)

Impacts under Alternative B would be similar as described for Alternative A in regard to wildland fires and mechanical treatments. Under Alternative B, the additional mechanical work, management of wildfires for multiple objectives including resource objectives, native plant revegetation, and targeted herbicide application are all actions that could close visitor use areas temporarily (lasting the duration of the specified action). Temporary closures would detract from the visitor experience; however, the additional vegetation/fuel management treatments would increase the spatial extent of reduced hazardous fuels in forest stands, decreasing the potential for intense wildland fires. The proposed mechanical work would result in a more resilient forest by improving the health and vigor of the pineland forest stands. Resilient forests are less vulnerable to pine beetle infestations. Damage associated with pine beetle infestations include weakened, dying, or standing dead trees that can increase the amount of hazardous fuels in forest stands and make the forest more prone to intense wildfire. Additionally, unhealthy forests can detract from the visitor experience offered by healthy forests. The proposed actions under Alternative B would result in improved visitor use and experience while restoring forest resiliency, reducing wildfire risks, and restoring fire-adapted communities, such as longleaf pine, by opening the canopy and mid-story. Reduced canopy closure promotes growth and germination of ground cover (e.g., grasses, forbs, and longleaf pine seedlings). Increasing the ability to restore native, fire-adapted communities and associated native wildlife species would enhance the visitor experience of varied TIMU ecosystems. Furthermore, reducing the risk of wildfire would reduce the need for further wildfire management/suppression activities, resulting in fewer disturbances from noise and more closures to visitor use areas.

Cumulative Impacts

Adverse cumulative impacts to visitor use and experience for Alternative B are similar to Alternative A. However, over time Alternative B would contribute to beneficial cumulative impacts to visitor use and experience due to the increased ability to restore native plant communities, which would both enhance wildlife viewing opportunities and exhibit a more historically accurate landscape.

Impacts of Alternative C—Use of Additional Vegetation Management Tools and Wildfire Managed for Resource Objectives in Preserve Natural Zones Only

Alternative C impacts would be similar to those described for Alternative B. However, portions of the preserve would remain untreated and could result in increased fuel loading from overgrown vegetation and woody debris. Intense wildfires could require longer closures to visitors until the fire is suppressed or burns out. The degree of impacts would vary depending on fire size, behavior, location, extent, timing, and other factors. Additionally, smoke emissions from intense wildfires could impact a larger area, affecting visitors using other areas in the preserve as well as surrounding lands.

The perpetuation of the untreated Cultural and Development zones would reduce the health and vigor of these areas, thus reducing the aesthetics and native vegetation and wildlife viewing opportunities for visitors.

Cumulative Impacts

Alternative C would have similar cumulative impacts to Alternative B. However, compared to Alternative C, visitor use and experience in Cultural and Development zones could have increased adverse cumulative impacts due to the reduced visitor experience in the case of intense wildfire and the resulting reduced aesthetics and associated effects.

Human Health and Safety

Affected Environment

TIMU is located in a Wildland-Urban Interface (WUI), meaning that the land and urban communities adjacent to and surrounded by wildlands are at risk of wildfires. As such, the health and safety of firefighters, visitors, employees, and surrounding residents, and neighbors of the preserve are the primary objective of the FMP. As noted under the Air Quality Section of this EA, Interstates 295 and 95, US 17, and State Highway A1A are major transportation routes concerned with every ignition within TIMU due to visibility and safety issues. Recorded visitor accidents have been low, and Operational Leadership Training has been completed by preserve staff. Cardiopulmonary resuscitation (CPR), First Aid, and Automated External Defibrillator (AED) training are offered to staff on a space-available basis. Job Hazard Analysis is conducted before specific tasks throughout the preserve. Regular safety messages are given and distributed to staff members. The safety program at TIMU has been identified as a best practice model in the SE Region (NPS 2016). The preserve neighbors, visitors, local residents, and adjacent communities would be notified of all fire management activities that have the potential to impact them.

