



Timucuan Ecological and Historic Preserve

Fire Management Plan 2004

2004 Fire Management Plan
Timucuan Ecological and Historic Preserve
Florida

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1.0 INTRODUCTION

1.1 Reason for Development of Fire Management Plan

National Park Service (NPS) policy (*Director's Order #18: Wildland Fire Management*, website <http://www.fire.nps.gov/fire/policy/do18/do18.htm>) requires that every park unit with vegetation capable of sustaining fire develop a Fire Management Plan (FMP) approved by the park superintendent. The FMP serves as a detailed and comprehensive program of action to implement fire management policy principles and goals, consistent with the unit's resource management objectives. This plan outlines the fire management program at Timucuan Ecological and Historic Preserve (hereinafter referred to as "the preserve"), which includes Fort Caroline National Memorial, a National Park System unit incorporated into the preserve as part of the preserve's 1988 enabling legislation. The preserve's fire management program, guided by federal policy and the preserve's resource management objectives, will serve to protect life, property, and natural and cultural resources.

1.2 Collaborative Processes

In addition to administering the preserve, the NPS collaborates with over 40 entities, including the U.S. Fish and Wildlife Service; the U.S. Navy; the U.S. Coast Guard; the U.S. Army Corps of Engineers; the Environmental Protection Agency; the National Marine Fisheries Service; the Department of Environmental Protection, Division of State Lands; the Florida State Historic Preservation Office; the Florida Department of Transportation; the Florida Department of Environmental Protection—State Parks; the Florida Department of Environmental Protection—Coastal Aquatic Managed Areas; the Florida Fish and Wildlife Conservation Commission; the Florida Division of Forestry; the St. Johns River Water Management District; the City of Jacksonville Regulatory and Environmental Services; the City of Jacksonville, Office of the Mayor; the Jacksonville Parks, Recreation and Entertainment Division; the Jacksonville Transportation Authority; the Jacksonville Electric Authority; The Nature Conservancy; local colleges and universities; community and business leaders; and preserve neighbors.

Collaborative opportunities pertaining to fire management at the preserve include coordination/cooperation with the Florida Division of Forestry, the St. Johns Water Management District, Okefenokee National Wildlife Refuge, Osceola National Forest, Cumberland Island National Seashore, the Florida Department of Environmental Protection—Division of Recreation and Parks, the Florida Interagency Coordination Center, the City of Jacksonville, The Nature Conservancy, and local law enforcement.

1.3 Implementation of Fire Management Policy

The organizational structure of this FMP follows the outline furnished in chapter 4 of *Wildland Fire Management Reference Manual-18* (version 3.0, 11/05/02), hereinafter referred to as *RM-18* (<http://www.fire.nps.gov/fire/policy/rm18/index.htm>). This FMP will guide the preserve in implementing federal fire management policy and resource and

fire management goals as defined in the *2001 Federal Fire Policy; Managing Impacts of Wildfires on Communities and the Environment, and Protecting People and Sustaining Resources in Fire-Adapted Ecosystems—A Cohesive Strategy*; and *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan*.

1.3.1 2001 Federal Fire Policy

The 1994 fire season with its 34 fatalities triggered a series of reports under the rubric FIRE 21, including the *1995 Federal Wildland Fire Management Policy and Program Review*. This review, the first comprehensive federal fire policy for the Departments of Agriculture and the Interior, provided direction for fire management programs and activities, including such areas as safety, protection priorities, preparedness, suppression, wildland fire use, prevention, and wildland-urban interface roles and responsibilities. Following the escape of the Cerro Grande Prescribed Fire in May 2000, the *1995 Federal Fire Policy* was evaluated and revised in the *2001 Review and Update of the 1995 Federal Wildland Fire Management Policy (2001 Federal Fire Policy)*. The *2001 Federal Fire Policy* finds no fundamental flaws in the 1995 document. It builds on the *1995 Federal Fire Policy*, and addresses issues not fully covered in 1995, including rehabilitation and restoration of burned lands, the importance of sound science driving fire management activities, and the need for the full range of fire management activities to achieve ecosystem sustainability.

The *2001 Federal Fire Policy* states that “...successful implementation of 2001 Federal Fire Policy depends on the development and implementation of high-quality Fire Management Plans by all land managing agencies.” The policy is founded on the following guiding principles:

1. Firefighter and public safety is the first priority in every fire management activity.
2. The role of wildland fire as an essential ecological process and natural change agent will be incorporated into the planning process.
3. Fire management plans, programs, and activities support general and resource management plans and their implementation.
4. Sound risk management is a foundation for all fire management activities.
5. Fire management programs and activities are economically viable, based upon values to be protected, costs, and general and resource management objectives.
6. Fire management plans and activities are based upon the best available science.
7. Fire management plans and activities incorporate public health and environmental quality considerations.

8. Federal, State, tribal, local, interagency, and international coordination and cooperation are essential.
9. Standardization of policies and procedures among Federal agencies is an ongoing objective.

1.3.2 Managing Impacts of Wildfires on Communities and the Environment, and Protecting People and Sustaining Resources in Fire Adapted Ecosystems—A Cohesive Strategy

The *Cohesive Strategy* was developed by the USDA National Forest Service, the U.S. Department of the Interior, and the National Association of State Foresters, in response to the 2000 fire season, during which more than 6.8 million acres of public and private lands burned—more than twice the 10-year national average. The magnitude of these fires was attributed to severe drought, accompanied by a series of storms that produced thousands of lightning strikes followed by windy conditions; and the long-term effects of almost a century of aggressively suppressing all wildfires, resulting in an unnatural buildup of brush and small trees throughout forests and rangelands. The *Cohesive Strategy* provides an overall framework for implementing fire management and forest health programs. It is based upon the following operating principles:

- ❑ Firefighting Readiness: Increase firefighting capability and capacity for initial attack, extended attack, and large fire support that will reduce the number of small fires becoming large, to better protect natural resources, to reduce the threat to adjacent communities, and reduce the cost of large fire suppression.
- ❑ Prevention Through Education: Assist state and local partners to take actions to reduce fire risk to homes and private property through programs such as FIREWISE.
- ❑ Rehabilitation: Focus rehabilitation efforts on restoring watershed function, including the protection of basic soil, water resources, biological communities, and prevention of invasive species.
- ❑ Hazardous Fuel Reduction: Assign highest priority for hazardous fuels reduction to communities at risk, readily accessible municipal watersheds, threatened and endangered species habitat, and other important local features, where conditions favor uncharacteristically intense fires.
- ❑ Restoration: Restore healthy, diverse, and resilient ecological systems to minimize uncharacteristically intense fires on a priority watershed basis. Methods will include removal of excessive vegetation and dead fuels through thinning, prescribed fire, and other treatment methods.
- ❑ Collaborative Stewardship: Focus on achieving the desired future condition on the land in collaboration with communities, interest groups, and state and federal agencies. Streamline process, maximize effectiveness, use an ecologically

conservative approach, and minimize controversy in accomplishing restoration projects.

- ❑ **Monitoring:** Monitor to evaluate the effectiveness of various treatments to reduce unnaturally intense fires while restoring forest ecosystem health and watershed function.
- ❑ **Jobs:** Encourage new stewardship industries and collaborate with local people, volunteers, Youth Conservation Corps members, service organizations, and Forest Service work crews, as appropriate.
- ❑ **Applied Research and Technology Transfer:** Focus research on the long-term effectiveness of different restoration and rehabilitation methods to determine those methods most effective in protecting and restoring watershed function and forest health. Seek new uses and markets for byproducts of restoration.

1.3.3 A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan

In August, 2001, the Secretaries of Agriculture and the Interior joined the Western Governor's Association, National Association of State Foresters, National Association of Counties, and the Intertribal Timber Council to endorse *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy*. This report marked the initial fulfillment of two key Congressional directives that:

- ❑ The Secretaries of the Interior and Agriculture and the Governors jointly develop a long-term national strategy to address the wildland fire and hazardous fuels situation and the needs for habitat restoration and rehabilitation; and
- ❑ The strategy should be developed with "close collaboration among citizens and governments at all levels."

The four goals of the *10-Year Comprehensive Strategy* are:

1. Improve fire prevention and suppression
2. Reduce hazardous fuels
3. Restore Fire-Adapted Ecosystems
4. Promote community assistance

Its three guiding principles are:

1. Priority setting that emphasizes the protection of communities and other high-priority watersheds at risk
2. Collaboration among governments and broadly representative stakeholders
3. Accountability through performance measures and monitoring for results

1.4 Environmental Compliance

In association with this plan, an Environmental Assessment that meets the requirements of the National Environmental Policy Act, including compliance with Section 106 of the National Historic Preservation Act and with Section 7 of the Endangered Species Act, is included as Appendix E.

1.5 Authorities for Implementing Fire Management Plan

Authority for fire management at the preserve originates with the Organic Act of 1916. The Organic Act established the National Park Service “to promote and regulate the use of the Federal areas known as national parks,...which purpose is to conserve the scenery and the natural and historic objects and the wild life 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.”

The 1978 “Redwood amendment” to the General Authorities Act of 1970 expands upon the provisions of the Organic Act, stating that, “...the protection, management, and administration of these [Park Service] areas shall be conducted in light of the high public value and integrity of the National Park System and shall not be exercised in derogation of the values and purposes for which these various areas have been established...”

As an NPS fire management program by design tiers to the respective park unit’s general and resource management objectives, fire management is an effective way of accomplishing the mandates of the above legislation.

2.0 RELATIONSHIP TO LAND MANAGEMENT PLANNING AND FIRE POLICY

2.1 Federal Fire Management Policy

The *2001 Federal Fire Policy*, discussed in section 1.3.1, is the product of a collaborative effort involving the U.S. Department of the Interior, the U.S. Department of Agriculture, the Department of Energy, the Department of Defense, the Department of Commerce, the U.S. Environmental Protection Agency, the Federal Emergency Management Agency, and the National Association of State Foresters. The report recognizes the role that fire plays as a critical natural process, as well as the detrimental effects of its absence in fire-adapted ecosystems. As per the report:

Historically, fire has been a frequent and major ecological factor in North America. In the conterminous United States during the preindustrial period (1500-1800), an average of 145 million acres burned annually. Today only 14 million acres (federal and non-federal) are burned annually by wildland fire from all ignition sources....

This decrease in wildland fire has been a destabilizing influence in many fire-adapted ecosystems such as ponderosa pine, lodgepole pine, pinyon/juniper woodlands, southern pinelands, whitebark pine, oak savanna, pitch pine, aspen, and tallgrass prairie. Fuels

increased and understory vegetation became more dense. As a result, those wildland fires that did occur were larger and more severe than historical fires. Eliminating fire also affected individual plant species. For example, Hessel and Spackman (1995) found that, of the 146 threatened, endangered, and rare plant species found in the conterminous U.S. for which there is conclusive information on fire effects, 135 species benefit from wildland fire or are found in fire-adapted ecosystems.

The report further states that:

...today's conditions confront us with the likelihood of more rapid, extensive ecological changes beyond any we have experienced in the past. To address these changes and the challenges they present, we must first understand and accept the role of wildland fire, and adopt land management practices that integrate fire as an essential ecosystem process.

The task before us—reintroducing fire—is both urgent and enormous. Conditions on millions of acres of wildlands increase the probability of large, intense fires beyond any scale yet witnessed. These severe fires will in turn increase the risk to humans, to property, and to the land upon which our social and economic well being is so intimately intertwined.

In the case of the preserve, fire once played an important role in the function of the local ecosystem. Far from being a negative and destructive force, naturally occurring fires shaped the landscape over time. In many cases, the landscape today shows the legacy of past fires. Many plant and wildlife species evolved under the influence of fire and, in some cases, depend on fire for their continued existence. To exclude fire from this ecosystem deprives it of a powerful and essential natural force.

2.2 Establishment of Timucuan Ecological and Historic Preserve

The National Park System consists of more than 380 units representing our country's finest natural and cultural assets. Timucuan Ecological and Historic Preserve was established by Public Law 100-249 on February 16, 1988, "to administer those lands...within the preserve in such a manner as to protect the natural ecology of such land and water areas in accordance with this Act and the provisions of the law generally applicable to units of the National Park System."

With designation of the preserve, Congress sought to protect the complex salt marsh/estuarine ecosystem and historic and prehistoric sites in the valley between the lower St. Johns and Nassau Rivers, Florida, and to provide opportunities for the public to understand, enjoy, and appreciate these resources. Timucuan was designated a national preserve rather than a national park because Congress envisioned it to be a place that could accommodate public and private uses not traditionally found in national parks.

The preserve's enabling legislation also directed the Secretary of the Interior to incorporate Fort Caroline National Memorial, established in 1950 (64 Stat. 897), into the preserve, stating: "Such historical park shall serve as the principal interpretive center and administrative facility for the ecological, historic and prehistoric resources made available under this legislation."

Located in northeast Florida, the preserve encompasses waterways and wetlands that form an extensive estuarine system between the Nassau and St. Johns rivers where they meet the Atlantic Ocean. This estuarine system is predominately salt marsh, coastal hammock, and marine and brackish waters. Much of the salt marsh is among the least disturbed on the southern Atlantic Coast. Many resident, migratory, and rare species rely on the important habitats within the preserve.

While the preserve is a relatively new National Park System unit, most of the area had already been designated by the state of Florida as the Nassau River-St. Johns River Marshes Aquatic Preserve and Outstanding Florida Waters with strict water quality criteria for protection. Because of these designations, the preserve contains class II waters (suitable for shellfish harvesting), the last in Duval County.

The preserve provides a large open area for recreation within the boundaries of a major metropolitan area. Existing water-based recreation resources include the Intracoastal Waterway, fish camps, fisheries, shellfish waters, and the St. Johns and Nassau rivers. The Theodore Roosevelt area provides trails and picnic areas. State parks in and adjacent to the preserve have beaches, trails, and other recreational resources. Huguenot Memorial Park and Sisters Creek Park and boat ramp, operated by the city of Jacksonville, offer water access and day use activities. The E. Dale Joyner Nature Preserve at Pelotes Island, operated by the Jacksonville Electric Authority and also within the preserve boundary, provides environmental education opportunities to school groups on a reservation basis.

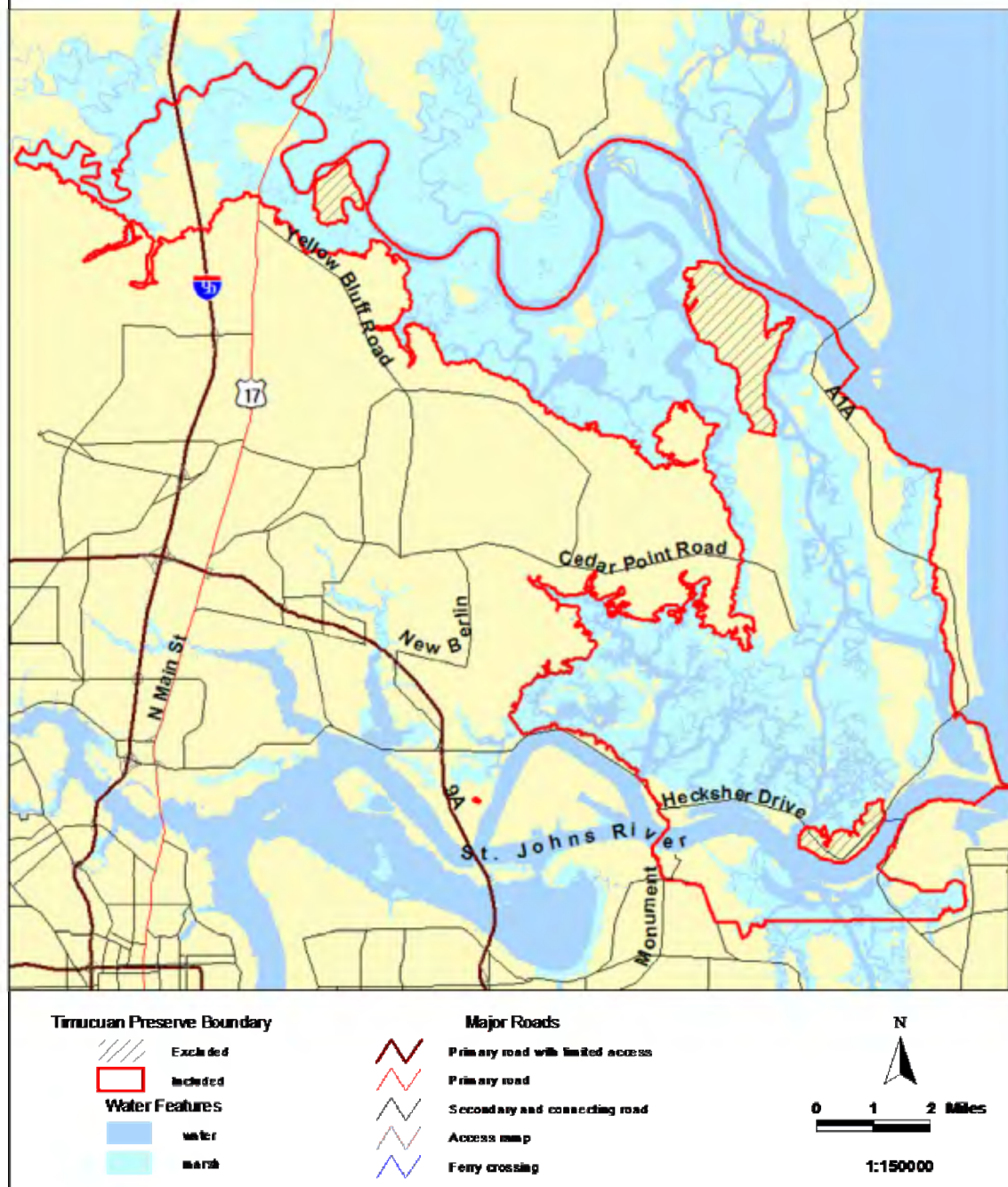
Cultural resource areas provide opportunities for recreational as well as educational experiences. Fort Caroline National Memorial and Kingsley Plantation offer trails and/or picnic tables. The Mayport Ferry also provides a recreational opportunity for preserve visitors.

**Timucuan Ecological and Historic Preserve
Fort Caroline National Memorial
General Location Map**



Figure 2

Timucuan Ecological and Historic Preserve Boundary Map



2.3 General Management Plan Objectives

The preserve's 1996 Final General Management Plan/Development Concept Plans/Environmental Impact Statement (GMP) provides management guidance for concerns of the preserve related to protection of the important ecosystem; impacts on plant and animal species, especially those listed as threatened, endangered, or of special concern; threats to important cultural resources; land ownership or land control and land uses; interpretation of the preserve's diverse resources and unique ecology for residents and visitors; and appropriate types and levels of use by humans for residing, working, commuting, recreating, learning, hunting, and fishing.

The GMP lists one of the preserve's purposes as contributing "to the protection, preservation, and management of the Nassau River/lower St. Johns River drainage." It identifies the role of fire in achieving this, stating that, "Fire is an integral part of upland ecology in the preserve. Most plant communities are not only susceptible to fire, but depend on periodic burning for their survival."

2.4 Resource Management Plan Objectives

The preserve's 1997 Resource Management Plan (RMP) states that there is a need to "conduct prescribed burns, manage exotic plants, and restore the functioning of disturbed vegetation communities." The preserve's fire management program will implement the approved course of action called for in Project Statement TIMU-I-201 of the RMP. This project statement recognizes fire as an important factor in the ecosystem, identifies the negative impacts caused by total fire suppression, and calls for the establishment of a more appropriate and responsive program of fire management. This will include prescribed fire, mechanical treatment of the pine plantation forests (harvest, mowing, and plowed lines) and utilization of the latest fire ecology research.

2.5 How Fire Management Plan Supports General and Resource Management Plan Objectives

Principle #3 of the *2001 Federal Fire Policy* states that "fire management plans, programs, and activities [will] support general and resource management plans and their implementation." This FMP serves as a detailed and comprehensive program of action to implement federal fire management policy principles and goals, which in turn support the preserve's general and resource management plan objectives, as well as its enabling legislation. Specifically:

- ❑ Wildland fire suppression will serve to protect human life, property, and natural and cultural resources from the adverse effects of unwanted fire.
- ❑ Prescribed fire will serve to promote ecosystem sustainability at the preserve. Many of the plant communities here are fire-dependent or fire-adapted. Lack of fire favors fire-intolerant species over fire-dependent ones. The interruption of natural burn

cycles also results in abnormal fuel loading and unnaturally severe fires when ignitions do occur.

- ❑ Prescribed fire and non-fire applications will serve to reduce hazard fuels accumulations. This creates fuel conditions that support low-intensity fires, thereby reducing the threat of catastrophic wildland fire, and reducing the risk of negative impacts to natural and cultural resources, preserve infrastructure, and adjacent property in the event of a wildland fire. Reducing hazard fuels accumulations additionally improves conditions for firefighter and public safety.
- ❑ Prescribed fire, in conjunction with non-fire applications, will promote exotic vegetation species control. The *National Park Service Management Policies 2001* (section 4.4.4.2) states that high priority will be given to managing—up to and including eradicating—exotic species that have, or potentially could have, a substantial impact on park resources.

3.0 WILDLAND FIRE MANAGEMENT STRATEGIES

3.1 General Management Considerations

The preserve's fire management goals, which follow, incorporate the preserve's overall management objectives as well as previously-discussed federal fire management policy principles and goals, including firefighter and public safety, collaboration, and accountability.

3.2 Wildland Fire Management Goals

Fire management goals at the preserve are:

Goal 1: Make firefighter and public safety the highest priority of every fire management activity.

Objective: Ensure that wildland fire suppression and prescribed fire operations cause no injuries to firefighters or to members of the public.

Strategies: All personnel involved in fire management operations will receive a safety briefing that describes known hazards and required mitigating actions. Briefings will address established firefighter safety practices, current fire conditions, and current and predicted fire weather and behavior.

Only qualified individuals may conduct fire management operations. For prescribed fires, each individual must meet National Wildfire Coordinating Group standards listed in the *Wildland and Prescribed Fire Qualification Systems Guide 310-1*, including the appropriate fitness test. The requirement for suppression activities will mandate that firefighting personnel meet the qualifications of their agencies. After initial stages, every effort will be made to utilize only personnel who meet the 310-1 standards.

Notify preserve neighbors, preserve visitors, interagency partners, and local residents of all planned fire management activities that could affect them. For unplanned fires, an effort will be made to inform neighbors at the first opportunity.

The superintendent may close all or portions of the preserve to the public when fire activity poses a threat to human safety.

On every prescribed fire project there will be one person assigned as safety advisor.

Goal 2: Suppress all wildland fires, regardless of ignition source, to protect the public, to check fire spread onto private property, and to protect the natural and cultural resources of the preserve.

Objective: Limit 95% of wildland fires to less than 10 acres in size.

Strategies: Suppress fires or portions of fires that threaten to damage private or public property.

Ensure that preserve staff are trained in wildland fire operations.

Ensure that preserve staff responsible for fire operations understand fire policy.

Ensure that the preserve fire engine is in a state of readiness during fire season.

Establish and maintain effective working relationships with neighboring agencies to best accomplish suppression objectives.

Goal 3: Manage prescribed fires in compliance with federal, state, and local air quality regulations.

Objective: Ensure that air quality thresholds for National Ambient Air Quality Standards are not exceeded and that visibility is not reduced in adjacent airsheds.

Strategy: Air quality impacts will be addressed in the Wildland Fire Implementation Plan. Air quality objectives will be incorporated in each prescribed burn plan. Smoke impact mitigation measures will be implemented for prescribed burns and all wildland fire actions. Alternative methods (e.g., mechanical, biological, etc.) to prescribed fire will be analyzed prior to selecting fire treatment.

Goal 4: Manage wildland fires so that preserve resources (natural, cultural, and improvements/development) are protected from damage by fire and suppression actions.

Objective: Manage suppression actions so that rehabilitation costs total less than 10% of suppression costs.

Strategies: Ensure that wildland fire suppression operations employ minimum impact suppression tactics to the greatest extent feasible and appropriate, employing methods least damaging to preserve resources for the given situation.

Ensure that fire operations personnel are briefed on preserve resources and potential damage from fire and suppression actions.

Goal 5: Facilitate reciprocal fire management activities through cooperative agreements and working relationships with other fire management entities.

Objective: Review and modify agreements with neighboring agencies annually.