Fire management activities and wildfires can pose unplanned, unforeseen risks to the public and employees, but firefighters and TIMU staff face direct risks when engaged in suppression-related activities. Smoke on roads and waterways in and adjacent to the preserve is a visibility concern for traffic. In addition, smoke emissions from wildland fires can impact air quality for surrounding residents and visitors. The flaming front of a fire can put members of the visiting public, residents, preserve employees, and firefighters at risk. Accidents and unintended consequences can be more prevalent in chaotic emergency wildfire situations. For this reason, wildfire and prescribed fire areas would be closed to the public. Mitigations would be implemented as soon as possible. These could include press releases, area closures and/or restrictions, and traffic control if smoke impacts road visibility.

Firefighter/public safety and protection of private property has always been emphasized at TIMU, and the message of fire's necessary natural role in maintaining ecosystems, restoring habitat, and reducing hazard fuels has been communicated to the public as well. Locally, the public is generally understanding and accepting of the need for the preserve to utilize fire as a restoration and maintenance tool. However, smoke is always a concern, especially for longer duration incidents.

During periods of extreme or prolonged fire danger, fire prevention messages would be included in all interpretive programs. Emergency restrictions regarding fires or area closures may become necessary. Such restrictions would be coordinated between other fire agencies for unified messaging as much as possible. Closures or restrictions would be authorized by the Superintendent. The Florida Fire Service is usually closely involved in these decisions.

TIMU and cooperating agencies use incident communications processes to keep the public and neighbors up to date about wildfires and prescribed fires. Staff supplementation may be necessary for larger or longer duration incidents. Public education and awareness is approached through a variety of methods: printed materials, media outlets, signs and posters, interpretive and educational programs, and other outreach programs. TIMU and agency partners inform each other about wildfires, prescribed burning, and vegetation treatments so the other's visitor contacts will be informed and up-to-date.

Before and during prescribed burns TIMU disseminates media releases and posts signage that emphasize the beneficial effects of fire; visitor center contacts emphasize fire's role in re-creating more natural ecological conditions.

The fire management program in the preserve has worked to mitigate the long-term threat to the safety of visitors, employees, local residents, and surrounding landowners. These actions include removing hazardous fuel loads using prescribed fire, defensible space work within 50 feet of preserve buildings and interior access roads, and additional maintenance activities that contribute to creation of defensible space (e.g., mowing and cutting of brush, removal of fallen trees and debris in developed areas or on trails). These activities would continue under all alternatives.

Analysis of Alternatives and Impacts on Human Health and Safety

Impacts of Alternative A—Continue Current Fire Management at TIMU (No-action Alternative)

There would be adverse impacts to firefighter health and safety if wildfire results in wildland fire suppression. These could include exposure to heat, smoke inhalation, and in severe cases, injuries or death. Impacts to the public could include smoke inhalation, and in severe cases, injuries from wildland fires.

Under Alternative A, wildfires would be managed with an emphasis on suppression objectives as outlined in the 2004 FMP. Some unplanned ignitions, such as those in the coastal salt marsh areas, would continue to be managed with confine/contain strategies. Where firefighter safety and/or cost objectives would prevent active firefighter engagement, these fires would be self-limiting and usually self-exhaust due to the dampness of the marsh.

In the pinelands, wildfires would be more aggressively managed due to their potential spread in drier fuels. In most cases the NPS would utilize indirect tactics to contain fire at nearby roads, trails, or natural barriers, depending on conditions. New fireline construction does not usually happen due to access, safety, or terrain limitations but could occur when using MIST tactics to minimize effects on resources. Fuel-break construction during wildfire suppression efforts could pose safety risks to firefighters from the use of equipment. Each crew member 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.

Acute smoke inhalation by firefighters from wildland fires starts with acute eye and respiratory irritation and shortness of breath and may progress into headaches, dizziness, and nausea, depending on the duration of exposure. Most firefighter exposure to smoke has been considered nonhazardous, with a small percentage exceeding recommended exposure limits for carbon monoxide, the primary inhalation hazard, and respiratory irritants (USDA 2000).

Portions of the pinelands would retain dense stands that could increase the potential for severe wildfires. These fires would be harder to suppress or manage and smoke emissions could increase risks to human health and safety. The degree of impacts would vary depending on fire size, location, extent, timing, and other factors. In the event of a potentially severe wildfire in the preserve, the fire staff would coordinate public notification, restrictions, closures, and evacuation efforts with preserve law enforcement staff and local emergency response agencies. The extent of public notice would depend on the specific fire situation. Ensuring the safety of visitors, local residents, and staff would take priority over other preserve activities.

Human safety is of primary concern during prescribed fires and all preserve activities. Prescribed fire and defensible space work around preserve buildings may necessitate a closer look under current WUI protection guidelines. This normally allows for better health and safety protections and precautions under planned and controlled workplace conditions than under inopportune wildfires that tend to occur during severe weather and dangerous fuel conditions. Health and safety of staff would be enhanced when additional fire personnel are brought in from interagency cooperators for prescribed fires. Therefore, the potential for impacts associated with management actions (though it is not possible to eliminate all risk) would be reduced overall.

Prescribed fires would benefit the native vegetation communities by rejuvenating soils with nutrients, which would help to perpetuate grasses and seedlings; reduce competition from invasive plants; maintain open vegetation structure in fire-influenced vegetation communities; and enhance the diversity, structure, composition, and integrity of fire-dependent vegetation communities. Over time, the use of prescribed fires would be expected to decrease the potential size and intensity of wildfires by reducing hazardous fuel loads. Establishing and maintaining a prescribed fire regime that replicates/mimics the natural fire regime of low intensity, frequent fires would lead to increased vigor and health and lessen the probability of severe wildland fire at the Cedar Point area of the Black Hammock FMU. Other FMUs would not be treated with prescribed fire.

Cumulative Impacts

Actions outside the preserve that could have an impact on public health and safety include continued development of lands adjacent to the preserve. Continued development would increase the WUI boundaries, which could increase hazardous fuel loadings and the number of homes and structures at risk, thus increasing risks to firefighters and the public. The impacts of Alternative A would contribute negligibly to adverse cumulative impacts to human health and safety. This is because exposure to associated fire risks (e.g., heat, smoke inhalation) would be temporary and localized. In addition, use of prescribed fire to reduce hazardous fuel loads in the Cedar Point FMU and defensible space work around preserve infrastructure would continue, all of which would decrease the risks of intense wildfire and its impacts to people and structures.

Impacts of Alternative B— Use of Additional Vegetation Management Tools and Wildfire Managed for Resource Objectives (Proposed Action and Preferred Alternative)

Human health and safety impacts would be the same as described under Alternative A in regard to wildland fire suppression and fuels/vegetative management activities. The use of managing wildfires for multiple objectives, including resource objectives in the preserve, could over time lead to treating more acres, which would reduce hazardous fuels and suppression actions required for future wildfires. In addition, wildfires managed or partly managed for resource objectives could use passive containment such as natural or manufactured features, depending on the resource objectives and values to be protected, rather than requiring direct active suppression.

The additional mechanical works, targeted follow-up herbicide use, and multiple-objective prescribed fires would increase the ability to reduce hazardous fuel loads, increase defensible space around structures, and develop fuel breaks along the preserve boundaries. The additional vegetation/fuels management tools would be expected to increase the probability of lower-intensity surface wildfires that are easier to suppress or manage, thus reducing risks to human health and safety.

All herbicide treatment areas would have individual treatment plans and would only use U.S. EPA approved herbicides. Targeted herbicide use would be implemented after signage was placed at all entryways to the treatment area and all visitors were out of the area. All staff using herbicide would be trained in approved procedures related to proper handling, storage, transportation, mixing, spill prevention, and application procedures. Furthermore, the Federal Insecticide, Fungicide, and Rodenticide Act and federal water quality monitoring indicate that the use of herbicides in forestry practices, such as ecological restoration efforts and prescribed fire, constitutes low risk to humans (Shepard et al. 2004). The areas to be treated would be relatively small (up to 25 acres annually across the preserve) and targeted (hand or backpack sprayer applied), so the risk to human health and safety would be minimal.