Strategy: Coordinate with the following entities:

- ☐ Florida Division of Forestry
- ☐ The Nature Conservancy
- ☐ St. Johns River Water Management District
- ☐ U. S. Forest Service (Osceola National Forest)
- ☐ U. S. Fish and Wildlife Service (Okefenokee NWR)
- ☐ Florida Department of Environmental Protection – Division of Recreation and Parks (also manages Little Talbot Island, Big Talbot Island, Ft. George Island, and Pumpkin Hill Preserve state parks)
- ☐ Cumberland Island National Seashore
- ☐ City of Jacksonville Fire and Rescue

Goal 6: Use prescribed fire as a tool to meet resource management objectives. Maintain and restore, where possible, the preserve's natural resources, and the natural ecological conditions that would prevail without modern civilization.

Objective: Restore fire as an ecological process, and maintain fire-dependent vegetative communities and their associated wildlife species.

Strategies: Maintain a variety of age groups of pine trees to make nesting and perching sites for birds and other wildlife available in the pine plantations.

Reduce fuel loading in certain areas of the preserve from dangerously high artificial levels to less volatile natural levels.

Increase native plant diversity and reduce exotic species.

Monitor the effects of fire on the ecosystem.

Goal 7: Reduce hazard fuels accumulations around developed areas, along boundaries, and in areas adjacent to cultural sites.

Objective: Ensure fire does not destroy or damage any public or private structure, nor incur any damage to any cultural or historic site.

Strategies: Reduce hazard fuels through the use of mechanical techniques and prescribed fire to reduce the intensity of subsequent unwanted wildland fires.

Manually and mechanically reduce hazard fuels around structures to reduce fire intensity and severity to defensible levels.

Manually and mechanically reduce hazard fuels in areas where wildland or prescribed fire may be difficult to suppress before leaving NPS lands.

Manually and mechanically reduce hazard fuels around vulnerable cultural sites.

Goal 8: Reduce the incidence and extent of human-caused wildland fires in and around the preserve.

Objective: Prevent unplanned human-caused ignitions through fire prevention and education programs for preserve visitors, neighbors, and staff.

Strategy: Inform and educate the public through school visits, interpretive programs, public meetings, etc. Topics will include prevention, defensible space, and ecosystem maintenance.

3.3 Scope of Wildland Fire Management Elements to be Implemented

The preserve will implement a combination of wildland fire suppression, prescribed fire, and non-fire applications. It should be noted that the prescribed fire and non-fire applications proposed in this FMP apply only to areas with approved vegetative management and/or forestry management plans. There are numerous parcels of newly acquired land owned by the preserve that lack such plans. Prescribed fire and/or non-fire applications will occur in these areas only after such plans have been completed and undergone public review, or site-specific NEPA compliance has occurred.

3.3.1 Wildland Fire Suppression

A wildland fire is defined as any nonstructural fire, other than prescribed fire, that occurs in the wildland. All wildland fires at the preserve, regardless of origin, will be suppressed.

3.3.2 Prescribed Fire

The preserve will use prescribed fire primarily to restore fire as an ecological process, and maintain fire-dependent vegetative communities and their associated wildlife species; and to reduce hazard fuels accumulations. Preserve planning documents will guide the use of prescribed fire. Until additional planning documents (vegetation management or

forestry management plans) are completed, the preserve proposes using prescribed fire only on one parcel at Cedar Point. This 140-acre area is a former slash pine plantation that has been mechanically treated to reduce hazard fuels.

3.3.3 Non-Fire Applications

The preserve will use non-fire applications (manual and mechanical techniques) to reduce hazard fuels accumulations around preserve structures and cultural sites, to refurbish existing holding lines around the proposed prescribed fire unit, and possibly to treat the same prescribed fire unit prior to burning it.

3.4 Preserve Description

The preserve has been divided into six fire management units (FMUs) to facilitate the achievement of fire management objectives. A description of the general physical and biotic characteristics of the preserve, below, is followed by descriptions of the FMUs.

3.4.1 Physical and Biotic Characteristics

3.4.1.1 Real Property

The preserve is located in Duval County of northeastern Florida. It includes the river valley formed by the Nassau River to the north and the St. Johns River to the south (except for a small preserve parcel south of the St. Johns River), the Atlantic Ocean to the east (excluding Little Talbot Island), and Browns Creek to the west. The NPS currently owns and manages approximately 8,000 acres of uplands within the 46,000-acre preserve.

Much of the preserve is at or near sea level. Most of the area within existing boundaries is open water or salt marsh that is submerged at mean high tide. Upland areas range from barely above water level to above 60 feet elevation at two locations. The highest point, about 75 feet above sea level, is on St. Johns Bluff on the south bank of the St. Johns River.

3.4.1.2 Soils

Five major soil associations occur within the preserve, consisting of Tisonia mucky peat in salt marshes; the Leon-Ridgeland-Wesconnett fine-sand soil type in areas where pines, palmetto and other shrubs and native grasses occur; the Mandarin-Kureb sandy textured soils of the elevated flatwood areas; the sandy and well-drained Kershaw-Ortega type that supports oaks, pinelands and native grasses; and the limited Aquic Quartzipsammets-Fripp soil type which occurs only along the Atlantic beaches.

3.4.1.3 Air Quality

The preserve is designated a class II air shed under the Clean Air Act under the 1977 amendments to the Clean Air Act. Under class II, modest increases in air pollution are

allowed beyond baseline levels for particulate matter, sulfur dioxide, nitrogen and nitrogen dioxide, provided that the national ambient air quality standards, established by the Environmental Protection Agency (EPA), are not exceeded.

Air quality is a major concern at the preserve, because of its location in a large and growing metropolitan area. Although limited industrial development is located within preserve boundaries, there is heavy industry around the southern portion of the preserve. All shipping traffic bound to and from the Port of Jacksonville passes through the preserve on the St. Johns River, and commercial barge traffic passes through on the Intracoastal Waterway. Mobile and stationary sources contribute to air quality degradation. There are 34 major permitted stationary sources of air pollution in Duval County, most of which are located in the vicinity of the preserve, including the largest coal-fired power plant in Florida. There are several other sources in northeastern Florida as well as along the nearby Georgia coast. Table 1 lists the permitted stationary facilities located within five miles of preserve boundaries.

Table 1: Air Quality Permitted Facilities within Five Miles of Preserve Boundaries

Facility Name	CO	NOX	PM	VOC	SO2	Total
JEA-Northside/SJRPP	1676.93	31925.69	1871.7	160.91	48067.55	83702.78
Cedar Bay Cogenerat	583.06	1744.71	202.27	18.46	1927.33	4475.83
City of JAX, Girvin Land	89.01	47.35	No data	No data	No data	136.36
Celotex	29.41	35.01	12.77	3.02	0.21	80.42
NAS-Mayport	6.28	27.87	2.48	42.43	0.37	79.43
Atl. Dry Dock/Marine	No data	No data	35.5	33.48	No data	68.98
Amerada Hess	No data	No data	No data	56.15	No data	56.15
Stone Container	13.79	22.99	1.30	0.92	0.09	39.09
Williams Energy Ventu	No data	No data	No data	32.75	No data	32.75
APAC-Florida, Inc.	4.4	9.17	0.35	8.44	6.85	29.21
BP Oil	No data	No data	No data	22.72	No data	22.72
Blount Island Command	No data	No data	16.38	2.96	No data	19.34
BF Goodrich	0.26	1.06	0.84	4.69	3.75	10.60
City of JAX, Soild Waste	2.06	0.11	0.05	1.78	1.81	5.81
Detyens Shipyards	No data	No data	0	3.47	No data	3.47
Atlantic Marine, Inc.	No data	No data	1.58	0.98	No data	2.56

Measured in tons/year

There are 14 air monitoring sites in Duval County, including several near the western edge of the preserve. Among the pollutants being monitored are total suspended particulates, PM-10, carbon monoxide, sulfur dioxide, nitrogen dioxide, and lead.

3.4.1.4 Water Resources/Water Quality

The preserve includes the seaward confluence of the Nassau and St. Johns rivers, which forms an extensive estuarine system of predominately salt marsh, coastal hammock, and marine and brackish waters. The U.S. Fish and Wildlife Service has classified the majority of the preserve as an estuarine, intertidal wetland with persistent, emergent vegetation. Other less prominent estuarine wetlands include subtidal open water and subtidal unconsolidated bottom.

The largest known freshwater wetland in the preserve is Spanish Pond. Freshwater wetlands are primarily limited to upland areas on islands and thus represent a small percentage of wet areas in the preserve.

The estuarine waters and salt marshes that surround islands between the St. Johns River and the Nassau River are part of the state of Florida's Nassau River-St. Johns River Marshes Aquatic Preserve. This area contains Duval County's last remaining class II waters suitable for shellfish harvesting. The Florida Department of Environmental Protection recently designated all waters in the preserve as Outstanding Florida Waters, with stringent water quality criteria.

A baseline water quality monitoring program includes 11 stations (Florida Department of Environmental Regulation 1991) within the boundaries of the preserve. All of these stations are on the Intracoastal Waterway from the Nassau River south to the confluence of the Intracoastal Waterway with the Fort George River. At these stations, chemical and microbiological parameters are measured; aquatic macroinvertebrates are sampled at two stations.

The city of Jacksonville's water quality monitoring program currently includes 14 stations within the Nassau River drainage, nine stations within the Fort George River drainage/Intracoastal Waterway drainage, and one station on the St. Johns River, most within preserve boundaries.

3.4.1.5 Vegetation

As delineated by the Florida Game and Fresh Water Fish Commission (1991), 53.7 percent of the preserve is coastal salt marsh, 23.3 percent is open water, 5.1 percent is pinelands, 4.7 percent is hardwood hammocks and forests, and 3.8% is barren (largely unvegetated areas including roads, cleared land, and beaches). Coastal salt marsh, pinelands, and hardwood hammocks and forest are discussed below. The remaining vegetation at the preserve consists of small amounts of shrub and brushland (2.5%), xeric oak scrub (2.1%), mixed hardwood-pine forest (2.0%), hardwood swamp (1.8%), dry prairie (0.4%), freshwater marsh and wet prairie (0.3%), coastal strand (0.2%), bay swamp (0.1%), sand hill (<0.1%), and cypress swamp (<0.1%).

- ❑ Coastal Salt Marsh: This herbaceous and shrubby wetland community 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 *Spartina* and *Juncus*.
- ❑ Pinelands: This upland community includes pine flatwoods and commercial pine plantations. Pine species represented across the area are longleaf, slash, sand, loblolly and pond pine, depending on the preferred site. Understory and surface cover include

saw palmetto, gallberry, wax myrtle, and a variety of grasses and other herbaceous plants.

- Hardwood Hammocks and Forests: This upland community expresses a species distribution driven largely by soil moisture, soil type, and geographic location. The mesic (wet) hammock type consists of a mix of beech, magnolia, oak, hickory, ash, mulberry, and 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, containing oak, maple, elm, palm, red cedar, beech and sweetgum.

Exotic vegetation species targeted for management at the preserve include paper mulberry (*Broussonetia papyrifera*), Boston fern (*Nephrolepis cordifolia*), mimosa (*Albizia julibrissin*), Chinese tallow (*Sapium sebiferum*), Chinese wisteria (*Wisteria sinensis*), air potato (*Dioscorea bulbifera*), winged yam (*D. atropurpurea*), English ivy (*Hedera helix*), Chinaberry (*Melia azederach*), kudzu (*Pueraria montana*), water hyacinth (*Eichhornia crassipes*), Old World climbing fern (*Lygodium scandens*), green wandering Jew (*Tradescantia fluminensis*), asparagus fern (*Asparagus densiflorus*), cogon grass (*Imperata cylindrica*), Japanese honeysuckle (*Lonicera japonica*), coral ardisia (*Ardisia crenata*), cat's claw vine (*Macfadyena unguis-cati*) and Peruvian primrosewillow (*Ludwigia peruviana*).

The University of Georgia is currently conducting a vascular plant inventory at the preserve.

Appendix C includes a list of known preserve flora.

3.4.1.6 Wildlife

The preserve encompasses both aquatic and terrestrial communities. Examples of preserve fauna are provided below (source: Florida Department of Natural Resources 1990, Newman et al. 1988, City of Jacksonville 1984). Section 3.4.1.7 discusses federally- and state-listed species at the preserve.

- Fish: According to the Florida Game and Fish Commission (1983), there are 55 freshwater and 115 marine and estuarine fish species in the St. Johns River basin. Several families of finfish contribute to recreational and commercial fisheries in the lower St. Johns River and in northeast Florida. The most important of these families is the Sciaenidae, which includes whittings (*Menticirrhus* spp.), spotted seatrout (*Cynoscion nebulosus*), weakfish (*C. regalis*), croaker (*Micropogon undulatus*), spot (*Leiostomus xanthurus*), black drum (*Pogonias cromis*), and red drum (*Sciaenops ocellatus*). The young and juvenile of these species require estuaries for nursery grounds, and adults are either permanent residents of estuaries or inhabitants of shallow coastal waters.

The U.S. Geological Survey recently completed a fish inventory at the preserve, with a 2001 report documenting its findings. Auburn University is currently collecting and geo-referencing voucher specimens and historical collections within and close to the preserve.

- Mammals: Mammals documented to occur at the preserve include the white-tailed deer (*Odocoileus virginianus*), bobcat (*Lynx rufus*), gray fox (*Urocyon cinereoargenteus*), Florida mink (*Mustela vison lutensis*), river otter (*Lutra canadensis*), raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), unidentified bats (Vespertilionidae or Molossidae), eastern mole (*Scalopus aquaticus*), eastern gray squirrel (*Sciurus carolinensis*), marsh rabbit (*Sylvilagus palustris*), eastern cottontail (*S. floridanus*), rice rat (*Oryzomys palustris*), round-tailed muskrat (*Neofiber alleni*), cotton mouse (*Peromyscus gossypinus*), manatee (*Trichechus manatus*), and wild hog (*Sus* spp.).

The University of North Carolina at Wilmington is currently conducting a mammal inventory at the preserve, and the University of Florida is currently conducting a bat inventory at the preserve.

- Reptiles and Amphibians: Few reptiles and no amphibians are regular residents in the preserve salt marshes; most inhabit the upland areas. Reptiles documented to occur at the preserve include the American alligator (*Alligator mississippiensis*), six-lined race runner (*Cnemidophorus sexlineatus*), southern fence lizard (*Sceloporus undulatus*), eastern glass lizard (*Ophisaurus vantralis*), broad-headed skink (*E. laticeps*), gopher tortoise (*Gopherus polyphemus*), eastern mud turtle (*Kinosternon subrubrum*), Florida softshell (*Apalone ferox*), diamondback terrapin (*Malaclemys terrapin*), Florida cottonmouth (*Agkistrodon piscivorus*), eastern diamondback rattlesnake (*Crotalus adamanteus*), corn snake (*Elaphe guttata*), yellow rat snake (*E. obsoleta quadrivittata*), eastern indigo snake (*Drymarchon corais couperi*), scarlet king snake (*Lampropeltis triangulum*), eastern coachwhip (*Masticophis flagellum*), and rough green snake (*Opheodrys aestivus*).

Amphibians documented to occur at the preserve include the slimy salamander (*Plethodon glutinosus*), southern cricket frog (*Acris gryllus*), greenhouse frog (*Eleutherodactylus planirostris*), green tree frog (*Hyla cinerea*), squirrel tree frog (*Hyla squirella*), southern leopard frog (*Rana sphenoccephala*), Florida gopher frog (*R. areolata aesopus*), southern toad (*Bufo terrestris*), eastern narrowmouth toad (*Gastrophryne carolinensis*), and eastern spadefoot toad (*Scaphiopus holbrooki*).

The University of Georgia recently completed a herpetofaunal inventory at the preserve, and is currently completing a report documenting its findings. The species list will be certified by fall of 2004.

- Avifauna: Birds at the preserve include permanent resident species, as well as winter or summer residents, and migrants. Species documented to occur within or adjacent to the preserve include the brown pelican (*Pelecanus occidentalis*), double-crested

cormorant (*Phalacrocorax auritus*), white ibis (*Eudocimus albus*), wood stork (*Mycteria americana*), wood duck (*Aix sponsa*), black vulture (*Coragyps atratus*), osprey (*Pandion haliaetus*), bald eagle (*Haliaeetus leucocephalus*), red-shouldered hawk (*Bureo lineatus*), wild turkey (*Meleagris galloavo*), Wilson's plover (*Charadrius wilsonia*), American oystercatcher (*Haematopus palliatus*), ring-billed gull (*Larus delawarensis*), royal tern (*Sterna maxima*), Forster's tern (*S. forsteri*), black skimmer (*Rynchos niger*), eastern screech owl (*Otus asio*), great horned owl (*Bubo virginianus*), belted kingfisher (*Megaceryle alcyon*), red-headed woodpecker (*Melanerpes erythrocephalus*), pileated woodpecker (*Dryocopus pileatus*), purple martin (*Progne subis*), Carolina wren (*Thryothorus ludovicianus*), gray catbird (*Dumetella carolinensis*), palm warbler (*Dendroica palmarum*), pine warbler (*D. pinus*), summer tanager (*Piranga rubra*), rose-breasted grosbeak (*Pheucticus ludovicianus*), and orchard oriole (*Icterus spurius*).

The NPS Inventory and Monitoring Network is scheduled to begin a bird inventory at the preserve within the year.

Appendix C includes a list of known preserve fauna.

3.4.1.7 Threatened and Endangered Species

Table 2 identifies federally- or state-listed species that occur at the preserve.

Table 2: Federally- or State-Listed Species that Occur at the Preserve

Scientific Name	Common Name	Federal Status	State Status
<i>Acipenser brevirostrum</i>	Shortnose sturgeon	E	E
<i>Cheliona Mydas</i>	Common green sea turtle	E	E
<i>Dermochelys coriacea</i>	Leatherback sea turtle	E	E
<i>Eretmochelys imbricata</i>	Hawksbill sea turtle	E	E
<i>Lepidochelys kempii</i>	Kemp's ridley sea turtle	E	E
<i>Mycteria americana</i>	Wood stork	E	E
<i>Picoides borealis</i>	Red-cockaded woodpecker	E	S
<i>Puma concolor coryi</i>	Florida panther	E	E
<i>Trichechus manatus</i>	Manatee	E	E
<i>Schwalbea americana</i>	Chaffseed	E	E
<i>Ambystoma cingulatum</i>	Flatwoods salamander	T	S
<i>Caretta caretta</i>	Loggerhead turtle	T	T
<i>Charadrius melodus</i>	Piping plover	T	T
<i>Drymarchon corais couperi</i>	Eastern indigo snake	T	T
<i>Haliaeetus leucocephalus</i>	Bald eagle	T	T
<i>Nerodia fasciata teaeniata</i>	Atlantic salt marsh snake	T	T
<i>Alligator mississippiensis</i>	American alligator	T (S/A)	S
<i>Aimophila aestivalis</i>	Bachman's sparrow	*	
<i>Charadrius alexandrinus tenuirostris</i>	Southeastern snowy plover	*	
<i>Egretta refescens</i>	Reddish egret		S
<i>Gopherus polyphemus</i>	Gopher tortoise		S
<i>Heterodon simus</i>	Southern hognose snake	*	
<i>Notophthalmus perstriatus</i>	Striped newt	*	
<i>Ophisaurus compressus</i>	Island glass lizard	*	
<i>Ophisaurus mimicus</i>	Mimic glass lizard	*	

Scientific Name	Common Name	Federal Status	State Status
<i>Pituophis melanoleuas mugitus</i>	Florida pine snake		S
<i>Cheilanthes microphylla</i>	Southern lip fern		E
<i>Forestiera godfreyi</i>	Godfrey's privet		E
<i>Lantana depressa</i> var. <i>floridana</i>	Atlantic Coast Florida lantana		E
<i>Peperomia humilis</i>	Terrestrial peperomia		E
<i>Spiranthes polyantha</i>	Green ladies'-tresses		E
<i>Sterna antillarum</i>	Least tern		T
<i>Cistothorus palustris griseus</i>	Worthington's marsh wren		S
<i>Egretta tricolor</i>	Tricolored heron		S
<i>Eudocimus albus</i>	White ibis		S
<i>Haematopus palliatus</i>	American oystercatcher		S
<i>Pandion haliaetus</i>	Osprey		S
<i>Rynchops niger</i>	Black skimmer		S

Source: 2002 park list and occurrence records obtained from Florida Natural Areas Inventory, as well as preliminary listing from 2001 herpetological inventory.

Keys to table: C = candidate for listing; E = endangered; N = not currently listed, nor currently being considered for listing; R = rare; S = species of special concern; T = threatened; T (S/A) = Threatened due to similarity of appearance to a threatened taxon; * = species of special concern as per 2002 preserve natural resources map

3.4.1.8 Cultural and Historic Resources

Ten sites specifically related to the preserve's history were identified in the enabling legislation. Only four of these 10 sites have extant remains that have been located—the antebellum Zephaniah Kingsley Plantation, Yellow Bluff Fort, Spanish-American War fortification, and San Juan del Puerto mission site. The other six sites—San Estaban, San Gabriel, Dos Hermanas, Thomas Creek Battlefield, Fort St. George, and St. Johns Town—have not been found.

There are, however, many other prehistoric and historic cultural resources within the preserve not cited in the legislation, that contribute to the understanding of human use and life in the region. The preserve contains sites representing almost every cultural period: Archaic, Orange, Woodland, Mississippian, Protohistoric, Mission Period, First Spanish Period, British Period, Second Spanish Period, and 19th century American to the present. These sites represent several thousand years of human occupation of the area. Perhaps the oldest documented ceramic culture habitation site in the state of Florida (dating back 6,000 years) is found on preserve lands.

The NPS Southeast Archeological Center (SEAC) has conducted research for the preserve since 1987. In 1988, SEAC prepared the report entitled *Archeological Overview and Assessment of Sites Within and Adjacent to the Proposed Boundaries of the Timucuan Ecologic and Historic Preserve* (NPS 1988). In 1990, an archeological survey and evaluation was begun at the preserve through a cooperative agreement between SEAC and the Florida Museum of Natural History, University of Florida at Gainesville. Although the work beginning in 1990 was extensive, many areas within the preserve were not surveyed, and approximately two-thirds of the preserve remains to be surveyed.

Searches were made for many of the historic sites mentioned in the preserve's enabling legislation, but most were not located.

The museum collection for the preserve is maintained as two distinct collections (FOCA and TIMU), although they are stored together in the new curatorial building next to the preserve headquarters. The collections include numerous objects recovered by archeological methods at various sites over the past 50 years. Archeological collections recovered by SEAC staff are housed at their building in Tallahassee. Other items in the collection include donated and purchased historic objects, books, and photographs. A new Scope of Collection statement for both park units is in draft form and should be finalized in 2004.

3.4.2 Management Considerations

- ❑ Ensure that firefighter and public safety remains the primary consideration in planning and conducting all fire management activities.
- ❑ Ensure that archeological/cultural/historic resources are considered in planning and conducting all fire management activities.
- ❑ On lands not currently in pine plantations, the use of bulldozers or retardant is prohibited except in situations where buildings may be lost, fire threatens to leave NPS lands, or with the express approval of the preserve superintendent.
- ❑ Avoid disturbance to federally- or state-listed species during sensitive periods, such as nesting, to the greatest extent possible.
- ❑ Protect any bald eagle nests located on NPS lands.
- ❑ Ensure that air quality regulations are considered in planning and conducting all fire management activities.
- ❑ Ensure that all applicable laws, policies and regulations are considered in planning and conducting all fire management activities.
- ❑ Ensure that socio-political economic impacts, including wildland urban interface, are considered in planning and conducting all fire management activities.
- ❑ Ensure that fire management activities are coordinated as appropriate with all affected parties. This includes any federally recognized Indian tribes that have historical, cultural, economic or other interests in the proposed action or its effects (required, for example, by 36 CFR 800, 40 CFR 1508, and 43 CFR 10).
- ❑ Consult with preserve neighbors concerning any fire management activity that could impact them.

3.4.3 Past Role of Fire

The historic role of fire must be understood in order to perpetuate ecological processes and preserve the natural conditions at the preserve. Fire is an integral part of the ecosystem; much of the vegetative communities can be considered fire subclimax. Thousands of years of natural fires achieved equilibrium between competing forces. Fire exclusion in more recent history has shifted the equilibrium and the vegetative communities.

- Pre-Human Settlement: Ecological and meteorological evidence indicates that lightning-caused fires were a major environmental force shaping the vegetation of North America for millions of years prior to human habitation (Van Lear and Waldrop 1989). Fire-adapted ecosystems developed, as did individual plant species dependent upon or adapted to wildland fire. According to fire ecologist Dr. Cecil Frost (1998), "...fire once played a role in shaping all but the wettest, the most arid, or the most fire-sheltered plant communities of the United States."

The preserve lies in an area that receives a large number of thunderstorms. Lightning is a common occurrence in late spring through summer, and lightning ignitions occur regularly. The frequency of fires started by lightning prior to human settlement in northeast Florida is unknown, but other coastal areas have documented fire at return intervals of seven to 20 years (U.S. Fish and Wildlife Service 1995).

- Prehistoric Settlement to European Contact: There are several indications that the Native Americans of this area regularly used fire to modify their environment. The earliest evidence of humans in the preserve area dates to 4000 B.C., although Native Americans are known to have been in Florida as early as 10,000 B.C. The first groups of aboriginals contacted by Europeans in the preserve area were the Timucuan, who cleared plots of land for crops, such as maize and beans, and may have used fire for this purpose. Dobyns (1983) cites evidence of the Timucuan using fire, including the presence of meadows maintained for hunting, and the presence of specific species that require open habitat. The 1539–1543 de Soto expedition described large agricultural fields, probably created and maintained by the use of fire (Doolittle 1992).

In Virginia, Europeans observed Native Americans using fire to drive or herd animals, but no written accounts are known of the Timucuan utilizing fire in this manner (Davison and Bratton 1986). Also, in the Piedmont and mountain provinces of the southeast, Native Americans used fire to clear the forest understory, which facilitated the gathering of roasted acorns, hickory nuts, and chestnuts.

French settlers in the 1560s reported an occurrence of fire that seemed particularly severe. Laudonniere chronicled a fire so intense that "green fields and birds were consumed in one instance" (Bennett 1975). The fire lasted for three days and resulted in fish kills. Some modern scholars have speculated that this may be a reference to a fire caused by a meteor strike as opposed to lightning.

- Euro-American Settlement: Europeans arrived in the area in the 1560s and seem to have had little influence on the vegetation of the area, with the exception of areas immediately surrounding settlements, which included forts and other outposts. It was these early Europeans who chronicled the use of fire by the Timucuan. Although some cattle were introduced to the region, there was little land cleared for grazing.

British planters began to settle in the area in the late 1700s. The planters and later American settlers used fire to clear land, maintain pasture, control insects, and hunt game. Some areas were intensively managed, such as Kingsley Plantation on Ft. George Island. Nearly the entire island was cleared of native vegetation for the production of cotton and indigo crops. Black Hammock was most likely extensively cleared for crops. Due to the extensive number of plantations, many other uplands areas within the boundaries of the preserve were probably cleared for agriculture during this era.

- Present Era: As the city of Jacksonville expanded northward, fire suppression became more important due to the increased need to protect dwellings and industrial structures. Commercial forestry with planted slash pine plantations occupied a large percentage of the uplands in the vicinity of the preserve by the 1950s.

The general attitude for most of the 20th century was that fire was to be excluded, and active suppression was the rule. Timber companies, who had large land holdings in pine plantations, plowed firebreaks to help reduce fire spread. Most of the uplands within and adjacent to the preserve are planted in pines of differing age. The areas where the NPS owns its two largest upland tracts, Black Hammock and Thomas Creek, were both planted in pine. The Roosevelt Area, in private ownership closer to downtown Jacksonville, was never cleared of its oaks and was not planted in pines.

Both the Florida Division of Forestry and the Jacksonville Fire and Rescue Department have performed aggressive fire suppression for many decades. Others have also assisted in the suppression of wildland fires, including state park personnel, and individual and corporate landowners, especially timber companies.

Some prescribed fire was used primarily to prepare lands for slash pine planting. The remaining slash was burned and pines planted in rows after land clearing or harvesting of a previous pine crop was completed. In 1991, the Florida Division of Forestry assisted a private landowner with a prescribed fire at Cedar Point. The purpose of the fire was to burn slash in preparation for pine planting. The NPS now owns this land.

Modern development continues to alter the landscape. Roads, parking areas, canals, dikes, houses, and NPS administrative structures have greatly influenced the natural environment. These developments have altered the effects of fire by creating barriers and firebreaks, and have influenced the flora and fauna of the region.

- **Recorded Fire History:** The record of wildland fire occurrence for the preserve is incomplete. The Florida Division of Forestry has the primary responsibility for wildland fire suppression and holds the records for 1993 to 2002. These records show few fires occurring on property now owned by the NPS. However, it should be noted that during this period, Cedar Point and Thomas Creek were planted in pines. Young pine plantations are very fire resistant due to low fuel loads.

Due to the small number of fires on preserve lands, data on fires occurring within two miles of the boundary have been collected. Here, the Florida Division of Forestry—not the NPS—has primary responsibility for wildland fires. An analysis of Florida Division of Forestry fire records indicates that between the years of 1993 and 2002, 111 wildland fires occurred inside of or within two miles of preserve boundaries. Table 3 summarizes the number of fires by year. Appendix H itemizes each of these fires by month and year, acres, cause, fuel type, and location.

Table 3: Fire History of Preserve Area, 1993-2002

Year	Human-Caused	Lightning	Unknown	Total Fires
1993	14	9	1	24
1994	6	0	0	6
1995	11	0	0	11
1996	15	1	0	16
1997	5	6	0	11
1998	11	6	1	18
1999	6	4	2	12
2000	2	3	0	5
2001	1	2	1	4
2002	4	0	0	4
Total	75	31	5	111

69.4% (77 fires) of size classes A or B (0.1 to 9.9 acres)

26.1% (29 fires) of size class C (10.0 to 99.9 acres)

4.5% (5 fires) of size classes D, E, or F (100.0 to 4,999.9 acres)

As per Table 3, 75 (or 67.6%) of the 111 wildland fires that occurred between 1993 and 2002 were human-caused. Human-caused fires can and do occur throughout the year in the preserve vicinity. Five (or 4.5%) of the fires were of unknown cause.

Thirty-one (or 27.9%) of the fires were lightning-caused. Lightning ignitions occur primarily during the summer months (all but one of the 31 lightning ignitions occurred between the months of June and September), associated with normal summer thunderstorm activity. The small number of analyzed fires obscures a second concentration of lightning-caused fires that occur occasionally in late winter and early spring with the passage of cold fronts. Winter fires can grow to large size due to high winds typically associated with these cold fronts.

Fire history, fuel models, and fire weather history will continue to be studied and analyzed at the preserve in an attempt to refine the fire season and fire danger period. Through interactions with local fire experts, personal contacts and on-site visits, the

preserve will continue to gather information on fire histories, land alterations, and the potential to restore the lands to a more natural condition.

3.4.4 Wildland Fire Management Situation

3.4.4.1 Historical Weather Analysis

At the preserve, winters are short and mild, summers are hot and humid, and there is no appreciable spring or fall. Summer weather patterns usually begin in May and continue until October. Summer temperatures range from the low 70s (F) at dawn to the upper 80s or low 90s during the afternoon. November and December may have some cool days, but winter weather typically starts in January and lasts through March, with temperatures ranging from the low 40s to the mid 70s.

Average annual rainfall is 51.32 inches (National Weather Service, Jacksonville, Florida 2001). The heaviest rainfall occurs during the summer months. This precipitation is generally in the form of afternoon thundershowers, which are intense, short in duration, and can be widely scattered. Each of the summer months (June to September) averages over five inches of rainfall. Winter rains are associated with cold fronts, which generally bring less intense, but more widespread rain showers. Cold fronts generally occur in December through March, with rainfall averaging about three inches per month. The driest months are April and November. Precipitation extremes range from 30 - 82 inches per year, and temperature extremes from near 100° F in the summer to the teens (unusual) in the winter. Relative humidity in the wet season ranges between 70 and 100 percent. The dry periods average 55 percent relative humidity.

Wind and lightning are important factors when considering wildland fire at the preserve. Florida has the highest lightning frequency in the United States. Wind changes throughout the day, with intermittent sea breezes and erratic winds associated with thunderstorms. High winds, above 20 miles per hour at the 20-foot level, are common in the winter and spring months, with occasional winds of 35 to 40 mph. High winds are also associated with tropical systems in the summer. In general, fall winds are from the east to northeast, winter winds from the north to northwest, spring winds from the southeast, and summer winds from the south.

Table 4: Weather Averages, Jacksonville Florida

Month	High Temp. (F)	Low Temp. (F)	Precip. (inches)	Freeze Days	Thunder Days	Rain Days	Cloudy Days	Low Rel. Humidity (%)	Wind (mph)
Jan	64	41	3.31	6	8	1	14	58	8.2
Feb	67	43	3.93	3	8	2	13	53	9.0
Mar	73	49	3.68	1	8	3	13	50	9.0
Apr	79	55	2.77	0	7	4	10	48	8.5
May	85	62	3.55	0	8	6	10	50	8.0
Jun	89	69	5.69	0	12	11	12	57	7.7
Jul	91	72	5.60	0	15	16	12	58	7.0
Aug	91	72	7.93	0	15	13	11	60	6.7
Sep	87	69	7.05	0	13	7	13	63	7.5
Oct	80	59	2.90	0	9	2	12	59	8.0
Nov	74	50	2.19	1	7	1	11	57	7.8
Dec	67	43	2.72	4	8	1	14	59	7.8
Year	79	57	51.32	-	-	-	-	56	8.0

3.4.4.2 Fire Season

The fire season at the preserve is essentially year round, with the majority of fires occurring between February and August. As discussed earlier, lightning-caused fires occur primarily during the summer months, associated with normal summer thunderstorm activity. However, in the winter and early spring, lightning associated with the passage of cold fronts ignites occasional fires. The high incidence of human-caused fires in the vicinity of the preserve further contributes to the year round fire season.

3.4.4.3 Fuel Characteristics and Fire Behavior

The primary fuel types represented at the preserve have been classified according to the National Fire Danger Rating System (NFDRS) and the Northern Forest Fire Laboratory Fire Behavior Prediction System (FBPS) (Deeming et al 1978:30, Anderson 1982).

- NFDRS Fuel Model D, FBPS Fuel Model #7: This model simulates fire behavior within the pine flatwoods (palmetto-gallberry understory) community. The foliage of this community has very high live fuel flammability and creates a hazardous fire condition in areas of high fuel accumulation.
- NFDRS Fuel Model L, FBPS Fuel Model #1: Short grasses exist in areas where mowing or other disturbances have occurred. Generally these are relatively small areas along roadways and near developed sites. Due to the typically short vegetation height, fires do not spread rapidly. Grasses are flammable, perennial and coarse, but have light loads and are fairly discontinuous.
- NFDRS Fuel Model N, FBPS Fuel Model #3: FBPS fuel model #3 was constructed specifically for the sawgrass prairies of south Florida and over-predicts the rate of spread and intensity of fire burning in the salt marsh areas of the preserve. Fire spreads readily when the fine fuels are one-third or more cured. Fires are fast

spreading and intense under the influence of wind. At the preserve, wider spacing of plants and general wetter conditions greatly decreases the occurrence of fires. High winds are needed to drive the fires across the grasses.

- NFDRS Fuel Model O, FBPS Fuel Model #4: Fuels are typical of the east coast pocosins with a nearly continuous secondary overstory. Very flammable live and dead fine woody foliage creates a very rapid rate of spread and high fireline intensity. The plants are typically over 6 feet tall and often found under an open stand of pine. The coastal scrub and coastal strand vegetation at the preserve most closely approximate this model. Fires in pine plantations with very high, live fuel loads also fall into this model.
- NFDRS Fuel Model R, FBPS Fuel Model #8: These models closely simulate the hardwood hammocks of the preserve dominated by live oak (*Quercus virginiana*). Fire can be carried through the relatively tightly packed surface litter and possibly torch out trees where ladder fuels are present. However, unless drought conditions exist, these areas exhibit relatively moderate fire behavior.

Some of the hardwood hammocks within the preserve have a moderate component of brush and other ladder fuels. This is especially true at the edge of the hammock or transition zones between flatwoods and hammock vegetation. These areas may be better described by NFDRS fuel model E/FBPS fuel model 9, with slightly longer flame lengths and higher rates of spread.

3.4.4.4 Fire Regime Alteration

The predominant fire regimes at the preserve are wet grasslands, and southern pine (which includes pine flatwoods). The wet grasslands is a stand-replacement fire regime, in which fire typically kills more than 80 percent of the overstory. The following excerpt concerning the wet grasslands fire regime comes from the USDA Forest Service General Technical Report entitled *Wildland Fire in Ecosystems: Effects of Fire on Flora* (2000):

Much of the coastal region of the Southern United States, from Virginia to Texas, is characterized by a presettlement fire frequency of 1 to 3 years (Frost 1995). Coastal marsh landscapes are typically extensive, a factor that aids in the propagation of an individual fire. Natural barriers to fire spread are relatively common and vary from wide river channels to small stream channels and narrow animal trails. Depending on the fuel and wind speeds, fires may either bridge small to moderate-sized natural breaks or be stopped by them. Thus, the extent of natural fires varies greatly as does the ease of accomplishing a prescribed burn. Lightning-strike fires are thought to be common in coastal wetlands (Frost 1995), and often fire from the adjacent upland can spread into the marsh.

It should be noted that the salt marsh at the preserve is dominated by *Spartina* and *Juncus*, both of which support fire, but do not require it for ecosystem health. In spite of numerous missed fire return intervals as per the above excerpt, the wet grasslands fire regime at the preserve is in condition class 1. As defined in the USDA Forest Service General Technical Report entitled *Development of Coarse-Scale Spatial Data for*

Wildland Fire and Fuel Management (2002), a condition class 1 fire regime is at low risk of losing key ecosystem components. “Vegetation attributes (species composition and structure) are intact and function within an historical range.”

In regard to the southern pine fire regime, the above-mentioned *Wildland Fire in Ecosystems: Effects of Fire on Flora* (2000) discusses lightning as the primary ignition source prior to human settlement, and then describes the human influence on the fire regime:

Native Americans used fire extensively to shape the vegetative mosaic for thousands of years, and for the past 400 or more years Euro-Americans have subjected these same lands to varying degrees of fire use and abuse, including the exclusion of fire.... Native American-induced changes [from the period of pre-human influence] include the fact that they ignited fires throughout the year, but before their influence, many sites burned more frequently by fires confined to the spring and summer thunderstorm season (Martin and Sapsis 1992). A slight shift toward reduced fire intensity and severity took place. Growing-season fires tend to be patchier than dormant-season fires because of different weather patterns and greater variation in fine-fuel moisture once greenup occurs.

Komareck (1982) pointed out that it is difficult to understand the practice of prescribed fire in the South without an appreciation of Southern history. It is also a prerequisite to realizing the tremendous impact humans have had in shaping the present vegetative mosaic. For example, prior to the Civil War, over 75 percent of the white population were pastoral herdsmen (Owsley 1945) who came from the British Isles, Spain, and France where fire was an integral part of their livelihood. They brought this practice with them, blended their knowledge with that of the Native Americans they displaced, and aggressively expanded the use and frequency of fire throughout the South. A circa 1731 North Carolina law required the annual burning of all pastures and rangelands every March (Carrier and Hardison 1976). Eldredge (1911) described the turn-of-the-century fire situation in north Florida as follows:

...the turpentine operator burns his woods and all other neighboring woods during the winter months, generally in December, January, or February. The cattleman sets fire during March, April, and May to such areas as the turpentine operator has left unburned. During the summer there are almost daily severe thunderstorms, and many forest fires are started by lightning. In the dry fall months hunters set fire to such “rough” places as may harbor game. It is only by chance that any areas of unenclosed land escapes burning at least once in two years.

Most students of fire history agree that typical longleaf pine sites burned every 1 to 4 years prior to the arrival of Europeans, and then every 1 to 3 years until aggressive fire suppression activities began in the 1920s and 1930s (Landers 1991; Landers and others 1990). As typical upland sites grade toward mesic (wet) or xeric (dry and thus low rates of fuel accumulation), fire frequency decreases. Loblolly, slash, and pond pines were historically confined to wetter sites (Monk 1968) where a 3 to 4 year fire-free interval allowed saplings to become large enough to withstand low intensity fire....

With attempted fire exclusion, dead fuels accumulated on the forest floor and a needle-draped understory of highly flammable shrubs such as saw palmetto, gallberry, and wax myrtle developed within 5 or 6 years on all but xeric sites. Given this receptive fuel bed and human and natural ignition sources, wildfire occurrence remained high. At first, these fires were easy to extinguish, but as fuels accumulated on unburned areas, fires became

increasingly difficult to suppress, and the probability of catastrophic, high-intensity fire increased. Often, the post-fire outcome was atypical successional pathways with concomitant declines in flora and fauna.

Many of these ecosystems can still be restored with the judicious reintroduction of fire, sometimes in combination with other chemical and mechanical methods, because the long association between fire and Southern vegetation has evolved species traits that favor them in fire-prone ecosystems (Christiansen 1977; Landers 1991). Providing a certain threshold limit has not been reached, the natural resiliency within these systems allows them to recover (Vogl 1976). However, once this threshold limit has been exceeded, nature can no longer rectify the situation. Thus, many components of the original ecosystem cannot survive long periods without fire (Garren 1943).

At present, due to habitat manipulation and decades of fire exclusion, species composition has changed significantly in the southern pine fire regime. It is in condition class 3, as defined in the USDA Forest Service General Technical Report entitled *Development of Coarse-Scale Spatial Data for Wildland Fire and Fuel Management* (2002): Fire regimes have been significantly altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals. This results in dramatic changes to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been significantly altered from their historical range. Where appropriate, these areas may need moderate levels of restoration treatments, such as hand or mechanical treatments, before fire can be used to restore the historical fire regime.

The proposed non-fire and/or prescribed fire applications within 140 acres of the southern pine fire regime at Cedar Point should begin moving these acres to a better condition class.

3.4.4.5 Control Problems and Dominant Topographic Features

In many areas of the preserve, resistance of fires to control is a serious issue. Unnaturally high fuel accumulations have occurred because of fire exclusion and introduction of commercial tree plantations. This situation together with the encroachment of residential, light industrial, and agricultural development brings these factors into close proximity with each other, which compounds control efforts.

Lack of roads, numerous waterways, proximity of the water table to the surface, and fragility of soils and plants in some areas contribute to control problems.

3.4.5 Fire Management Units

As previously stated, the preserve has been divided into six fire management units (FMUs) to facilitate the achievement of fire management objectives (Figure 3). For all of these FMUs, all wildland fires, regardless of origin, will be suppressed via the most appropriate management response, in order to protect human life and other identified

values at risk. In addition, prescribed fire will be applied to 140 acres within the Black Hammock/Cedar Point FMU.

- Fort Caroline Fire Management Unit (Figure 4): This 121-acre unit includes Spanish Pond, the preserve visitor center, preserve housing, maintenance buildings and Ribault Column. Surrounding this area are private family homes in a classic urban setting. Fire hydrants are available along Ft. Caroline Road.

The fuels are primarily oak hammock with a closed canopy. Unless driven by high winds, rate of spread will be low to moderate. A city fire station is located approximately three miles away on McCormick Road.

- Theodore Roosevelt Fire Management Unit (Figure 5): This 361-acre unit contains the preserve headquarters and curatorial storage. It is surrounded on three sides by urban development (single family homes). The fourth side opens onto the creeks and marshes of the St. Johns River. Primarily a mature oak hammock, this area has one dirt road/hiking trail bisecting the area. Fire spread rates should be low to moderate unless driven by high winds. The two greatest concerns in this unit are fires leaving NPS property, and evacuation of hikers on trails.

- Kingsley Plantation Fire Management Unit (Figure 6): This 58-acre unit contains a National Register-listed former cotton plantation. In addition to the historic buildings, there are several maintenance structures, parking areas, and employee housing. The unit is bordered by the Ft. George River on one side with private homes and state park lands bordering the remaining three sides.

Kingsley Plantation is on the northern end of Ft. George Island, which has a 4.5-mile loop road that generally follows the east and west edges of the island. Visitation, especially on weekends, can be heavy, and evacuation of visitors would be the highest priority.

Most of the island is a closed canopy oak hammock, and fire spread rates would be low to moderate unless pushed by high winds. There are few water sources on the island; the one primary water system is located at Kingsley. Access to open saltwater for drafting is available at only a few locations due to road configurations.

- Thomas Creek Fire Management Unit (Figure 7): This 649-acre unit, located in the extreme northern portion of Duval County, is bisected by Interstate 95 and is mostly former pine plantation. Smoke generated by a wildland fire presents potentially major safety issues due to the presence of the interstate highway and nearby (3.5 miles distant) Jacksonville International Airport. This area was formerly a pine pulp plantation and was harvested in 2003. In late 2003, the cleared areas were replanted in longleaf pine seedlings. Prescribed fire may be needed to allow the longleaf pine to mature.

Fuels will rapidly increase in the harvested area without the use of prescribed fire (not being considered in this FMP) or herbicide treatments. Within a few years, the fuel loads in the areas that have not been treated will allow fires in this FMU to be intense and move rapidly. Visibility impairment from smoke is a major concern. Given the proximity of this unit to Interstate 95 and the international airport, the use of tractor plows for suppression will be the initial attack response in order to minimize the threats to public safety.

- Black Hammock Fire Management Unit (Figure 8): This 670-acre unit includes parcels to be acquired by 2005. The unit is located on the southern half of Black Hammock Island, and includes Cedar Point (at the far south end of the island) and several parcels of land along the east bank of Pumpkin Hill Creek. Several of these parcels of land are adjacent to private or commercial lands (plant nurseries and pine pulp plantations). All of the upland acres are a mix of oak hammock and pine flatwoods. Most of the pine areas are current or former pine plantations with slash pine planted in rows.

The two largest parcels within this FMU are Cedar Point (approximately 380 acres of uplands) and the parcel formerly owned by Mr. Sohn (approximately 200 acres). These two parcels have few improvements, but long-range planning calls for a boat ramp, ranger station and visitor center, and hiking trails at Cedar Point.

At Cedar Point, near the southern tip of Black Hammock Island, the preserve owns a former slash pine plantation covering approximately 140 acres. These pines were planted in 1991 (personal communication, Bruce Hill, Florida Division of Forestry) and no thinning, harvest, prescribed fire or mowing was utilized. The density of the trees (over 800 per acre) and the lack of forestry management practices had allowed the understory vegetation to become a dense mix of palmetto and gallberry. The vegetation was so thick that walking or even crawling was nearly impossible. Numerous forestry experts advised the preserve to reduce the hazard fuel loading in order to prevent a wildland fire from leaving NPS-owned lands. In September 2001, the preserve was able to secure funding to reduce the concentration of fuels. A private contractor utilized a heavy-duty forestry mower to mow the small trees and underbrush from most of the pine plantation.

The former Sohn property is located near the middle of Black Hammock Island and is a mix of oak hammock and pine flatlands. Portions of the pine area burned in 1993 and 1998 by lightning-started fires. Dense brush and pine reproduction have resulted in a heavy concentration of fuels.

- Broward/Burton Island Fire Management Unit (Figure 9): This 474-acre unit consists of eight named islands as well as approximately 40 additional unnamed islands scattered throughout the preserve. These ~50 islands vary in size from less than one acre to approximately 106 acres. Some have been created by the deposition of spoils from dredging operations. The closest distance to adjacent uplands is approximately 300 yards. There are no known values at risk on these islands. Should any wildland

fire occur on these islands, it is highly important to notify the public (via the press) that these fires are being actively managed. Access to all of these islands is by boat only.