Cumulative Impacts

Actions outside the preserve that could have an impact on public health and safety include continued development of lands adjacent to the preserve and management activities. Continued development would increase the WUI boundaries, which could increase hazardous fuel loadings and the number of homes and structures at risk, thus increasing risks of fire and dangers to firefighters and the public. The impacts of Alternative B would contribute negligibly to adverse cumulative impacts to human health and safety due to the temporary and localized exposure to associated fire risks (e.g., heat, smoke inhalation). Alternative B would also contribute negligibly to beneficial cumulative impacts to human health and safety due to the continued use of prescribed fires, the additional mechanical works, and wildfires managed for resource objectives. These would further reduce hazardous fuel loads, decreasing the potential for intense wildfires and associated risks to people and structures.

Impacts of Alternative C— Use of Additional Vegetation Management Tools and Wildfire Managed for Resource Objectives in preserve Natural Zones Only

Public health and safety impacts under Alternative C would be similar as described for Alternative B. However, with limited use of fire management tools, increased fuel loading from overgrown vegetation and woody debris would occur. These conditions could increase risks to firefighters, adjacent neighbors, and structures, TIMU employees, and visitors. The degree of impacts would vary depending on fire behavior, size, location, extent, timing, and other factors.

Cumulative Impacts

Alternative C would have similar cumulative impacts to Alternative B, except that human health and safety risks in preserve Cultural and Development zones could increase due to greater risks for intense fires and associated risks to firefighters, adjacent neighbors and structures, employees, and visitors.

Consultation and Coordination

Agency Consultation

In accordance with the ESA, TIMU consulted with the FWS about federally listed species. A copy of the EA will be sent to the FWS for review along with a request for their concurrence with the determination of effects on federally listed species for this EA.

In accordance with Section 106 of the NHPA, as amended in 1992 (54 USC 306108 *et. seq.*), NPS contacted the Florida Historic Preservation Office (SHPO) by letter dated December 18, 2015, during the public scoping period asking for information concerning cultural resources. A copy of this EA will be sent to Florida SHPO for review and comment.

No agency consultation correspondence has been received at the date of publication of the Draft EA for public review.

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Appendix 1

(MIST Procedures)

Minimum Impact Suppression Tactics

The intent of minimum impact suppression tactics (MIST) is to manage a wildland fire with the least impact to natural and cultural resources. Firefighter safety, fire conditions, and good judgment dictate the actions taken.

By minimizing impacts of fire management actions, unnecessary resource damage is prevented and cost savings can be realized. These actions include, but are not limited to:

Line Construction and Mop Up

- Consider:
  - Cold-trailing fireline.
  - Using wetline or sprinklers as control line.
  - Using natural or human made barriers to limit fire spread.
  - Burning out sections of fireline.
  - Limiting width and depth of fireline necessary to limit fire spread.
- Locate pumps and fuel sources to minimize impacts to streams.
- Minimize cutting of trees and snags to those that pose safety or line construction concerns.
- Move or roll downed material out of fireline construction area.
- In areas of low spotting potential, allow large-diameter logs to burn out.

- Limb only fuels adjacent to the fireline with potential to spread outside the line or produce spotting issues.
- Scrape around tree bases near fireline likely to cause fire spread or act as ladder fuel.
- Minimize bucking of logs to check/extinguish hot spots; preferably roll logs to extinguish and return logs to original position.
- Utilize extensive cold-trailing and/or hot-spot detection devices along perimeter.
- Increased use of fireline patrols/monitoring.
- Flush-cut stumps after securing fireline.

Long-Term Incidents

- Consult with Resource Advisor to locate suitable campsites. Scout thoroughly to avoid hazards (bee's nests, widowmakers, etc.).
- Plan for appropriate methods of:
  - Helispot locations
  - Supply deliveries
  - Trash back-haul
  - Disposal of human waste
- Minimize ground and vegetation disturbance when establishing sleeping areas.
- Use locally approved storage methods to animal-proof food and trash.
- When abandoning camp, rehab impacts created by fire personnel.