Figure 3

Timucuan Ecological and Historic Preserve Fire Management Units

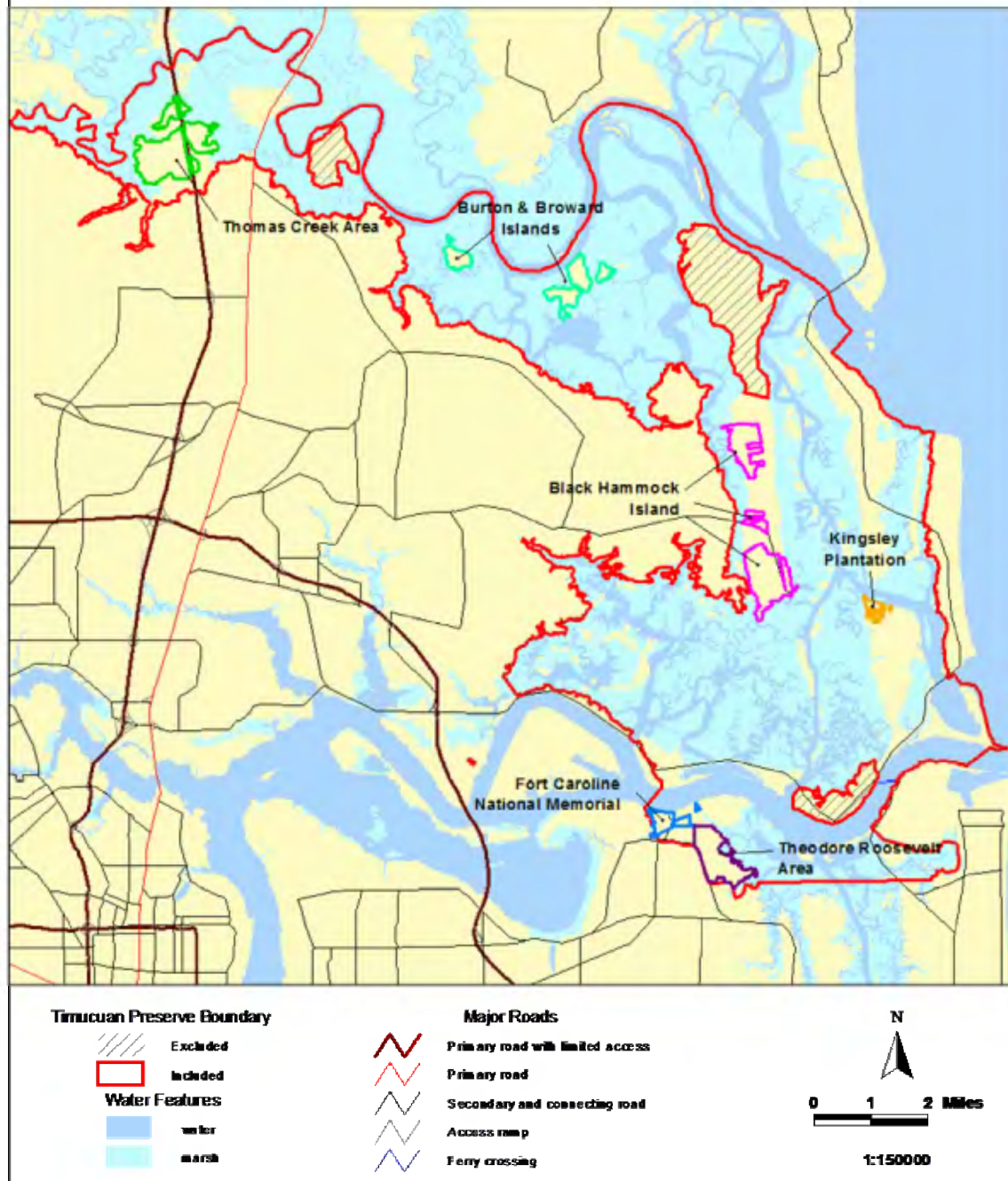


Figure 4

Timucuan Ecological and Historic Preserve Fort Caroline National Memorial



Figure 5

Timucuan Ecological and Historic Preserve Theodore Roosevelt Area

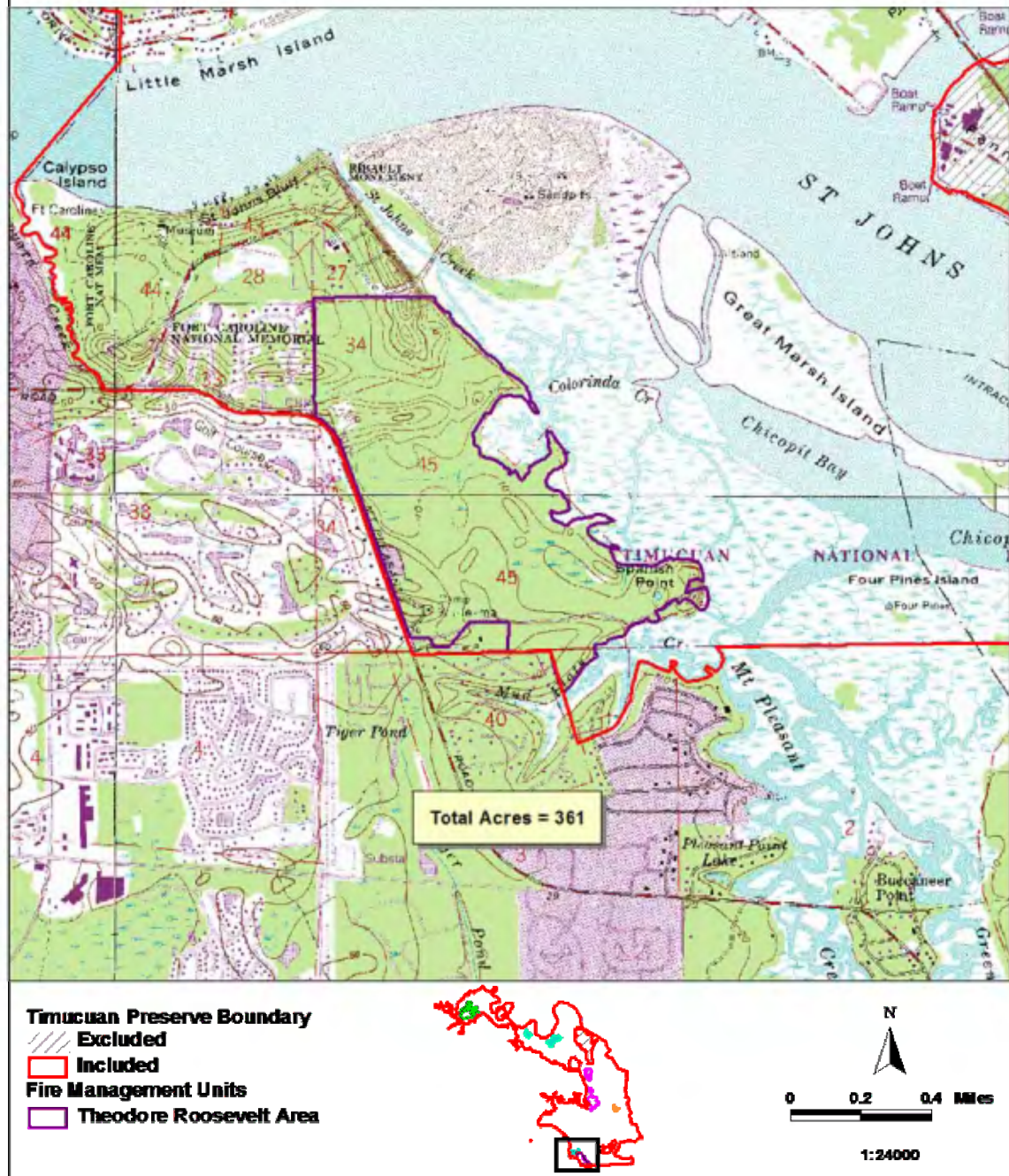


Figure 6

Timucuan Ecological and Historic Preserve Kingsley Plantation

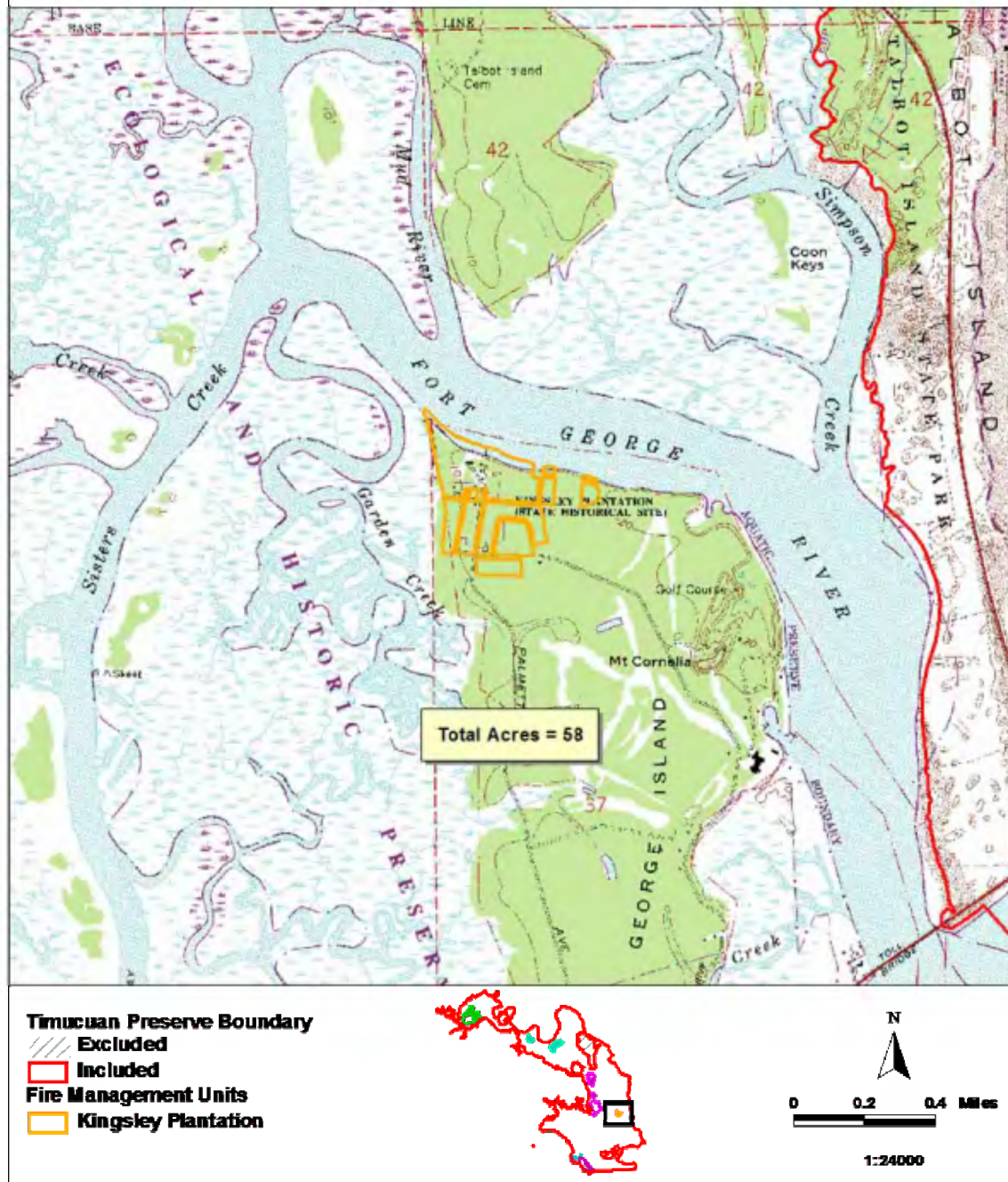


Figure 7

Timucuan Ecological and Historic Preserve Thomas Creek Area

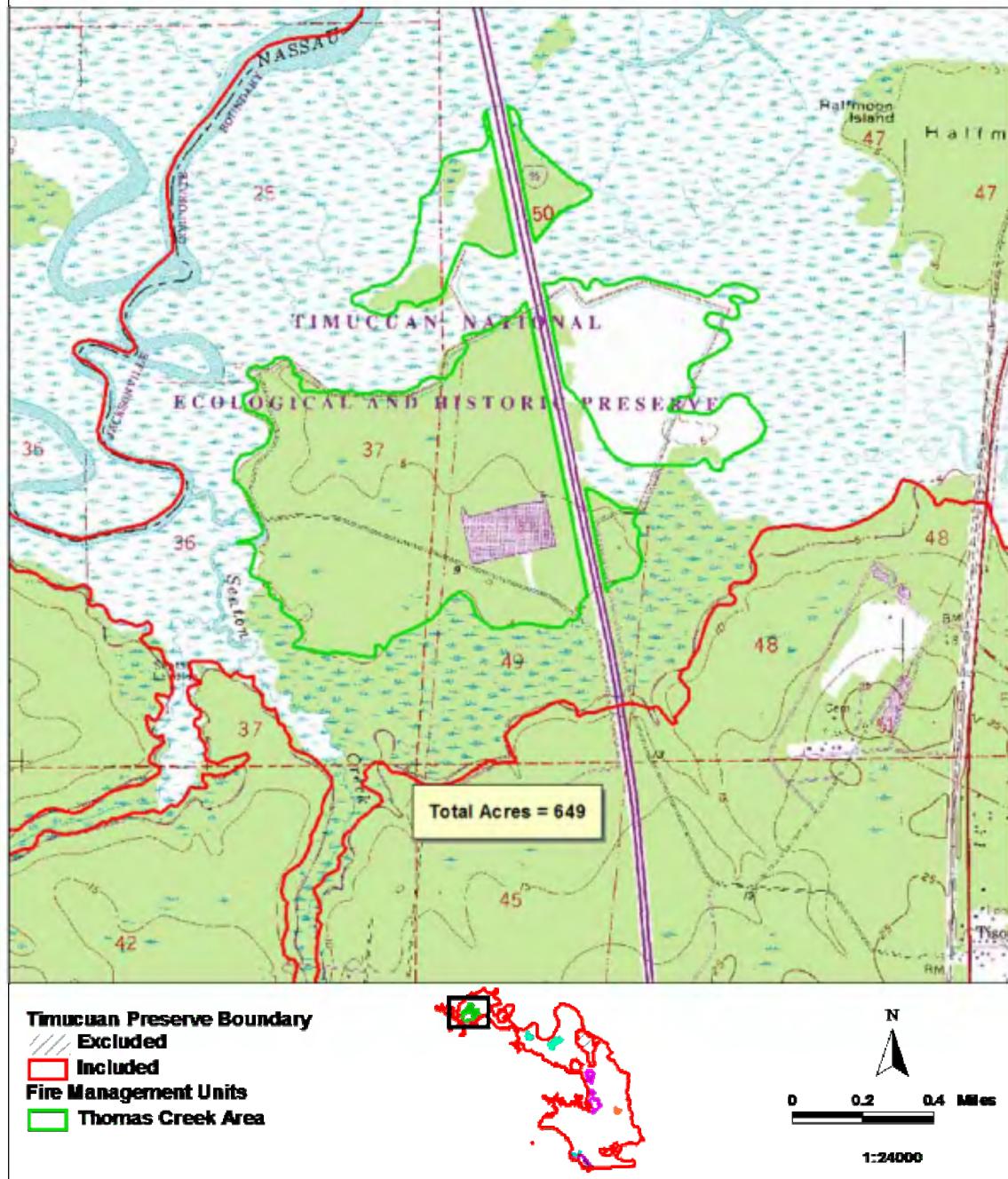


Figure 8

Timucuan Ecological and Historic Preserve Black Hammock Island

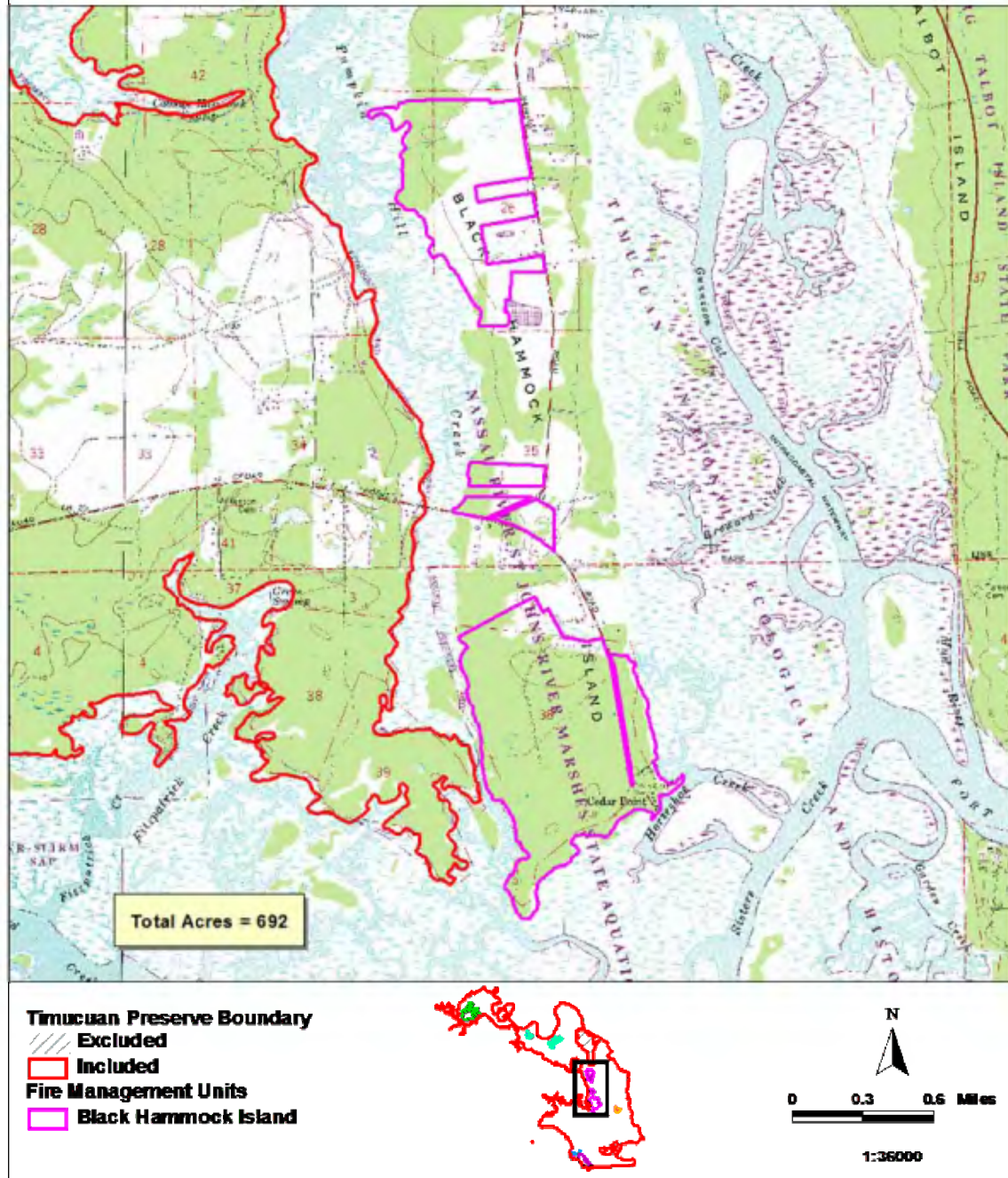
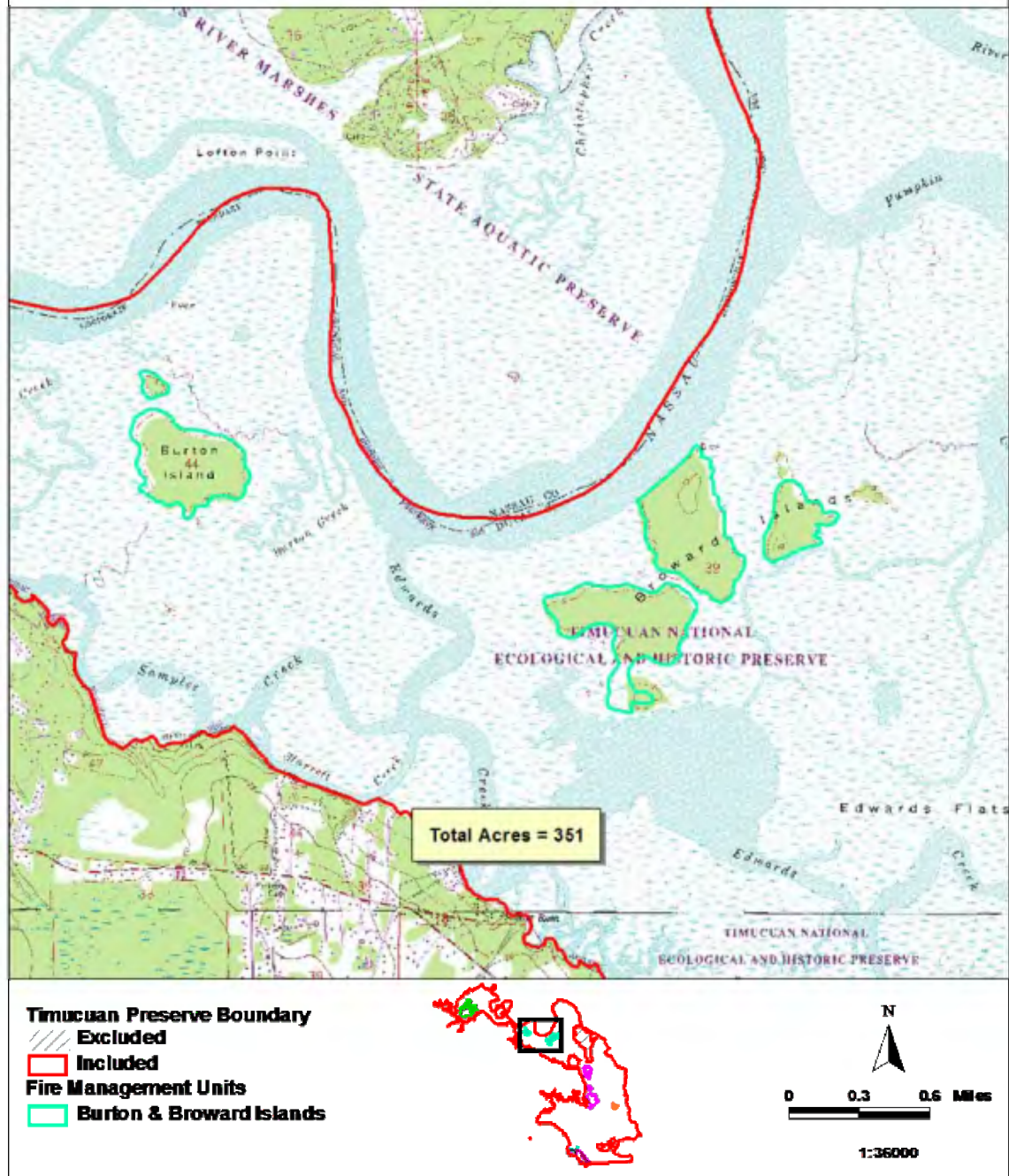


Figure 9

Timucuan Ecological and Historic Preserve Burton & Broward Islands



3.4.6 Values to Protect, Manage, or at Risk

The proximity to the City of Jacksonville, Interstate 95, Jacksonville International Airport, and numerous rural residents/communities and businesses are of paramount concern to the preserve. Inside the preserve, numerous historic structures, archeological sites, wildlife habitat, administrative sites and developments are resources critical to the preserve's mission.

- Human health and safety: Firefighter and public safety is the highest priority in every fire management activity. In light of this:
 - Only fully qualified (i.e. meeting NPS qualifications and accepted interagency knowledge, skills and abilities for the assigned fire job) employees will be assigned fire management duties (unless assigned as trainees, in which case they will be closely supervised by an individual fully qualified for the given position).
 - No fire management operation will be initiated until all personnel involved have received a safety briefing describing known hazards and mitigating actions (LCES*), current fire season conditions, and current and predicted fire weather and behavior. Hazards specific to the preserve include:
 - Snags and dead trees with weak root systems;
 - Biting/stinging insects and poisonous snakes;
 - Poison ivy;
 - Volatile fuels in many areas;
 - Heavy fuels accumulations in areas, that can contribute to intense fire behavior and block escape routes; and
 - Dehydration, heat exhaustion and heat stroke.
 - Wildland fire incident commanders and prescribed fire bosses will minimize firefighter exposure to heavy smoke by incorporating the recommendations outlined in the publication *Health Hazards of Smoke* (Sharkey 1997), available from the Missoula Technology and Development Center.
 - Prescribed burning will not be conducted when atmospheric conditions exist that could permit degradation of air quality to a degree that negatively affects public health. Federal and state air quality standards will be the basis for this decision.
 - Preserve neighbors, visitors and local residents will be notified of all planned fire management events that have the potential to impact them.
 - The preserve superintendent or designee may, as a safety precaution, temporarily close all or parts of the preserve to the visiting public. In the case of prescribed

* LCES is an acronym intended to remind firefighters of the four key elements associated with firefighter safety: Lookouts, Communications, Escape Routes, and Safety Zones.

fire, areas needing to be closed for visitor protection will be closed prior to the initiation of prescribed burning.

- Smoke on roadways will be monitored and traffic control provisions taken to ensure motorist safety during fire events at the preserve. The following procedures will be taken to compensate for reduced visibility when a paved road is affected by smoke (the incident commander or prescribed fire boss on a particular event will determine visibility levels):
 - Posting of warning signs on either side of the affected area;
 - Reducing the posted speed limit when visibility is strongly reduced; and
 - Closing the road to traffic when visibility is severely reduced.
- Property: To the greatest extent feasible and appropriate, preserve infrastructure, any other development, and adjacent non-agency land will be protected during all fire management activities.
- Natural and Cultural Resources: Natural and cultural resources will be protected from the adverse effects of unwanted fire as well as the adverse effects of fire management activities (see section 10.0). During all suppression activities, the minimum impact suppression tactics policy will be incorporated to the greatest extent feasible and appropriate, employing methods least damaging to preserve resources for the given situation (see section 4.2.7).
- Air and water quality: The preserve will comply with the Clean Air Act, the Clean Water Act, and all other applicable federal, state, and local laws and requirements. Additionally:
 - The suppression response selected to manage a wildland fire will consider air quality standards.
 - Fire weather forecasts will be used to correlate prescribed fire ignitions with periods of optimal combustion and smoke dispersal. Any smoke situation that arises and threatens any smoke-sensitive areas will entail *immediate* suppression action.
 - During fire suppression, water will be used in lieu of fire retardant whenever possible. If retardant must be used, a non-fugitive type will be chosen, and bodies of water avoided.
 - Because prescribed fire will not be applied under extreme conditions, the probability of denuding the soil will be limited, thereby limiting the possibility of extreme erosion. (The primary threat to water quality is sediments and nutrients resulting from uncontrolled erosion.)

4.0 WILDLAND FIRE MANAGEMENT PROGRAM COMPONENTS

4.1 General Implementation Procedures

As wildland fire will not be used for resource benefits at the preserve, suppression is the only appropriate response to a wildland fire. The requirement for a decision checklist as part of the Stage 1: Initial Fire Assessment of the wildland fire implementation plan (WFIP) is considered to be met at the programmatic level in this Fire Management Plan.

4.2 Wildland Fire Suppression

RM-18 defines wildland fire suppression as “an appropriate management response to wildland fire that results in curtailment of fire spread and eliminates all identified threats from the particular fire. [This may include confinement within natural or pre-existing boundaries.] All wildland fire suppression activities provide for firefighter and public safety as the highest consideration, but minimize loss of resource values, economic expenditures, and/or the use of critical firefighting resources.”

4.2.1 Range of Potential Fire Behavior

The volatile nature of the preserve’s vegetation, particularly saw palmetto, and large amounts of fuel which have accumulated in the last several decades, combine to make severe wildland fire a serious threat, especially during periods of drought.

In the past several years the area has experienced several droughts when the Keetch-Byram Drought Index has reached the mid-500s. These severe drought conditions can start as early as March and last into July. The dry conditions combined with summer winds of 12-14 miles per hour can result in very high to extreme fire danger. Fires in the flatwoods under these conditions would exhibit flame lengths of eight to ten feet and rates of spread of between 1/4 - 1/2 miles per hour. Frequent torching and spotting could allow the fire to easily cross most existing barriers.

Dry conditions can develop during the winter months, but the cooler temperatures and rains associated with the passage of cold fronts can result in fire behavior that is normally less dramatic than other periods of the year, and fires can be held using existing control features. During the passage of a cold front, high winds and low humidity can result in erratic fire behavior. After the cold front passage, the air temperature is generally lower and the weather (wind direction especially) is more predictable.

- Pine Flatwoods (National Fire Danger Rating System fuel model D, Fire Behavior Prediction System fuel model 7): Pine flatwoods are the most prevalent vegetation type in northeast Florida. The greatest numbers of lightning-caused fires in the region are in this fuel type. These flatwoods are the locations of the pine plantations at Black Hammock and Thomas Creek. Other pinelands found in this type include longleaf pine, native slash pine and pond pine. These are areas of natural regeneration (not planted in rows). The flatwoods have a large flammable live fuel

component and high moisture of extinction. Rates of spread are generally between 10-20 chains (a chain is equal to 66 feet) per hour with flame lengths of 6-8 feet (U.S. Fish and Wildlife Service 1995). In areas with heavy fine fuel loads or with a large palmetto component, fires can be very intense. In extreme conditions, rates of spread from 30-50 chains per hour and flame lengths of 12-15 feet are not uncommon. Significant spotting can occur, with burning palm fronds carrying several hundred feet in only moderate winds. Since the topography is extremely flat, fire behavior is not affected by slope or aspect.

Fires in flatwoods at Pumpkin Hill State Buffer Preserve in 1997 burned 125 acres with flame lengths of over 20 feet. This area is approximately two miles north of Black Hammock with a similar fuel type of planted pines with heavy underbrush.

- Thick Palmetto Scrub (National Fire Danger Rating System fuel model O, Fire Behavior Prediction System fuel model 4): In palmetto and gallberry shrub areas over seven years of age, the thickness of the vegetation allows for rapid spread (up to 75 chains per hour) and flame lengths of over 19 feet. With fire suppression and no mechanical fuel reduction actions, many of the preserve's flatlands covered in palmetto and gallberry will exhibit this higher intensity due to fuel height and thickness. Both live and dead fuels add to the fire intensity.
- Hammock (National Fire Danger Rating System fuel model R, Fire Behavior Prediction System fuel model 8): Hardwood hammocks provide a fairly fire resistant environment. The tree canopy reduces the rate of drying, so fuel moisture is usually higher than surrounding areas. There are fewer fine fuels on the floor of the hammock, and these are comprised largely of deciduous leaves that fall in autumn. Fires within the hammock are usually slow moving, cool burns that spread across the forest floor. Under normal conditions, rates of spread are one to two chains per hour and flame lengths seldom exceed one foot in length (U.S. Fish and Wildlife Service 1995). Ladder fuels will occasionally allow fire to spread to the treetops, but spread is limited since these fuels are fairly discontinuous.

Some of the hardwood hammocks within the preserve have a moderate component of brush and other ladder fuels. This is especially true at the edge of the hammock or transition zones between flatwoods and hammock vegetation. These areas may better be described by NFDRS fuel model E/FBPS fuel model 9, which has slightly longer flame lengths (up to 8 feet) and higher rates of spread (up to 8 chains per hour).

Because of heavy fuel accumulations in the pine flatwoods adjacent to the oak hammocks at Black Hammock, there is a danger that fire will carry from the pine plantation into the Black Hammock hammock. Under extreme fire weather conditions and a strong northerly wind, a head fire could reach the hammock with enough intensity to carry fire into it.

- Salt Marsh (National Fire Danger Rating System Model N, Fire Behavior Prediction System Model 3): Even though there have been no recent wildland fires in the

preserve's coastal marshes, fuel accumulation does not appear to be significant. The most flammable portion of marsh vegetation is the dead material located in the aerial portion of the plant. However, live portions are also flammable under many conditions. The few salt marsh fires that have occurred in the area have generally been human-caused (personal communication, Bruce Hill, Florida Division of Forestry).

Marsh fires in the Everglades are very intense, with high rates of spread under the influence of wind. The average fire spread is 100-200 chains per hour with flame lengths of 20 feet (U.S. Fish and Wildlife Service 1995). In tall grasses under extreme conditions, the rate of spread can reach 300 chains per hour with 30-35 foot flames. Marshes at the preserve have much lower fuel loadings and would have less intense fire behavior. Shorter grasses burn with much less intensity, averaging a rate of spread of 2-3 chains per hour and flame lengths of 1-2 feet. Due to numerous creeks and other open water, spread of salt marsh fires would be limited.

- Short Grass (National Fire Danger Rating System Model L, Fire Behavior Prediction System Model 1): Areas of disturbance (mowing, recent tree harvest, roadsides) have very little fuel available and will exhibit very short flame lengths. These areas may act as fire carrier to allow fire to move from one fuel type to another. Generally these disturbed areas have enough fuel to permit a fire to rapidly spread.

4.2.2 Preparedness Actions

NPS policy requires that every unit with a fire management program incorporate preparedness considerations into its fire management plan (*RM-18*, chapter 7, provides guidelines). Preparedness is the process of planning and implementing activities prior to wildland fire ignitions to keep the unit in a state of fire-readiness. It includes actions that are completed on a routine basis prior to the most active portion of the fire season, as well as incremental actions conducted in response to increasing fire danger.

Elements of preparedness are training, equipment and cache maintenance, record keeping, pre-attack planning, risk analysis and emergency preparedness. Each of these is discussed below. Prior to and during the fire season, the following preparedness actions will be taken at the preserve to ensure adequate fire preparedness. The responsible positions for meeting specific target dates are in parentheses.

October 1 through March 31 (All Supervisors):

Qualified fire management personnel will be recruited and trained as resources and funds allow. On-the-job training and fire management correspondence courses will be used to upgrade the skill levels of the preserve staff.

January 1 through March 1 (Fire Management Officer):

- ❑ Schedule fire physical exams for employees as per standards in *RM-18*. Seasonal employees with fire-related responsibilities may be tested as they enter on duty.
- ❑ Give pack test to individuals who need a fitness level certification in order to perform duties for which they are qualified.
- ❑ Conduct annual safety refresher training.
- ❑ Review and update cooperative agreements with neighboring fire management agencies.
- ❑ Review step-up plan.
- ❑ Complete inventory of all fire-related equipment. Worn or missing items will be ordered and replaced.
- ❑ Check established procedures for using suppression and emergency preparedness accounts.
- ❑ Complete and update all prescribed fire plans for spring season and have them signed by the superintendent.

March 1 through September 30 (Fire Management Officer):

- ❑ Inspect and test all fire equipment for readiness.
- ❑ Fire equipment and supplies will be maintained in serviceable condition and in constant readiness, as conditions warrant.
- ❑ Slip-on pump unit will be mounted onto truck as drought index increases and as conditions warrant (in wet years slip-on pumper is mounted on truck only when potential for wildland fire is above the low probability). Pump and engine will be started and tested weekly during this period.
- ❑ Complete all prescribed fire plans for the fall season and have them signed by the superintendent.

May 1 through September 30 (Fireline-Qualified Staff):

During fire season (when staffing class is high, very high, or extreme), all firefighters and key overhead personnel will provide the fire management officer with their availability during off duty hours. Each employee subject to fire duty will have a fire pack available for immediate use.

November 1 through December 31 (Involved Staff)

- ❑ Critique fire season, including all fire management activities (i.e. wildland fire suppression, prescribed fires and mechanical fuel treatments, prevention, etc.) with involved personnel.
- ❑ Evaluate individual performance of preserve staff to correct deficiencies and recommend personnel for training.
- ❑ Review and revise FMP as needed.
- ❑ Update and submit fire experience and training to the Southeast Regional Office FMO, for entry into IQCS (or the appropriate reporting system).

In late winter, the preserve FMO meets with representatives from the Okefenokee National Wildlife Refuge, Osceola National Forest, and Cumberland Island National Seashore to review and update an Interagency Agreement and Dispatch Plan (the Tri-Agency Agreement) which covers preparedness, dispatch, and training needs.

4.2.2.1 Fire Prevention Activities

Fire prevention includes all activities designed to reduce the number of human-caused wildland fires within the preserve. Two major aspects of prevention are public awareness and education. Fire prevention messages will be presented to communicate the difference between human-caused wildland fire and prescribed fire with respect to the preserve's ecosystem. All NPS employees will possess a basic understanding of the FMP so that they can explain the complementary programs of fire prevention and the use of prescribed fire to preserve visitors and neighbors.

The preserve fire prevention program will include the following activities:

- ❑ Pertinent signs, posters and notices will be posted on bulletin boards at parking areas and boat ramps. In all fire prevention messages, the message will stress that any individual starting a fire deliberately or unintentionally can be held civilly liable for the cost of suppressing the fire, as well as being charged criminally.
- ❑ Fire prevention messages will be included in the preserve folder, camping and hiking brochures, nature trail guides and a site bulletin describing the preserve's wildland fire management program.
- ❑ Pertinent messages will be included in visitor center exhibits and interpretive talks.
- ❑ During periods of very high to extreme fire danger ratings, all trailheads will be posted with "No Smoking" signs.
- ❑ Uniformed preserve personnel will share appropriate information with visitors and neighbors through informal contacts.
- ❑ The preserve's safety committee will conduct formal annual fire safety building inspections. A minimum clearance of hazard fuels 30 feet around each structure will be maintained.
- ❑ Roadways, parking areas and fuel breaks will be mowed or cleared of excess vegetation at a minimum of once per year.

4.2.2.2 Annual Training Needs of Fire Staff

NPS fire management training meets criteria specified within the training curriculum approved by the National Wildland Coordination Group (NWCG), which is tiered to positions described in the NWCG *Wildland Fire Qualifications*, *Prescribed Fire Job Qualifications*, and *Incident Command System Wildland Fire Job Performance* guides. All fireline-qualified preserve staff will additionally receive at least eight hours of annual safety refresher training (see section 8.1).

The preserve FMO is responsible for fire training. This includes:

- ❑ Knowledge of required courses for fire qualifications;
- ❑ Recruitment of existing preserve staff into fire program;
- ❑ Yearly update of individual training and qualification records;
- ❑ Use of individual training records and in-park needs analysis to develop fire training schedule/needs;
- ❑ Providing required training for employees to meet minimum staffing levels specified in this plan;
- ❑ Obtaining self-study materials for applicable fire training; and,
- ❑ Coordinating with other parks/agencies to sponsor/provide training.

The preserve FMO will forward all training and experience information to the Southeast Regional Office FMO, for entry into IQCS (or the appropriate reporting system).

4.2.2.3 Fire Weather and Fire Danger

Preparedness activities at the preserve are based on the National Fire Danger Rating System. Fire days are divided into five staffing classes, according to the intensity of danger factors. The staffing classes relate to the expected severity of fire conditions.

Staffing Class	Adjective Rating
I	Low
II	Moderate
III	High
IV	Very High
V	Extreme

4.2.2.3.1 Weather Station

The preserve does not have a fire weather station. It uses data collected at a neighboring Florida Division of Forestry weather station.

4.2.2.3.2 National Fire Danger Rating System

The National Fire Danger Rating System (NFDRS) enables a land management unit to determine fire danger based upon an evaluation of the upper limit of predicted fire behavior. Calculations of fire behavior are based on fuels, topography and weather. NFDRS outputs give relative ratings of potential wildland fire growth and behavior, thereby allowing a unit to systematically correlate its readiness level to the predicted fire problems of the day.

The preserve will assign the same fire danger rating as the Bryceville office of the Florida Division of Forestry (DOF). The DOF uses a system similar to NFDRS to determine fire danger rating. This system incorporates several indices in determining fire danger, including the Keech-Byram Drought Index, temperature, humidity, herbaceous stage,

wind, rain, dispersion index, and the previous day's buildup index. The outputs of this program include spread index, buildup index, fuel dryness, fire weather conditions and overall fire danger. These factors influence decisions regarding prevention activities, initial attack, extended attack, and prescribed fire activities.

The fire danger rating system software is located at the Florida Division of Forestry's website www.flame.doacs.state.fl.us/fire_weather, and can be viewed, used or downloaded from the site. The preserve is located in District 7.

4.2.2.4 Step-Up Staffing Plan

Staffing classes levels range from 1 to 5 (lowest to highest). As the staffing class increases, the preserve will respond with corresponding actions intended to mitigate the predicted difficulty of containing a wildland fire. The preserve superintendent may raise the staffing class one level for either predicted lightning or for holidays, special events, or special circumstances.

Staffing Classes I and II

Conditions: Fire would present a low to moderate level of control difficulty. Fires occurring at this level could be controlled with onsite forces. Wind speed and direction would determine severity of fire spread. Fine fuels would be drying.

Preparedness Actions:

- ☐ Fire weather reviewed daily.
- ☐ Hand tools and portable equipment kept ready.
- ☐ Initial attack will consist of a minimum of two individuals (1 Type V Incident Commander and 1 Type II Firefighter).
- ☐ Additional attack forces will be dispatched after size-up and upon request of the first firefighter to arrive.
- ☐ Government owned buildings at the preserve will be inspected for hazard fuel clearance.

Funding Source: These activities will be funded through programmed park accounts or non-emergency FIREPRO funds.

Staffing Class III

Conditions: Fires would present a moderate level of control difficulty. Light and heavy fuels would be drying. Mop-up would be more difficult and time-consuming.

Preparedness Actions:

- ☐ All actions specified for staffing class I - II days will also be implemented at this level.

- ❑ Initial attack will consist of a minimum of three individuals if available (1 Type IV Incident Commander and 2 Type II Firefighters).
- ❑ The preserve's engine will be dispatched with 1-2 individuals with a second/third being obtained from neighboring cooperators.
- ❑ When fires are detected on NPS lands, immediately request support from both DOF and City of Jacksonville Fire and Rescue.

Funding Source: These activities will be funded through programmed park accounts or non-emergency FIREPRO funds.

Staffing Classes IV and V

Conditions: Fire would present a moderate to high level of control difficulty. Initial attack and reinforcing crews could have difficulty controlling a fire at this level. All fuels would be dry. Air temperature would be high and humidity low. Strong gusty winds may be present. Spotting would be likely.

Preparedness Actions:

- ❑ All actions specified for staffing class III days will also be implemented at this level.
- ❑ Initial attack will consist of a minimum of three individuals (1 Type IV Incident Commander and 2 Type II Firefighters).
- ❑ When fires are detected on NPS lands, immediately request support from both DOF and City of Jacksonville Fire and Rescue.
- ❑ Firefighters may work extended hours and lieu days with supervisory approval; emergency firefighters hired on an administratively-determined basis.
- ❑ Request additional resources through the Florida Interagency Coordination Center and notify Southeast Regional Office FMO of such orders.
- ❑ Visitor center personnel will alert the public to fire conditions and hazards.
- ❑ Interpretive activities will include a fire safety message.
- ❑ Fire danger notices will be posted.
- ❑ Temporary closures may be placed in critical areas when fire, or the threat of fire, could compromise life safety.

Funding Source: FIREPRO emergency funds may be used at these staffing class levels with the approval of the Southeast Regional Office FMO. This funding can be used for ensuring that adequate fireline-qualified staff are on-duty to respond to fire starts, to conduct patrols or prepare equipment for initial attack. Both nonessential routine activities and project work may be postponed on staffing class IV and V days.

4.2.3 Pre-Attack Plan

The pre-attack plan is a compilation of essential fire management information that must be available in the preserve's fire management and/or dispatch offices. The plan includes important information on areas of high risk, natural firebreaks, water sources, cultural resource locations, endangered species critical habitat, structures, utilities, criteria and

procedures for evacuations and closures, preserve base maps, vegetation/fuel maps and firefighting resources available near the preserve. Advance preparation of this critical document will save fire managers considerable time during fire suppression operations.

The pre-attack plan will be reviewed and revised annually by the fire management officer, natural and cultural resource management specialists, facility manager and staff from each district (See *RM-18* for additional information on pre-attack plan components). The pre-attack plan is based on a large format map and is not included in this FMP due to its size.

4.2.4 Initial Attack

Visitors, neighbors, and employees report most wildland fires at the preserve. Any preserve employee to whom a fire is reported must obtain complete information regarding the fire; and the name, address, and phone number of the reporting party.

The preserve FMO will assure that all fire reports are promptly investigated. Initial attack on wildland fires is the primary responsibility of the on-scene incident commander (IC) with support from the preserve staff. The IC will perform or designate an individual to size-up the fire. Size-up will include:

- ☐ Fire name (assign a name if not already named);
- ☐ Location;
- ☐ Access;
- ☐ Terrain and fuels;
- ☐ Size of fire;
- ☐ Anticipated control problems;
- ☐ Values threatened;
- ☐ Cause (if known);
- ☐ Weather (winds, humidity, temperature);
- ☐ Resources on fire (number and type);
- ☐ Resources needed (if any); and,
- ☐ Fire behavior.

The preserve FMO and cultural resource management specialists will be notified of a wildland fire as soon as possible. The cultural resource management specialist will supply information on any cultural sites in the area. Once a fire is located and a size-up conducted, the IC will determine the most appropriate management strategy to suppress the fire. The IC will also complete a Wildland Fire Situation Analysis if the fire escapes initial attack.

The IC will relay size-up information, request personnel and equipment as needed, and supervise suppression actions. The IC will keep current on weather forecasts and predicted fire behavior, and conduct fire operations until the fire is declared out or until formally relieved. The IC is responsible for completion of all fire documents, including a written fire report (Department of Interior DI-1202) submitted within five days after the

fire is declared out. All ICs are responsible directly to the preserve FMO or superintendent.

The point of origin will be established and protected so that an investigation can determine or confirm the cause of the fire. That area should be treated as a crime scene and left undisturbed for future investigation. Vehicles observed while en route to the fire should be noted (license number, make, color, etc.) and the information given to the investigation officer. All evidence which may indicate arson as the cause shall be preserved and the investigation officer informed. The IC may request a fire investigator on all suspected arson fires.

The cause of ignition for each fire will be properly reported, using the *Wildfire Cause Determination Handbook* (National Wildfire Coordinating Group) as a guide. The preserve FMO or designee will be responsible for wildland fire investigation and law enforcement.

The IC or designee will keep Florida Division of Forestry updated on fires that may impact their lands and/or resources. The preserve superintendent and FMO will be notified whenever there is a possibility of movement of a fire from one jurisdiction to another.

After the fire has been controlled, the IC or his/her representative will map the fire. Fires will be patrolled until pronounced controlled by the IC. No fires will be left until the IC is certain that the fire will not escape existing control lines. The preserve FMO will ensure all controlled fires are checked by 11:00 a.m. on subsequent days until he/she is comfortable that the fire can be declared out.

Due to limited preserve staff and the isolation of many of the NPS-owned land parcels, most fires at the preserve will probably be reported to the Florida Division of Forestry (DOF). The preserve has a standing delegation of authority (dated January 29, 2003) to the DOF to take suppression action on NPS lands if an NPS official cannot be contacted. If NPS officials cannot be contacted, DOF may take suppression action using the lowest impacting suppression technique needed (including the use of tractor plows and aerial retardant) to halt the fire prior to the fire leaving NPS lands and causing damage to neighboring homes, commercial establishments or posing a threat to public safety.

The NPS and DOF have signed a memorandum of understanding (MOU) (NPS Agreement H5023-02-0515, dated October 30, 2002) to take suppression actions on lands under the responsibility of either agency. The MOU spells out conditions of initial attack responsibilities, transition to unified command, and cost reimbursements. Annual operating plan is updated yearly, as called for in this MOU.

4.2.4.1 Information Used to Set Initial Attack Priorities

The goal in all initial attack actions is to suppress the fire in a safe, cost-effective manner, consistent with the preserve's general and resource management objectives. The following resources will be used to set priorities during multiple fire occurrences:

- ❑ Map displaying private structures within preserve boundaries or within one mile of the preserve boundary;
- ❑ Cultural site map;
- ❑ Wildlife habitat and vegetation maps; and,
- ❑ Key members of preserve staff.

4.2.4.2 Criteria for Appropriate Initial Attack Response

The appropriate initial attack response will be determined from an analysis of the given situation, and as stated above, will be consistent with the preserve's general and resource management objectives. Factors dictating the appropriate initial attack response include:

- ❑ Firefighter and public safety (the highest priority in every fire management activity);
- ❑ Protection of cultural, historic and natural resources;
- ❑ Protection of improvements and private property;
- ❑ Current and predicted fire weather and fire behavior;
- ❑ Suppression resources and response times;
- ❑ Minimum impact suppression tactics policy; and,
- ❑ Cost-effectiveness.

The appropriate initial attack response will vary from fire to fire, and sometimes even along the perimeter of the same fire. Options range from monitoring with minimal on-the-ground disturbance to aggressive suppression actions along the entire fire perimeter.

4.2.4.3 Confinement as an Initial Attack Suppression Strategy

A confinement strategy may be implemented as the initial attack action as long as it is not used to meet resource objectives. Confinement is selected in lieu of wildland fire use to maximize firefighter safety, minimize suppression costs, minimize cost + loss in low-valued and commodity resource areas, and to maximize availability of critical suppression and management resources during periods of high fire danger associated with fire in highly-valued resource areas.

Confinement may also be a strategic selection through the wildland fire situation analysis (WFSa) process when a fire is expected to exceed initial attack capability or planned management capability. When confinement is selected as the initial action, the same management process applies as for wildland fire use decisions. A long-term implementation plan is needed to guide the implementation of the confinement strategy. The wildland fire implementation plan (WFIP), prepared in stages, meets this requirement.

4.2.4.4 Typical Fire Response Time

Fire response times at the preserve vary depending on staffing, fire management activity in the area, day of the week, and the time of day. During the period of highest activity in the fire season, when no other fires are burning and staff are available, the preserve engine can respond to most fires within one hour or less. Reinforcements from local agencies can typically respond to a fire in the preserve within one hour as well. Aviation resources can typically reach a fire within one to two hours. Reinforcements from outside the immediate vicinity may not arrive until about eight hours, or more, after a request is made for them. All response times are subject to availability of firefighting resources.

4.2.4.5 Restrictions and Special Concerns

The preserve superintendent must authorize the use of any off-road mechanized equipment. This authorization is contained in a Delegation of Authority to the Florida Division of Forestry (DOF) to use off-road equipment for suppression action in cases where wildland fire may leave NPS-owned lands.

Retardant and saltwater will be used only when a fire threatens to leave NPS lands. This authorization is currently contained in a Delegation of Authority to the DOF to use retardants, including salt water, for suppression action in cases where wildland fire may leave NPS-owned lands.

Minimum impact suppression tactics will be used to the greatest extent feasible and appropriate, employing methods least damaging to preserve resources for the given situation.

4.2.4.6 External Issues

Local businesses and state of Florida resources will be utilized in support of fire management actions at the preserve whenever possible. The intent is to economically, politically, and socially involve the community in fire management activities.

4.2.4.7 Work/Rest Guidelines, Rest and Recuperation

The *Interagency Incident Business Management Handbook* (chapter 10, section 12.6) provides comprehensive direction on work/rest guidelines and rest and recuperation (R&R). It also provides guidance on the application of management-directed days off for employees at their home units. Management of work schedules, directed days off and R&R will be incorporated as appropriate into preserve fire management activities to give personnel proper rest so they remain productive, mentally alert, and physically capable of performing their jobs safely.

4.2.5 Extended Attack and Large Fire Suppression

Extended attack occurs when a wildland fire has not been controlled by initial attack forces, and additional firefighting resources are arriving, en route, or being ordered by the initial attack incident commander. Extended attack continues until the fire has been suppressed, or until transition to a higher-level incident management team is completed.

If a large or extended attack fire were to occur at the preserve, it would have to be managed in cooperation with other jurisdictions because of the size, location of the preserve, limited staffing, and the fuel types present. The following information should be used in determining management actions and decisions:

- ❑ Threats to life, property and preserve resources;
- ❑ Availability of suppression forces;
- ❑ Current and expected fire behavior; and,
- ❑ Wildland Fire Situation Analysis.

4.2.5.1 Determination of Extended Attack Needs

Extended attack requires a wildland fire situation analysis (WFSA) to guide a re-evaluation of suppression strategies. The WFSA process determines current fire complexity and facilitates selection of a new management response, which in turn determines the number and type of resources needed for extended attack. All agencies that will be affected in an extended attack, either by land ownership or resources committed, should be involved in the WFSA process.

4.2.5.2 Implementation Plan Requirements—WFSA Development

A wildland fire situation analysis (WFSA), required when extended attack occurs, serves as the decision record for selection of the appropriate management response. Whenever reasonable doubt exists regarding the successful outcome of an initial attack response, the incident commander will immediately begin a WFSA.

An example of the WFSA can be found in *RM-18*, Appendix A.

4.2.5.3 Complexity Decision Process from Initial to Extended Attack

One of the WFSA components is a fire complexity analysis guide. This guide contains specific yes/no questions regarding fire elements, including current and predicted fire behavior, resources committed, resources threatened, safety, ownership/jurisdiction, external influences, change in strategy, and existing overhead. The total number of positive responses to the questions determines the complexity/management level of the fire, i.e. type I, type II, or type III. The incident commander will submit the WFSA to the preserve superintendent for approval. If fire complexity dictates, the preserve FMO will request an interagency incident management team (type I or II) through the Florida Interagency Coordination Center.

See *RM-18*, chapter 9, exhibit 2, for a complexity decision chart.

4.2.5.4 Incident Commander Delegation of Authority

Whenever an incident commander from a cooperating agency manages a fire within the preserve's boundaries the superintendent must provide a written limited delegation of authority and a briefing package.

4.2.6 Exceeding Existing WFIP, Selecting New Strategy

The existing wildland fire implementation plan (WFIP) is exceeded when a wildland fire escapes initial attack or when the appropriate management response has not been successful, or when a prescribed fire can no longer be implemented in accordance with the approved plan. The incident commander will initiate a wildland fire situation analysis (WFSA), from which the most appropriate management strategy will be determined.

4.2.7 Minimum Impact Suppression Tactics

NPS policy requires fire managers and firefighters to select management tactics commensurate with a wildland fire's existing or potential behavior, but which cause as little impact to natural and cultural resources as possible. All suppression activities at the preserve will therefore incorporate the minimum impact suppression tactics policy, to the greatest extent feasible and appropriate for the given situation. Examples of minimum impact suppression tactics that will be implemented include:

- ❑ Use water instead of fire retardants. If retardants are needed, use those that are considered non-fugitive, and avoid lakes and marshes. Use saltwater only when absolutely necessary;
- ❑ Cold trail the fire edge when practical;
- ❑ Use wetlines or natural fuel breaks wherever possible in lieu of handline construction if water and pumps are available;
- ❑ Utilize soaker hose, sprinklers or foggers in mop-up. Avoid boring and hydraulic action;
- ❑ Keep firelines to the minimum width necessary to allow backfiring or safe blackline to be created. Utilize natural and existing human-made barriers whenever possible;
- ❑ Tractor/plow units will only be permitted in pine plantations at Black Hammock and Thomas Creek, with the permission of the preserve superintendent or designee. However, plow use will be considered at other locations on a case-by-case basis if fires could leave NPS lands and threaten lives or structures;
- ❑ Decisions on suppression actions will be made by the incident commander within the scope of the delegation of authority;
- ❑ Minimize cutting of trees;
- ❑ Archeological sites will be identified prior to a fire and protected wherever possible. Minimize ground disturbance to protect cultural resources. Report all fireline construction around archeological sites to the preserve cultural resource specialist;
- ❑ Scatter or remove debris as prescribed by the incident commander; and,

- All firelines, spike camps, and other disturbed areas will be rehabilitated to return the site to the way it appeared before the incident.

RM-18, chapter 9, provides minimum impact suppression tactics guidelines.

4.2.8 Rehabilitation Guidelines and Procedures

Fire rehabilitation involves short-term actions (generally 0-6 months) to stabilize a burned area and mitigate the effects of fire suppression activities. Immediate rehabilitation actions to prevent further land degradation or resource loss, or to ensure safety, may be undertaken as part of the incident.

At the preserve, all litter and trash in the vicinity will be removed after a fire is declared out. Firelines will be refilled and erosion control devices will be installed, if necessary. The severity of the burn and its resulting impacts will be considered when determining the need to seed or otherwise re-establish native plants. Landscaping and planting will be in full compliance with NPS management policies, and will have the prior approval of the regional director. A rehabilitation plan will be prepared before any action is undertaken. The plan will include species to be planted, techniques to be used, locations, and cost estimates.

The methods of suppression used on wildland fires at the preserve will be those that produce the least significant resource damage consistent with suppression goals. This will reduce the need for rehabilitation. In some cases, however, fire impacts or associated suppression actions are unavoidable and will require rehabilitation. In no case will rehabilitation be undertaken which will worsen the situation.

Rehabilitative actions may include obliterating firelines, flush cutting stumps, removing cut logs, erosion control, and scattering brush piles and debris. Generally, burned areas will not be reseeded. Residual seed and sprouting from surviving rootstocks will provide natural rehabilitation. Tractor plow lines will require the use of heavy equipment to re-establish the ground contour.

Rehabilitation will begin as soon as possible, even before the fire is out. This is especially important if existing equipment and personnel on the fireline are not being fully utilized in mop-up operations. Funding of direct costs of rehabilitation is through establishment of a Burned Area Rehabilitation account. Requests for an emergency account number must be made to the Southeast Regional Office FMO and include description of activity, cost, starting and ending dates. Verbal requests must be followed up in writing.

In the case of very large fires, a Department of Interior Burned Area Rehabilitation Team will be requested.

4.2.9 Reporting and Documentation

The preserve FMO is responsible for all fire management records and reports.

- Individual Fire Report: Reports and records will be held permanently in the Resource Management Office. An Individual Fire Report (Department of the Interior Form DI-1202) will be completed for all wildland fires, including prescribed fires and research fires. Copies of reports will be forwarded promptly to the Southeast Regional Office FMO, and cooperating agencies.

The form for documenting a wildland fire is the above-mentioned DI-1202. The report provides a historical record of the fire regime for the preserve. All fires within preserve boundaries must be documented with this form, including fires that go out on their own. The form is also used by the Department of the Interior to record fire occurrences. Support actions in which preserve personnel respond to fires outside the preserve (including out of state) are also to be reported on this form. The NPS must have a DI-1202 with an incident number on file for firefighters to receive credit for work performed on any fire.

The incident commander on a wildland fire is typically the person responsible for preparation of the DI-1202. In most cases, this is the individual who declared the fire out. That person may also complete a Case Incident Report (Form 10-343). The preserve FMO will assign each fire a number. Instructions for filling out the report are provided in *RM-18*.

For large fires, a complete fire report will include, as applicable:

- Written policies, guidelines or authority statements signed by the superintendent;
- Copies of equipment purchased or personnel request orders;
- All situation maps;
- Personnel lists, including emergency firefighter time slips;
- Press clippings;
- Accident reports;
- All weather data reports and records;
- Documentation of financial charges made against the incident; and,
- Rehabilitation plan.

The completed DI-1202 will be submitted to the preserve FMO, who will review the report and forward it to the Southeast Regional Office FMO for entry into the NPS Shared Access Computer System (or the appropriate reporting system).

- Training and Experience Records: The interagency Incident Qualifications and Certification System (IQCS) is replacing the NPS Shared Applications Computer System as the central repository for all individual fire experience and training records. The preserve FMO is responsible for forwarding all training and experience information to the Southeast Regional Office FMO for entry into IQCS.

- ❑ Daily Situation Report: Daily situation reports are required on those days when the fire danger index reaches the 90th percentile and the preserve moves into staffing class levels IV or V, or when a fire has started or is ongoing. The preserve FMO will notify the Southeast Regional Office FMO, who will enter the report into the NPS wildland fire management computer system by 9:30 a.m. the following day.
- ❑ Resource Order Form: All assistance requests must be documented on the Resource Order Form (National Fire Equipment Schedule Form 1470). These forms can be transmitted by telephone. The order form is an obligating procurement document.

4.3 Prescribed Fire

Prescribed fire is important to the management of vegetation communities at the preserve, and to the achievement of resource management goals. The preserve's Resource Management Plan states that there is a need to "conduct prescribed burns, manage exotic plants, and restore the functioning of disturbed vegetation communities." The preserve's vegetation communities have been altered by a variety of practices, including livestock grazing, land clearing, the planting of slash or loblolly pines in rows for fiber production (plantations), and fire exclusion.

Extensive grazing of cattle, sheep, and goats during the late 1800s and early 1900s within present preserve boundaries led to a decrease in native grasses and herbaceous cover, an increase in woody species (grass and herbaceous surface vegetation tend to decline as woody species increase and age), and a subsequent increase in fuels accumulations. The preserve has excluded grazing, which has increased the potential for successful restoration of native grass and forbs-dominated communities after fires.

Decades of fire exclusion have resulted in unnaturally high fuel loads, as well as causing a shift in vegetation composition from fire-dependent and fire-maintained species to fire-intolerant species. Restoration of fire to the ecosystem would help return the area to more natural conditions. While cutting woody species could restore native grasses and forbs with fewer impacts to air quality, many native plants require fire to scarify seeds and prepare the growing site. Prescribed fire is the single most appropriate management action to facilitate the restoration of native vegetation and natural ecosystems.

Prescribed fire at the preserve will serve primarily to restore fire as an ecological process, and maintain fire-dependent vegetative communities and their associated wildlife species; and to reduce hazard fuels accumulations. Reducing hazard fuels serves to increase safety for firefighters, preserve visitors and neighboring homes. When safety and control can be assured, frequency and intensity of natural fires will be duplicated to the maximum extent possible.

The preserve's prescribed fire program must concentrate on restorable sites that could support the desired plant communities. This FMP does not suggest wholesale removal of all woody species. Woody species play a very important role in the vegetative communities that historically occupied riparian and other sites with rocky and shallow

soils. The prescribed fire program should focus on reducing encroaching woody species and maintaining a natural mix of native grasses and forbs.

Research burns may be conducted with approval of the superintendent and must meet all requirements of any other planned ignitions.

4.3.1 Planning and Documentation

Prior to conducting a prescribed fire, the preserve FMO will obtain a burning permit from the Florida Division of Forestry. Nearby landowners and other interested parties, such as the Sheriff's Department and area fire departments, will be notified prior to and on the day of the planned ignition.

Go/no-go documents, one for preserve superintendent approval and the other for the prescribed fire burn boss, will be completed and signed prior to executing a prescribed fire. The superintendent's go/no-go approval is the final management approval prior to ignition of the prescribed fire. It is valid for up to 30 days after the approved date; if ignition does not occur prior to expiration of the superintendent's approval, a new go/no-go approval document will be completed.

The prescribed fire operations go/no-go checklist is the final operational confirmation that all requirements of the prescribed fire plan have been met, and conditions are appropriate for initiation of the prescribed fire (i.e. do we commence with firing or not?). This checklist will be used as a daily validation until ignition is completed, and there are no existing or eminent threats to the fireline/project boundary.

4.3.1.1 Annual Activities for Preparation and Implementation of Prescribed Fire Program

A prescribed burn plan should be prepared well in advance of the ignition, and will contain measurable objectives, predetermined prescription, operational procedures to properly prepare for and safely conduct the planned ignition, and contingency actions in event that prescription is exceeded. Prior to ignition, the superintendent must approve the burn plan. In addition, a prescribed fire specialist or fire management officer from outside the preserve will review all proposed prescribed fire burn plans.

4.3.1.2 Long-Term Prescribed Fire Strategy

The immediate goal of the prescribed fire program at the preserve is reintroducing fire to the ecosystem. Over the next five years, a rotational series of burns will begin in a 140-acre unit at Cedar Point, coinciding with the historic fire return interval, and creating and maintaining a mosaic of burned and unburned areas that will approximate natural conditions. Prescribed fire application will occur within specified weather and fuel moisture parameters. The prescription may be adjusted as deemed necessary by monitoring results, information gained from research burns, and further refinement of the

prescribed fire program. The ultimate objective of the cyclic burning of this unit is to restore the area as a pine flatwoods, as per preserve planning guidance.

A five-year prescribed fire schedule is included as Appendix J, and will be reviewed annually.

4.3.1.3 Personnel Requirements for Program Implementation

- **Prescribed Fire:** All prescribed burns will be conducted under the direction and standards specified in the NPS *Qualification System Guide*. A certified prescribed fire burn boss is required to implement every prescribed fire at the preserve (with the exception of debris burns, discussed below). The burn boss type (RXB1, RXB2) will be determined via the prescribed fire complexity rating process (see *RM-18*, chapter 10). The burn boss may be from another agency as long as s/he is qualified to burn in the fuel type of the proposed prescribed fire. The burn boss will use the complexity rating process to determine other overhead positions (ignition specialist, lead monitor, information officer, safety officer), as well as the minimum type, number and response time of holding resources. Prescribed fire crewmembers will each be minimally qualified at the type II firefighter level. Burn bosses and all other positions assigned to prescribed fires at the preserve will meet all national requirements for training and experience.

The preserve does not have sufficient qualified staff to independently conduct prescribed burns. The preserve FMO will therefore coordinate with cooperators to obtain qualified personnel. Assistance with filling the above positions can be obtained from the Southeast Regional Office, nearby federal or state agencies, water management districts, NPS fire use modules, or non-profit organizations with recognized prescribed fire programs such as The Nature Conservancy. The preserve FMO will obtain any necessary regional and national clearance for use of such personnel.

- **Debris Burns:** If a simple, isolated burn is proposed which has virtually no chance to escape, presents no threat to safety or resources, and is an established practice, a formal prescribed burn plan will not be required (*RM-18*, chapter 10, page 4). It will be necessary to have at least one qualified firefighter and the preserve's Type 7 engine on scene. An example would be burning of slash piles by the preserve maintenance personnel.

All personnel involved in such burns should wear appropriate personal protective equipment: boots, Nomex shirt and pants, gloves, and hardhat. The project supervisor is responsible for making all necessary notifications (local fire departments, air quality contacts, neighbors, etc.), obtaining all permits, and developing an appropriate safety and evacuation plan to enact in case of injuries or other emergencies. The burn crew must include someone who has previously conducted a similar burn.

4.3.1.4 Prescribed Fire Monitoring

All prescribed fires must include an adequate number of prescribed fire monitors to record site weather, smoke dispersal, and fire behavior; and to collect data from the plots in the burn unit as specified in the NPS *Fire Monitoring Handbook* (2001). A prescribed fire monitoring report that includes weather observations, fire behavior observations, ignition pattern, and immediate post fire effects will be completed for each burn. Monitoring critiques will be held after prescribed fires have been completed.

Fire weather will be recorded for at least three day prior to the planned ignition. Since the timing of most prescribed fires will depend on the passage of cold fronts during winter and spring months, the collection of weather data for longer periods of time is not useful since the cold front will alter weather patterns. The fuels to be burned are mostly green (especially palmetto). Therefore, the collection of fuel moistures for dead and down fuels (10-, 100- and 1000-hour fuels) is not needed for accurate modeling. Fire weather observations will be collected during ignition and burning phases on an hourly basis.

Wildland and prescribed fire monitoring is further discussed in section 6.3. A wildland and prescribed fire monitoring plan, not yet developed, will specifically describe monitoring protocols. It will be included as Appendix I.

Fire Behavior Monitoring: Lack of knowledge during critical phases of a prescribed fire's development can lead to management errors. Fire behavior monitoring of prescribed fire is critical for three reasons:

- ❑ To protect human life and/or property;
- ❑ To keep fires within predetermined criteria; and
- ❑ To know when to take suppression action.

Fire behavior monitoring information will include:

Topographic Variables

Percent slope

Aspect of terrain

Fire Weather Variables

Air Temperature

Relative humidity

Wind speed

Wind direction

Percent shading and cloud cover

10-hour time lag fuel moisture

Live fuel moisture

Drought index

Fuel Models

Identify fuel(s) carrying the fire

Fire Characteristics

Linear rate of spread

Fire spread direction

Perimeter and area growth

Flame length

Flame zone depth

Smoke Characteristics

Visibility

Transport and surface wind speeds and direction

Mixing height

Total smoke production

Documented complaints from downwind areas

Immediate Post-Fire Effects Monitoring: Immediate post-fire effects monitoring will provide information on fuels reduction, vegetative change, and other objective dependent variables. Monitoring may include the use of index plots and transects to be monitored prior to and after fire. Some of the variables to be measured include:

Tree Layer

Density by species

Diameter by species

Dead and Downed Fuel Loads

Fuel load by size class

Total fuel load

Litter depth

Duff depth

Brush and Herbaceous Layer

Number of transect hits by species

Relative cover by species

Number and percent of non-native species

Number and percent of native species

Brush density by species

Brush age by species

Post-Burn Conditions

Average scorch height

Percent of crown scorched

Burn severity (substrate and vegetation)

Additional recommended variables are listed in the NPS *Fire Monitoring Handbook* (2001) and may be added to the preserve's monitoring program.

4.3.1.5 Prescribed Fire Project Critiques

The prescribed fire burn boss will conduct a critique of each prescribed burn with personnel involved in the project. This will be done as soon as possible after the burn has been completed. Topics to be covered in the critique include:

- ☐ Safety concerns and issues;
- ☐ Attainment of burn objectives;
- ☐ Logistics;
- ☐ Planning process;
- ☐ Tactics and operations;
- ☐ Ignition plan;
- ☐ Holding plan;
- ☐ Monitoring plan;
- ☐ Predicted weather/behavior vs. actual weather/behavior; and,
- ☐ Recommendations for future projects.

The discussion of these issues will be summarized by the prescribed fire burn boss and included in the final prescribed fire report.

4.3.1.6 Reporting and Documentation Requirements for Accomplishments and Escaped Fires

The burn boss on a prescribed fire will document the fire with the following information, stored individually in preserve files:

- ☐ Original signed prescribed fire plan;
- ☐ Checklist of pre-burn prescribed fire activities;
- ☐ All reviewer comments;
- ☐ All maps;
- ☐ Notification checklist;
- ☐ Permits (e.g. burn, smoke, etc.);
- ☐ Monitoring data;
- ☐ Weather forecasts;
- ☐ Agency administrator go/no-go pre-ignition approval;
- ☐ Operational go/no-go checklist;
- ☐ Incident action plan(s);
- ☐ Unit logs, daily validation, or other unit leader documentation;
- ☐ Press releases, public comments, complaints;
- ☐ Smoke dispersal information;
- ☐ Post-fire critique; and,

- ❑ Individual Fire Report (DI-1202), completed by the burn boss and submitted to the Southeast Regional Office FMO for entry into SACS (or the appropriate reporting system) within 10 working days after the fire has been declared out.

4.3.1.7 Prescribed Fire Plan

The preserve will use the prescribed fire plan format provided in *RM-18*, chapter 10, Wildland and Prescribed Fire Management Policy and Implementation Procedures Reference Guide.

4.3.2 Exceeding Existing Prescribed Fire Plan

If a prescribed fire can no longer be implemented in accordance with the approved plan, the entire prescribed fire area will be declared a wildland fire, and suppression action taken. (Spot fires may not constitute an escape if they are contained within standards identified in the prescribed fire plan.) All subsequent action (i.e. initial incident commander, operational needs, notifications, strategies, resource orders, etc.) will be defined under the wildland fire transition plan, included in the prescribed fire plan. The contingency plan should be tiered to the worst-case scenario, utilizing current fire behavior processing systems for the fuel types and conditions outside the burn block and adjacent to the project area. In the event that the contingency plan is unsuccessful, the incident commander will develop a wildland fire situation analysis (see section 4.2.5.2).

4.3.3 Air Quality and Smoke Management

As a chemical air pollutant, smoke is subject to scrutiny under federal legislation established by the Environmental Protection Agency. In addition to posing health risks, smoke can reduce visibility many miles away from its source, affecting the safe operation of automobiles and aircraft, and diminishing the quality of scenic views.

As previously stated, the preserve is designated a class II air shed under the 1977 amendments to the Clean Air Act. Under class II, modest increases in air pollution are allowed beyond baseline levels for particulate matter, sulfur dioxide, nitrogen and nitrogen dioxide, provided that the national ambient air quality standards, established by the Environmental Protection Agency (EPA), are not exceeded.

Pertinent Air Quality Issues

The smoke produced by fire is about 90 percent water and carbon dioxide. The remaining emissions vary, depending upon factors such as type of fuel, moisture content, fire intensity and chemical reactions between the elements released by fire (U.S. Fish and Wildlife 1995). Other common emissions include carbon monoxide, nitrogen oxides, aldehydes, complex hydrocarbons, sulfur oxides, ozone and organic oxidants (Johansen et al. 1985, Sandberg and Dost 1990). A short-term study of biogenic emissions from *Juncus* and *Spartina* marshes after fire revealed an increase in levels of methane and nitric oxide (Levine et al. 1990).

The Environmental Protection Agency has set National Ambient Air Quality Standards for certain pollutants produced by wildland fire. These include:

- ❑ Particulate Matter: Particles under ten microns in diameter can enter the airways and cause lung damage. Firefighters should take precautions to avoid inhalation of minute particles.
- ❑ Oxides of Sulfur and Nitrogen: Large amounts of nitrogen and small amounts of sulfur are contained in forest fuels and combine to form oxides during burning. Fortunately, the amounts produced in wildland burning are not considered significant.
- ❑ Carbon Monoxide (CO): CO is present in high concentrations in the immediate vicinity of a fire; however, it disperses very quickly and would be of minimal risk to the public, even a short distance from the fire. Firefighters can be affected and should take proper safety measures to avoid CO inhalation.
- ❑ Ozone: Under certain conditions ozone can be formed during fire. This occurs in the upper part of the smoke column and therefore is not a threat to people near the fire. It can cause a problem downwind if the area affected already has high ozone levels.

There are also potentially harmful non-criteria pollutants, for which standards have not been set, that are contained in wood smoke. These include:

- ❑ Aldehydes: Two chemicals in this group are acrolein and formaldehyde. Acrolein has a severe toxic effect on cells and can reduce the body's ability to ward off respiratory infection. Formaldehyde can irritate the eyes and throat and interfere with breathing.
- ❑ Polynuclear Aromatic Hydrocarbons: Some polynuclear aromatic hydrocarbons are carcinogenic and can be inhaled as minute particles. They are of little threat to the public but could have long-term impacts on firefighters.

Other potential impacts of smoke include decreased visibility. If smoke were to settle on a highway, traffic safety could be compromised. Section 4.3.3 of this FMP discusses air quality and smoke management, and outlines steps that will be taken to ensure that smoke effects do not exceed acceptable limits.

Smoke Management Planning and Implementation Measures

The preserve's fire management program will manage smoke in full compliance with interstate, state, and local air pollution control regulations as required by the Clean Air Act, Title 42, U.S. Code 7418. Smoke will be monitored for trajectory, mixing height, and impact to air quality.

Goal 1: Preserve staff and visitors will be protected from unhealthy levels of air pollution from prescribed fires.

Objective: Do not exceed ambient concentrations of particulate matter (PM₁₀ and PM_{2.5}) established by the Environmental Protection Agency National Ambient Air Quality Standards.

Objective: Keep ambient concentrations of carbon monoxide measures below the Environmental Protection Agency National Ambient Air Quality Standards.

Strategy: Use state-of-the-art fire management practices to foster smoke dispersion or limit the size of the burn to reduce particulate matter. The Simple Approach Smoke Estimation Model (or equivalent) will be used to estimate particulate matter and carbon dioxide concentrations and to ensure that the proposed prescribed fire does not cause National Ambient Air Quality Standards violations. On-site monitoring will be conducted to determine particulate matter concentrations and smoke dispersion for burns that could significantly affect the local airshed for more than one burning period. Monitoring may be conducted using air quality instruments or by visual observation.

Goal 2: Average visibility in the preserve will not be impaired to such an extent that the neighboring airshed is seriously affected.

Objective: Smoke plumes will disperse within ten miles downwind of the fire as observed from a point perpendicular to the smoke trajectory.

Strategy: Management practices will foster rapid transport and dispersal of smoke. Ignition will be timed to maximize dispersion and to limit smoke production during those times of day when air mixing is less likely.

Smoke Management Practices

- ❑ Burn when meteorological conditions allow for good smoke dispersion.
- ❑ Use ignition techniques that minimize smoke (backing fires) when possible. If backing fires are not possible, then utilize head fires to minimize the duration of smoke production.
- ❑ Ignite burns under good-to-excellent ventilation conditions and suspend operations under poor smoke dispersion conditions. Utilize internal fire lines to halt a prescribed fire that is exceeding smoke limits.
- ❑ Consider smoke impacts on local communities, roads, highways and airports.
- ❑ Implement burns specifically to meet resource management objectives.
- ❑ Minimize smoldering by considering fuel moisture.
- ❑ Burn piles only when other burns are not feasible.

- ❑ Use all opportunities to meet the burn prescription and vary burn locations to spread smoke impacts over time and geographic areas.
- ❑ Burn during optimum midday dispersion, with all ignitions completed by 3:00 p.m. to prevent trapping smoke in inversions or diurnal wind patterns.
- ❑ Implement maintenance burning in a periodic rotation to mimic natural fire cycles and reduce excessive fuel accumulations.

Smoke on roadways will be monitored and traffic control provisions taken to ensure motorist safety during fire events at the preserve. The following procedures will be taken to compensate for reduced visibility when a paved road is affected by smoke (the incident commander or prescribed fire boss on a particular event will determine visibility levels):

- ❑ Posting of warning signs on either side of the affected area.
- ❑ Reducing the posted speed limit when visibility is strongly reduced.
- ❑ Closing the road to traffic when visibility is severely reduced.

4.4 Non-Fire Fuel Treatment Applications

Non-fire applications at the preserve will include reducing hazard fuels accumulations around preserve structures and cultural sites, refurbishing existing holding lines around the proposed prescribed fire unit, and possibly treating the same prescribed fire unit prior to burning it.

A dozer, tractor plow, or harrow will be used to refurbish existing holding lines around the 140-acre prescribed fire unit. Additionally, a roller chopper may be needed to create corridors within the unit to allow ignitors to safely walk through the interior of the unit.

4.4.1 Equipment and Seasonal Use Restrictions

Heavy equipment use will be delayed if soil conditions are saturated in order to prevent rutting. It may also be restricted to certain seasons in order to prevent disturbance to nesting birds. Areas to be treated will be surveyed for gopher tortoises and burrows, which will be marked for avoidance.

4.4.2 Cost Accounting

Hazard fuels reduction funding is available through Wildland Urban Interface, Hazard Fuels (both distributed by the National Interagency Fire Center in Boise), and PMIS. All costs charged to project will be tracked by the preserve and entered into the appropriate accounting system.

4.4.3 Reporting and Documentation

Project progress, accomplishments, and completion reports will be entered into the National Park Service Shared Access Computer System (or the appropriate reporting system) as required.

4.5 Emergency Rehabilitation and Restoration

Burned area emergency stabilization and rehabilitation actions are intended to protect public safety, stabilize and minimize unacceptable change to biotic communities and imminently threatened cultural resources (treatment to prevent further erosion of sites; not inventory or mitigation of sites), improve ecosystem structure and function according to approved field unit management plans, and repair or replace minor facilities damaged or destroyed by a wildland fire. Burned area rehabilitation (BAR) subactivity funds can only be used for treatments on agency lands within the perimeter of the fire or impact area downstream from the burned area. The use of BAR funding is further limited based on treatment effectiveness and to improve economic efficiencies. The Interagency Burned Area Emergency Stabilization and Rehabilitation Handbook provides treatment guidance and standards.

5.0 ORGANIZATIONAL AND BUDGETARY PARAMETERS

5.1 Organizational Structure of Fire Management Program

The preserve does not have a formal fire management organization. The preserve FMO (collateral duty) is located organizationally within the Resources Stewardship and Partnership Division. The FMO reports to the superintendent, and provides oversight and assistance as described in this plan. Additional support will be provided by or requested through the Southeast Regional Office FMO.

The preserve FMO is the point person for fire management at Timucuan. This person is responsible for coordinating with the Southeast Regional Office Fire Management staff.

The preserve superintendent is responsible for the approval of all planning documents pertaining to fire management actions, and will specifically certify, in writing, each day of a prescribed burn that resources and funding are available to manage the fire. The incident commander will apply the decision criteria each day during a prescribed fire to ensure that the criteria are being met.

5.2 FIREPRO Funding

FIREPRO is the mechanism for funding requests and resource allocations for the NPS fire management program. The preserve FMO manages all FIREPRO funding for the preserve. Funding is available for engine maintenance, personal protective equipment, and training on an as-needed and available basis.

5.3 Interagency Coordination

Interagency coordination and cooperation are integral to successful implementation of the fire management program at the preserve. Only small, slow-moving wildland fires fall within the current suppression capabilities of the preserve. All other wildland and prescribed fires will require external support by interagency cooperators and/or other NPS units.

Neighboring agencies, upon request, will provide assistance with emergency fire suppression while adhering to the suppression and mop-up standards of the requesting unit. When assistance is provided, the requesting unit may reimburse the other based on actual costs. When land of one unit is threatened by fire on the other, the threatened unit may reinforce or relieve the unit at the scene without expectation of reimbursement. Upon request, each unit will provide the other with fire reports, incident reports, and other pertinent records related to the agreement.

When a fire crosses, or there is an imminent threat of crossing, jurisdictional or agency boundaries, a unified command may be established by involved agencies.

Each unit will keep the other informed of changing conditions within its unit. An Annual Operating Plan will be written delineating mutual threat zones, policies, standards and procedures for arson investigation, communications and reports.

The preserve is also a member of the Florida Interagency Coordination Center (FICC) in Tallahassee. If the preserve and local cooperators cannot supply needed resources for any all-risk incident, the FICC will be contacted to fill orders.

5.4 Interagency Contacts by Function

- ❑ Geoff Babb, The Nature Conservancy – wildland and prescribed fire
- ❑ William Bossuot, St. Johns River Water Management District – wildland and prescribed fire
- ❑ George Foley, Osceola National Forest – wildland and prescribed fire
- ❑ Bruce Hill, Florida Division of Forestry – wildland and prescribed fire
- ❑ Ken King, City of Jacksonville Regulatory and Environmental Services – air quality
- ❑ Jim Murrian, The Nature Conservancy – prescribed fire
- ❑ Steven Miller, St. Johns River Water Management District – boundary, wildland and prescribed fire
- ❑ Caroline Noble, NPS/Tall Timber Research Station – fire ecology
- ❑ Fred Wetzal, Okefenokee National Wildlife Refuge – wildland and prescribed fire resources

5.5 Fire-Related Agreements

The Memorandum of Understanding (NPS Agreement Number H5032-02-0515) between the preserve and the Florida Division of Forestry will assist with successful coordination

and will be reviewed annually. The preserve is also a participant in a tri-agency agreement (Interagency Agreement and Dispatch Plan) with the Osceola National Forest, Okefenokee National Wildlife Refuge, and Cumberland Island National Seashore, to share resources in cases of fires (prescribed or wildland) or other emergencies. A Memorandum of Understanding is currently under development involving the preserve; the City of Jacksonville; the Florida Division of Forestry; the Florida Department of Environmental Protection—Division of Recreation and Parks; the St. Johns River Water Management District; and The Nature Conservancy, for the formation of the Northeast Florida Interagency Prescribed Fire Team.

Additional formal agreements pertaining to wildland fire suppression may need to be established with the following agencies:

- ❑ City of Jacksonville Fire and Rescue Department
- ❑ City of Jacksonville Department of Parks, Recreation and Entertainment
- ❑ Florida Department of Environmental Protection—Division of Recreation and Parks
- ❑ St. Johns River Water Management District
- ❑ The Nature Conservancy

6.0 MONITORING

6.1 NPS Fire Monitoring Handbook

NPS policy requires managers to monitor the effects of all wildland and prescribed fires. Monitoring directives, summarized here from *Director's Order #18* are:

- ❑ Fire effects monitoring must be done to evaluate the degree to which objectives are accomplished.
- ❑ Long-term monitoring is required to document that overall programmatic objectives are being met and undesired effects are not occurring.
- ❑ Evaluation of fire effects data is the joint responsibility of fire management and natural resource management personnel.

The preserve will conduct its fire monitoring program in accordance with the NPS *Fire Monitoring Handbook 2001 (FMH 2001)*, which outlines standardized methods to be used for monitoring both wildland and prescribed fires. Monitoring protocols will be reviewed and approved at the Southeast Regional Office level before receiving funding.

6.2 Recommended Standard Monitoring Levels

FMH 2001 provides recommended standards, divided into four monitoring levels, which constitute the lowest level of fire monitoring to be conducted by NPS units. Table 5 illustrates how these monitoring levels correspond to the given management strategy.

Table 5: Management Strategies and Recommended Standard (RS) Monitoring Levels

Management Strategy	RS Level
Suppression: All management actions are intended to extinguish or limit the growth of a fire.	1. Environmental 2. Fire observation -Reconnaissance -Fire conditions
Prescribed fire: Management uses intentionally set fires as a management tool To meet specific objectives.	1. Environmental 2. Fire observation -Reconnaissance -Fire conditions 3. Short-term change 4. Long-term change

*Bold face print in RS level column indicates mandatory monitoring for the given management strategy.

6.3 Wildland and Prescribed Fire Monitoring

As indicated, wildland fire suppression requires level 1 and the first stage of level 2 monitoring. Level 1 monitoring, coordinated by the preserve FMO, involves environmental or planning data that provide the basic background information needed for decision-making when a wildland fire occurs. The reconnaissance stage of level 2 monitoring, coordinated by the incident commander, provides a basic overview of a fire event. Monitoring the effect of suppressed wildland fire on vegetation or other area-specific variables can identify specific threats to preserve resources, facilitate adjustments to suppression actions, and identify the need for a rehabilitation response.

Prescribed fire requires all four monitoring levels to determine changes/trends in fuel loading and vegetative composition over time. These changes, sometimes subtle, can be critical indicators of whether the prescribed fire program is meeting specific objectives. Levels 3 and 4 monitoring objectives are tiered to resource and fire management objectives. Preserve fire and resource managers will collaborate to ensure that prescribed fire effectively meets overall objectives.

The preserve will develop a short- and long-term monitoring program to measure the attainment of prescribed fire objectives. Qualitative and quantitative changes in resources will be measured and results will be used to guide modifications for subsequent prescription treatments. Evaluation and interpretation of fire effects monitoring is the joint responsibility of fire and resource management personnel. Interpretation of monitoring results will be used to influence management decisions.

Short-term monitoring will follow the procedures and protocols established in NPS *FMH 2001*. Short-term monitoring will also determine if burn unit objectives, such as tree and shrub mortality and fuels reduction, have been achieved.

Long-term fire monitoring will measure the influence of fire on ecosystem structure and dynamics, identify areas for future research, and validate the use of fire in perpetuating the preserve ecosystem. The variables to be monitored will be those which have been determined to be primary indicators of long-term change. The preserve will determine

primary indicators by examining the preserve's fire management goals and objectives, and by consulting fire effects specialists. Permanent photo points will be established to supplement the vegetative plots.

As previously discussed, a wildland and prescribed fire monitoring plan, upon completion, will be included as Appendix I.

7.0 FIRE RESEARCH

A large body of scientific information concerning the effects of fire and fire exclusion in areas similar to the preserve already exists. Fire in southern forests has been reviewed and summarized in Wade (1988) and Wade et al. (1980).

There is limited funding available for fire research. Managers may submit requests through the annual FIREPRO budget call if a determination is made that more data are needed. Additionally, requests for research funding may be made through the Interagency Joint Fire Science Group.

Completed Research: There has not been any fire research conducted specifically at the preserve to date. However, a vast amount of fire research has been conducted throughout the southern states. Much of the research has been conducted by the U.S. Forest Service. Tall Timber Research Center in Tallahassee, The Nature Conservancy and other organizations have been conducting prescribed burns in pine flatlands for over 30 years. Effects of fire on vegetation are well documented.

Needed Research: Research is needed to determine effects of prescribed fire on air and water quality, riparian vegetation, and individual species habitat. At the preserve, much of the use of prescribed fire will be to reduce hazard fuel loads and to attempt to shift vegetation toward the desired type. This use of prescribed fire requires very little new research. Instead, monitoring will be used to determine if the manipulation by prescribed fire and/or non-fire applications is achieving the desired goals.

Should the objectives of land management be to enhance selected species of plants or animals, research may be needed to determine the appropriate use of prescribed fire and/or non-fire applications.

8.0 FIREFIGHTER AND PUBLIC SAFETY

8.1 Firefighter Safety and Related Training, Qualifications, and Fitness Standards

Firefighter and public safety is the first priority in every fire management activity. Agency administrators at all levels must stress that firefighter and public safety *always* takes precedence over property and resource loss. This policy will be emphasized throughout all fire management operations at the preserve.

NPS wildland fire training, qualification, and certification system meets or exceeds all National Wildfire Coordinating Group (NWCG) standards. Only fully qualified (i.e. meeting NPS qualifications and accepted interagency knowledge, skills and abilities for the assigned fire job) employees will be assigned fire management duties (unless assigned as trainees, in which case they will be closely supervised by an individual fully qualified for the given position). All personnel (including emergency hire firefighters) engaged in fireline operations must have completed a minimum of 32 hours of basic wildland fire training, including the modules on basic firefighting, basic fire behavior, and standards for survival. The preserve FMO will coordinate at least eight hours of mandatory annual safety refresher training for all preserve staff likely to be on the fireline.

Refresher training will concentrate on local conditions and factors, the 10 Standard Fire Orders, 18 Watch Out Situations, LCES (Lookouts, Communication, Escape Routes, Safety Zones), and common denominators of tragedies and near-miss situations. NWCG courses such as Standards for Survival, Lessons Learned, and Look Up, Look Down, Look Around, meet the firefighter safety refresher training requirement. Hands-on fire shelter inspection and deployment practice *will* be included as part of the annual refresher. Efforts should be made to vary the training from one year to the next. It can be presented in an eight-hour block or in increments. The preserve FMO will document completed training for each firefighter and submit this information to the Southeast Regional Office FMO for entry into SACS (or the appropriate reporting system).

All preserve fire management personnel will be equipped with approved personal protection equipment (PPE), and trained in its proper use. Operational personnel on wildland and prescribed fires are required to use the PPE. Mandatory PPE includes:

- ☐ 8" high, laced, leather boots with lug soles;
- ☐ Fire shelter;
- ☐ Hard hat with chin strap;
- ☐ Goggles/safety glasses;
- ☐ Ear plugs;
- ☐ Nomex shirt and trousers; and,
- ☐ Leather gloves.

The NPS *Wildland Fire Qualification System Guide* contains a supplemental list of PPE. Special PPE and hazard analysis is required for operations involving fuel gelling agents, fireline explosives, aircraft (particularly helicopters), and chainsaw operations.

Prior to and throughout all fire management field operations at the preserve, fireline supervisors will cover safety factors with incident personnel, via operational briefings beforehand, and safety briefings that occur during the incident. At least one person, operationally qualified at a level corresponding to the complexity of the given incident, should be assigned responsibility for safety oversight. Fireline supervisors will designate lookouts, and all operational personnel will maintain open lines of communication, and know where escape routes and safety zones are located at all times. No NPS employee,

contractor or cooperator will ever be intentionally exposed to life-threatening conditions (see *RM-18*, chapter 3, for further safety-related planning and operational guidelines).

NPS policy requires that all personnel (including emergency firefighters) engaged in suppression and prescribed fire duties meet the physical fitness standards set by the NWCG. Physical fitness/work capacity levels for wildland firefighters will be determined by the “pack test” series of tests. Descriptions of the three work capacity levels (light, moderate and arduous), as well as medical and physical fitness requirements and procedures are outlined in the NWCG *Wildland Fire Qualifications Subsystem Guide*. The preserve FMO will annually administer (or coordinate the administration of) the pack test to preserve fire management personnel, and maintain up-to-date records of employee qualifications.

8.2 Public Safety Issues/Concerns, and Mitigation Procedures

Under no circumstances will an individual be permitted near a wildland fire at the preserve without the appropriate training and required personal protective equipment (PPE). Members of the press may be allowed in the vicinity of a fire only if they are determined to meet the standards established for the light fitness rating, wear the required PPE, and are accompanied by a trained, qualified firefighter who can assist them. The public should be kept out of the fire area and should be far enough away that they will not hinder suppression activities.

In the case of a wildland fire that has the potential for rapid spread, preserve visitors could be in dangerous areas. During extreme situations in which the rate of spread constitutes an immediate threat, all efforts should be made to inform and evacuate all threatened parties as quickly as possible. Visitors will be informed of the fire at the preserve access points, roads, and the visitor center; and will be advised of areas where caution should be exercised. Preserve visitors and neighbors will be informed of any fire activity that may become threatening. The preserve (or unified command team, if applicable) will contact the local media with current information.

Temporary closure of parts of the preserve may be necessary when fire could endanger visitor and employee safety. Every effort will be made to inform the general public of the situation and evacuate the area, if necessary. If a fire threatens to escape park boundaries, adjacent authorities and landowners will be given as much advance warning as possible so that they may take appropriate action.

Every prescribed fire plan will outline safety measures. Actions will be taken as needed to ensure public safety, including contacting preserve neighbors with as much advance notice as possible; closing portions of the preserve as appropriate; ensuring that areas to be ignited are cleared of all visitors prior to ignition; posting signs at each trailhead, roads and other points of public access warning hikers when a prescribed fire is in progress; and posting warning signs on roads if smoke creates a safety hazard. Roads will be closed if visibility is significantly impaired.

9.0 PUBLIC INFORMATION AND EDUCATION

9.1 Public Information Capabilities and Needs

An informed public can provide support for the fire management program at the preserve and aid in fostering its goals. A concerted effort will be made to raise public awareness of fire concerns, including fire prevention messages. Fire management messages will be introduced into interpretive programs as appropriate. The preserve may participate in fire prevention and education activities in the community in conjunction with neighboring fire departments. Local media will be informed of fire prevention and education concerns through news releases. Media access to fire scenes will be facilitated when it is safe to do so. When interest is warranted, a staff member will be designated as the contact person for all information requests.

9.2 Step-Up Public Information Activities and Capabilities

The step-up staffing plan for the preserve is described in section 4.2.2.5 of this plan. Five categories of fire danger, ranging from low to extreme, have been identified along with the proper actions to be taken as fire danger escalates. The step-up plan is based on the fire danger rating from the Bryceville Office of the Florida Division of Forestry. The current rating (low, moderate, high, very high or extreme) will be obtained via a telephone call to the Florida Division of Forestry office at (904) 266-5003.

Fire danger indices will be publicized when they are high or extreme, and ongoing fires will be carefully explained. Visitors will be made aware of fire restrictions and closures in and around the preserve. High fire danger notices will be posted at the visitor center.

10.0 PROTECTION OF SENSITIVE RESOURCES

10.1 Archeological/Cultural/Historic Resources

The potential impact of fire and fire management activities on cultural resources is very important at the preserve. Although 192 archeological sites at the preserve are listed in the Archeological Sites Management Information System, it is likely that twice that many still remain undiscovered. Any time the soil is disturbed at the preserve, there is the possibility that an unknown site will be impacted. All unrecorded sites that are discovered during fire activities will be protected and recorded.

Three major factors determine the extent of fire damage to archeological sites: fire intensity, duration of heat, and heat penetration into the soil (Traylor et al. 1979). The most important variable influencing fire intensity is fuel load. Decades of fire exclusion at the preserve have resulted in excessively high fuel loads in some areas. The potential for a wildland fire of high intensity poses a distinct threat to the preserve's cultural resources. The use of low-intensity prescribed fire to reduce dangerous fuel loads is discussed in *RM-18*, chapter 5.

Virtually all surface artifacts will be scorched and smoke-blackened by fire. A majority of sites at the preserve are shell, which may fracture or disintegrate. Chipped stone items can splinter or chip. Small lead and glass items may fuse or melt. The structure of larger stone artifacts is generally not affected (Seabloom et al. 1991).

Overall, damage to organic cultural material begins at about 300 degrees C (Lissoway and Propper 1989). Specific studies have shown that surface artifacts such as bone becomes charred at 400 degrees C, organic paint burns off of prehistoric pottery at 350 degrees C, and pottery undergoes structural alteration at temperatures exceeding 600 degrees C (Lissoway 1989). Inorganic material, which is less vulnerable, can be exposed to temperatures of 400-500 degrees for up to one-half hour without undergoing severe alteration.

In contrast to surface artifacts, objects buried 5 centimeters or more below ground are generally unaffected by fire. An exception would be objects buried in proximity to burning roots, which can reach temperatures as high as 1500 degrees C (Traylor et al. 1979).

There are several indirect effects of fire that can also impact archeological sites. A particularly intense fire can denude the soil, leading to severe erosion and uprooting of trees killed by the fire that can fracture or displace artifacts (Lissoway and Propper 1989). Conversely, a beneficial by-product of lower-intensity fire can be the removal of thick vegetation, which hinders the detection of unrecorded archeological sites.

Significantly, the greatest damage inflicted on cultural sites is *not* the result of fire itself but of fire suppression activities. Fire retardants may have a corrosive effect on cultural materials, although this requires further study (Lissoway and Propper 1989). Mechanized equipment activity, hand line construction, helispot clearing, mop-up activity and even rehabilitation can cut deep into the soil, damaging and displacing artifacts. In addition, fire crews that have not been briefed on the importance of archeological sites tend to collect surface artifacts. The impact of fire suppression and rehabilitation activities can be significantly reduced with proper foresight and planning. Minimum impact suppression and rehabilitation guidelines can be found in *RM-18*, chapter 9, exhibit 5.

In conjunction with the Southeast Regional Fire Management Office, the Southeast Archeological Center is developing a matrix for cultural resources in the Southeast Region. This matrix will identify values and risks typically associated with different types of archeological sites found in the Southeast, and will provide guidance as to how different fire management activities can be tailored to minimize or mitigate any deleterious effects to the resources potentially at risk.

10.2 Natural Resources

An previous inventory of plants did not find any federally- or state-listed species that would be impacted by prescribed fire at the Cedar Point prescribed burn unit. Those

species of plants (listed or rare) that require early successional stages are generally not found at the preserve due to long-term fire exclusion.

Several federally- and/or state-listed faunal species exist within preserve boundaries, as earlier identified in section 3.4.1.7. While there are no known wood stork roosting/nesting areas, these birds will perch on trees and feed in the salt marsh areas.

The indigo snake probably occurs in upland habitats, and a prescribed fire program will increase habitat for this species. Indigo snakes may be directly impacted by mechanical fuel reduction actions and by fire. The preserve will institute “Standard Protection Measures for the Eastern Indigo Snake” (Appendix D) as they apply to land management activities to reduce impacts to this species.

Bald eagles are known to nest near the preserve and prior to any prescribed fires, areas within and immediately adjacent to the proposed burn unit will be surveyed for eagle nests. The preserve will consult with neighboring land managers to determine if any bald eagle nest may be impacted by smoke.

Several listed aquatic/marine species (shortnose sturgeon, manatee and five species of marine turtles) are known to inhabit the waters of the preserve, but the fire management program should have no effect on these species.

If the proposed activities have the potential to impact known or potential habitat for federally-listed species, preserve staff will consult with the U.S. Fish and Wildlife Service to implement the appropriate protection measures. This may include formal or informal consultation and implementation of mitigation measures as needed.

10.3 Development/Infrastructure

Accepted interagency wildland urban interface fire risk mitigation techniques should be applied to prevent or reduce negative impacts to development, improvements, structures, and other identified values at risk. These techniques may include, but are not limited to, hazard fuels removal, improvement of fire engine accessibility, and removal or replacement of burnable materials on or near structures.

11.0 FIRE CRITIQUES AND ANNUAL PLAN REVIEW

11.1 Critiques

All fires at the preserve will receive, at minimum, a review by those involved to evaluate such topics as: the initial response, “hotline” (ongoing fire incident) review, control methods used, safety concerns, and the need for new and replacement equipment. The incident commander, prescribed fire burn boss, preserve FMO, or the official who has designated fire program responsibilities, will conduct this review. The purpose of this review is to recognize and document actions that were successful, and to identify and rectify actions that were unsafe or ineffective.

The superintendent will conduct closeout meetings with incident management teams to ensure a successful transition of incident command back to preserve staff, and to identify and evaluate incomplete fire business. Refer to *RM-18*, chapter 13, exhibit 1 for a sample incident management team closeout.

A regional or national level fire review may be conducted if the fire:

- ❑ Crossed the preserve boundary into another jurisdiction without the approval of landowner or agency;
- ❑ Resulted in adverse media attention;
- ❑ Involved serious injury or death, significant property damage, or had the potential to do so; or,
- ❑ Resulted in controversy involving another agency or landowner.

Refer to *RM-18*, chapter 13, exhibits 2 and 3 for critique format and questions.

All entrapments and fire shelter deployments will be reported and investigated as soon as possible after the incident. Refer to *RM-18*, chapter 13, exhibit 4 and 5 for review directions and a written outline format.

11.2 Annual Plan Review

An informal fire management program review will be conducted annually to evaluate current procedures and identify any needed changes to the FMP. A formal fire management review will be conducted every five years. The preserve superintendent must approve significant changes to the body of this plan. The only exceptions to this procedure will include: grammatical corrections, minor procedural changes, deletions, corrections, and additions to the appendices. Copies of all changes will be forwarded to the Southeast Regional Office FMO. Changes requiring approval and concurrence will be submitted with a replacement cover sheet for signature.

12.0 CONSULTATION AND COORDINATION

Agencies Consulted

- ❑ City of Jacksonville Regulatory and Environmental Services
- ❑ Florida Department of Agriculture and Consumer Services, Division of Forestry
- ❑ St. Johns River Water Management District
- ❑ The Nature Conservancy
- ❑ U.S. Fish and Wildlife Service, Okefenokee National Wildlife Refuge
- ❑ Wildland Fire Associates

Persons Consulted

- ❑ Shauna Ray Allen, Timucuan Ecological and Historic Preserve, National Park Service, Jacksonville, FL

- ❑ Elizabeth Anderson, Wildland Fire Associates, Lakewood, CO
- ❑ Geoff Babb, The Nature Conservancy, Orlando, FL
- ❑ William Bossuot, St. Johns River Water Management District, Palatka, FL
- ❑ Roger Clark, Timucuan Ecological and Historic Preserve, National Park Service, Jacksonville, FL
- ❑ Ken Garvin, Southeast Regional Office Fire Management Officer, National Park Service, Atlanta, GA
- ❑ Gina Hernandez, Everglades National Park, Homestead, FL
- ❑ Bruce Hill, Florida Department of Agriculture and Consumer Services, Division of Forestry, Jacksonville, FL
- ❑ Ken King, City of Jacksonville Regulatory and Environmental Services, Jacksonville, FL
- ❑ John Lissoway, Wildland Fire Associates, Los Alamos, NM
- ❑ Jim Murrian, The Nature Conservancy, Orlando, FL
- ❑ Steven Miller, St. Johns River Water Management District, Palatka, FL
- ❑ Caroline Noble, National Park Service, Southeast Regional Office (duty station at Tall Timber Research Station, Tallahassee, FL
- ❑ Dan O'Brien, Wildland Fire Associates, Central Point, OR
- ❑ Robin Toole, National Park Service, Southeast Regional Office, Atlanta, GA
- ❑ Douglas Wallner, Prescribed Fire Specialist, Eastern U.S. National Park Service, Philadelphia, PA
- ❑ Kevin Walsh, Southeast Regional Office, Atlanta, GA
- ❑ Fred Wetzel, U.S. Fish and Wildlife Service, Okefenokee National Wildlife Refuge, GA
- ❑ John Whitehurst, Timucuan Ecological and Historic Preserve, National Park Service, Jacksonville, FL

Appendix A: References Consulted or Cited

Abrahamson, W.G. 1984a. Post-Fire Recovery of Florida Lake Wales Ridge Vegetation. *American Journal of Botany*. 71:9-21

Abrahamson, W.G. 1984b. Species Responses to Fire on the Florida Lake Wells Ridge. *American Journal of Botany*. 71:35-43.

Ahlgren, I.F. 1974. The Effects of Fire on Soil Organisms. p. 47-72, *in* T.T. Kozlowski and C.E. Ahlgren (eds.), *Fire and Ecosystems*. Academic Press, NY. 542 p.

Alexander, T.R. 1967. A Tropical Hammock on the Miami (Florida) Limestone—A Twenty-Five Year Study. *Ecology* 48:863-867.

Anderson, H.E. 1982. Aids to Determining Fuel Models for Estimating Fire Behavior. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Intermountain Experiment Station, Gen. Tech. Rep. INT-122.

Andrews, Patricia. 1986. BEHAVE: Fire Behavior Prediction and Fuel Modeling System. Intermountain Research Station, Ogden, UT. Gen. Tech. Rep. INT-194.

Austin, D.F., K.C. Marcois, and D.R. Richardson. 1977. Vegetation of Southeastern Florida II-V. *Florida Sci.* 40:331-361.

Babbitt, L. H., and C. H. Babbitt. 1951. A Herpetological Study of Burned-Over Areas in Dade County, Florida. *Copeia* 1951:79.

Bendell, J. F. 1974. Effects of Fire in Birds and Mammals. p. 73-138, *in* T. T. Kozlowski and C. E. Ahlgren (eds.), *Fire and Ecosystems*. Academic Press, New York. 542 p.

Bennett, C.E. 1975. Three Voyages of Rene Launonniere (trans.). University Presses of Florida. 232 pp.

Breining, D. R., P. A. Schmalzer, D. A. Rydene and C. R. Hinkle. 1988. Burrow and Habitat Relationships of the Tortoise in Coastal Scrub and Slash Pine Flatwoods on Merritt Island, Florida. Florida Game and Fresh Water Fish Commission. Nongame Wildlife. Program Final Rep. 238 p.

Bradshaw, Larry. 2002. Fire Family Plus version 3.0.1.0. Rocky Mountain Research Station Fire Sciences Lab.

Burton, G.W. and R.H. Hughes. 1961. Effects of Burning and 2, 4, 5-T on Gallberry and Saw Palmetto. *Journal of Forestry* 59:497-500.

Christiansen, N.L. 1978. Fire Regimes in Southeastern Ecosystems. p. 112-136, *in* Proc. Fire Regimes and Ecosystem Properties Conf. USDA Forest Service Gen. Tech. Report WO-26. Honolulu, HI. 594 p.

Crocker, T.C., Jr. 1968. Ecology of an Ideal Forest Community in the Longleaf Pine Region. p. 73-90, *in* N.E. Linnartz (ed.), The Ecology of Southern Forests. 17th Annual Forestry Symposium. Louisiana State University Press, Baton Rouge. 203 p.

Davison, K.L. 1984. Vegetation Response and Regrowth after Fire on Cumberland Island National Seashore, Georgia. U.S. Department of the Interior, National Park Service, Resource Management Report SER-69. 121 p.

Davison, K. L. 1986. Vegetation Responses to Fire on Cape Hatteras National Seashore, North Carolina. National Park Service Cooperative Park Studies Unit. Technical Report 25. Institute of Ecology, University of Georgia, Athens, GA. 26 p.

Davison, K.L. and S.P. Bratton. 1986. The Vegetation History of Canaveral National Seashore, Florida. National Park Service Cooperative Park Studies Unit Technical Report 22. Institute of Ecology, University of Georgia, Athens. 75 p.

Davison, K. L. and S. P. Bratton. 1988. Vegetation Response and Regrowth After Fire on Cumberland Island National Seashore, Georgia. *Castanea* 53:47-65.

Debano, L. F., P. H. Dunn and C.E. Conrad. 1977. Fire's Effects on Physical and Chemical Properties of Chaparral Soils *in* Proceedings of Environmental Consequences of Fire and Fuels Management in Mediterranean Ecosystems Symposium, U.S. Department of Agriculture, Forest Service. Gen. Tech. Rep. WO-3.

Deeming, John E., Robert E. Burgan, and Jack D. Cohen. 1978. The National Fire Danger Rating System. U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station, Gen. Tech. Rep. INT-39.

Dickson, J. G. 1981. Effects of Forest Burning on Songbirds. p. 67-72, *in* G. W. Wood (ed.), Proceedings of Prescribed Fire and Wildlife in Southern Forests Symposium. Clemson University, Georgetown, SC. 170 p.

Dobyns, H.F. 1983. Their Numbers Became Thinned: Native American Population Dynamics in Eastern North America. Knoxville, TN: University of Tennessee Press. 378 p.

Doolittle, W.E. 1992. Agriculture in North America at the Time of Contact: A Reassessment. *Annals of the Association of American Geographers*. Vol. 82, No. 3.

Eastern Space and Missile Center. 1989. Weather Meteorological Handbook ESMC pamphlet 105-1. Department of the Air Force, Eastern Space and Missile Center, Patrick Air Force Base, FL.

Edmisten, J. A. 1963. The Ecology of the Florida Pine Flatwoods. Ph.D. Dissertation.

University of Florida, Gainesville, FL. 117 p.

Emlen, J. T. 1970. Habitat Selection by Birds Following a Forest Fire. *Ecology* 51:343-345.

Frost, Cecil C. 1998. Presettlement Fire Frequency Regimes of the United States: A First Approximation. In Teresa L. Pruden and Leonard A. Brennan (eds.). *Fire in Ecosystem Management: Shifting the Paradigm from Suppression to Prescription*. Tall Timbers Fire Ecology Conference Proceedings, No. 20. Tall Timbers Research Station, Tallahassee, FL.

Garren, K. H. 1943. Effects of Fire on Vegetation of the Southeastern United States. *Botanical Review* 9:617-654.

General Authorities Act of 1970. 16 U.S.C. §§1a-1 et seq., Public Law No. 91-383.

Gholtz, H. L. and R. F. Fisher. 1984. The Limits to Productivity: Fertilization and Nutrient Cycling in Coastal Plain Slash Pine Forests in "Forest Soils and Treatment Impacts" (E.L. Stone, ed.). *Proceedings of North American Soils Conference*, 6th, University of Tennessee, Knoxville. p. 105-120.

Heyward, F. D., and R. M. Barnette. 1936. Field characteristics and Partial Chemical Analysis of the Humus Layer of Longleaf Pine Forest Soils. Florida. Agriculture Experiment Station in Bulletin 302, 27 p.

Hill, E. P. 1981. Prescribed Fire and Rabbits in Southern Forests. pp. 103-108. in G. W. Wood (ed.). *Prescribed Fire and Wildlife in Southern Forests*. *Proceedings of a Symposium*. The Belle W. Baruch Forest Science Institute, Clemson University, South Carolina.

Hilmon, J. B. 1968. Autecology of Saw Palmetto (*Serenoa repens* [Bartr.] Small). Ph.D. Dissertation. Department of Botany, Duke University, Durham, N.C. 190 p.

Hofstetter, R. H. 1973. Appendix K. Part 1. Effects of Fire in the Ecosystem: An Ecological Study of the Effects of Fire on the Wet Prairie, Saw Grass Glades, and Pineland Communities of South Florida. Final Report. Mimeo. Rep. (EVER-N-48). U.S. Department of the Interior, National Park Service, NTIS No. PB-231940. 156 p.

Johansen, R., J. Deming, M. Long, and D. Ward. 1985. Chapter II, Smoke Production Characteristics and Effects in Prescribed Fire Smoke Management Guide. National Coordinating Group. Boise Interagency Fire Center. Boise, ID. p. 5-10.

Klukas, R. W. 1973. Control Burn Activities in Everglades National Park. *Proceedings Tall Timbers Fire Ecology Conference*. Tall Timbers Resource Station, Tallahassee, FL. 12:397-425.

Landers, J. L. and D. W. Speake. 1980. Management Needs of Sandhill Reptiles in Southern Georgia. Proceedings of the Annual Conference, Southeast Association of Fish and Wildlife Agencies 34:515-529.

Lawrence, G. E. 1966. Ecology of Vertebrate Animals in Relation to Chaparral Fire in the Sierra Nevada Foothills. Ecology 47:278-291.

Layne, J. N. 1974. Ecology of Small Mammals in a Flatwoods Habitat in North-Central Florida with Emphasis on the Cotton Rat (*Sigmodon hispidus*). American Museum Novitates 2544:148.

Lee, D. S. 1974. The Possible Role of Fire on Population Density of the Florida Scrub Lizard *Sceloporus woodi* (Stejneger). Bulletin Maryland Herpetological Society. 10:20-22.

Levine, J.S., W.R. Cofer III, D.I. Sebachner, R.P. Rhinehart, E.L. Winstead, S. Sebachner, C.R. Hinkle, P.A. Schmalzer, and A.M. Koller, Jr. 1990. The Effects of Fire on Biogenic Emissions of Methane and Nitric Oxide from Wetlands. Journal of Geophysical Research 95: 1853-1864.

Lillywhite, H. B. 1977a. Animal Responses to Fire and Fuel Management in Chaparral. *In*: Proceedings Symposium Environmental Consequences of Fire and Fuel Management in Mediterranean Ecosystems. U.S. Department of Agriculture, Forest Service, Gen. Tech. Rep. WO-3.

Lillywhite, H. B. 1977b. Effects of Chaparral Conversion on Small Vertebrates in Southern California. Biological Conservation 11:171-184.

Lillywhite, H. B., and F. North. 1974. Perching Behavior of *Sceloporus occidentalis* and *S. graciosus* (Lacertilia, Iguanidae). Herpetologica 26:51-56.

Lissoway, J.D. 1989. Application of Fire Science; Management Considerations - Cultural Resources. Unpublished Manuscript. Presented at Introduction to National Park Service Fire Management for Natural Resource Management Trainees. Boise Interagency Fire Center Boise, Idaho. Feb 1989.

Lissoway, J. D. and J. Propper. 1989. Effects of Fire on Cultural Resources. Unpublished manuscript on file, U.S. Department of the Interior, National Park Service, Bandelier National Monument, NM.

Loveless, C. M. 1959. The Everglades Deer Herd Life History and Management. Florida Game and Freshwater Fish Commission. Technical Bulletin, Tallahassee, FL. 104 p.
Loveless, C. M., and F. J. Ligas. 1959. Range Conditions, Life History and Food Habits of the Everglades Deer Herd. Transcript 24th North American Wildlife Conference. p. 201-215.

Means, D. B., and H. W. Campbell. 1981. Effects of Prescribed Burning in Amphibians and

Reptiles. pp. 89-97. *In* G. W. Wood (ed.), Proceedings of Prescribed Fire and Wildlife in Southern Forests Symposium. Clemson University, Georgetown, SC. 170 p.

Mushinsky, H. R. 1985. Fire and the Florida Sandhill Herpetofaunal Community: With Special Attention to Responses of *Cnemidophorus sexlineatus*. *Herpetologica* 41:333-342.

Myers, R. L. and J. J. Ewel (eds) 1990. Ecosystems of Florida. University of Central Florida Press, Orlando, FL. 765 p.

National Park Service Organic Act of 1916. 16 U.S.C. §§1-18f, 39 Statute F35.

National Park Service, U.S. Department of Agriculture Forest Service, Bureau of Indian Affairs, U.S. Fish and Wildlife, and Bureau of Land Management. 1998. Wildland and Prescribed Fire Management Policy: Implementation Procedures Reference Guide.

National Wildfire Coordinating Group Fireline Handbook, Appendix B, Fire Behavior. 1993. National Interagency Fire Center, Boise, ID.

Olson, S.D. 1996. The Historical Occurrence of Fire in the Central Hardwoods, with Emphasis on Southcentral Indiana. *Natural Areas Journal*. 16: 248-256.

Redwoods Act of 1978. 16 U.S.C. §§1, 1a-1, Public Law No. 95-250.

Robertson, W. B., Jr. 1953. A survey of the Effects of Fire in Everglades National Park. Mimeo. report. U.S. Department of the Interior, National Park Service. 169 p.

Robertson, W. B., Jr. 1955. Populations Ph.D. Thesis. An analysis of the Breeding Bird of Tropical Florida in Relation to the Vegetation. University of Illinois. Urbana, IL. 599 p.

Robertson, W. B., Jr., and J. A. Kushlan. 1974. The Southern Florida Avifauna. *In* Environments of South Florida: Present and Past. Patrick J. Gleason, compiler and ed. pp. 414-452. Mem. 2. Miami Geologic Society, Miami, FL.

Sandberg, D.V. and F.N. Dost. 1990. Effects of Prescribed Fire on Air Quality and Human Health. *In* Natural and Prescribed Fire in Pacific Northwest Forests, J.D. Walstad, S.R. Radosevich and D.V. Sandberg (ed.). Oregon State University Press. Corvallis, OR. p. 191-218.

Schmalzer, P. A. and C. R. Hinkle. 1987. Effects of Fire on Composition, Biomass and Nutrients in Oak Scrub Vegetation on John F. Kennedy Space Center, Florida. NASA Technical Memorandum.

Schmalzer, P. A., C. R. Hinkle, and J. L. Mailander. 1991. Changes in Species Composition and Biomass in *Juncus roemerianus* and *Spartina bakeri* Marshes One Year after Fire. *In* Wetlands 11:67-86.

Seabloom, R. W., R. D. Sayler and S. A. Ahler. 1991. Effects of Prairie Fire on Archeological Artifacts. Park Science, Vol II, No 1, p. 1-3.

Secretaries of Agriculture and the Interior, Western Governor's Association, National Association of State Foresters, National Association of Counties, and the Intertribal Timber Council. 2001. A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: A 10-Year Comprehensive Strategy.

Sharkey, Brian, ed. 1997. Health Hazards of Smoke: Recommendations of the April 1997 Consensus Conference. Technical Report 9751-2836-MTDC. USDA Forest Service. Missoula Technology and Development Center. Missoula, MT.

Simon, D. M. 1986. Fire effects in Coastal Habitats of East Central Florida. NPS-CPSU Technical Report 27. University of Georgia, Athens, GA. 140 p.

Smith, C. R. 1982. Food Resource Partitioning of Fossorial Florida Reptiles. pp. 173-178. *In* N.J. Scott, Jr. (ed). Herpetological Service. Wildlife Research Report 13.

Speake, D. W., J. A. McGlinchey, and T. A. Colvin. 1978. Ecology and Management of the Eastern Indigo Snake in Georgia: A Progress Report. pp. 64-73. *In*: R.R. Odum and L. Landers (ed). Proceedings and Rare and Endangered Wildlife Symposium, Georgia Dept. Natural Resources Game and Fish Division Tech. Bull. WL4.

Spurr, S. H., and B. V. Barnes. 1980. Forest ecology. John Wiley and Sons, Inc., New York. 687 p.

Stransky, J. J. and R. F. Harlow. 1981. Effects of Fire on Deer Habitat in the Southeast. pp. 135-142. *In* G. W. Wood (ed.). Prescribed Fire and Wildlife in Southern Forests. Proceedings of a Symposium. The Belle W. Baruch Forest Science Institute. Clemson University, SC.

Traylor, D. L. 1981. Effects of Prescribed Fire on Small Mammals in the Southeastern United States. pp. 109-120. *In* G. W. Wood (ed). Prescribed Fire and Wildlife in Southern Forests. Proceedings of a Symposium. The Belle W. Baruch Forest Science Institute, Clemson University, SC.

Traylor, D. L. Hubbell, N. Wood, B. Fiedler. 1979. Investigations of Fire and Fire Suppression on Cultural Resources in Bandelier National Monument. Manuscript on file, U.S. Department of the Interior, National Park Service, Bandelier Monument. 173 p.

U.S. Department of Agriculture, Forest Service. 1993. Minimum Impact Suppression Tactics. Northern Region.

U.S. Department of Agriculture, Forest Service. 2000. Managing the Impact of Wildfires on Communities and the Environment, and Protecting People and Sustaining Resources in Fire-Adapted Ecosystems—A Cohesive Strategy. The Forest Service Management Response to the General Accounting Office Report GAO/RCED-99-65.

U.S. Department of Agriculture, Forest Service. 2000. Wildland Fire in Ecosystems: Effects of Fire on Flora. Gen. Tech. Report RMRS-GTR-42-volume 2. Fort Collins, CO: Rocky Mountain Research Station.

U.S. Department of Agriculture, Forest Service. 2002. Southern Forest Resource Assessment – Summary Report. GTR-SRS-53. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 103 p.

U.S. Department of the Interior, Fish and Wildlife Service. 1995. Fire Management Plan. Merritt Island National Wildlife Refuge, Florida.

U.S. Department of the Interior, National Park Service. 1996. Final General Management Plan/Development Concept Plans/Environmental Impact Statement and Environmental Assessment, Timucuan Ecological and Historic Preserve.

U.S. Department of the Interior, National Park Service. 1997. Resource Management Plan, Timucuan Ecological and Historic Preserve.

U.S. Department of the Interior, National Park Service. 1998. Director's Order #18: Wildland Fire Management.

U.S. Department of the Interior, National Park Service. 2001. Management Policies.

U.S. Department of the Interior, National Park Service. 2001. Wildland Fire Management Reference Manual-18.

U.S. Department of the Interior, U.S. Department of Agriculture. 1995. Federal Wildland Fire Management Policy and Program Review. Final Report—December 18, 1995.

U.S. Department of the Interior (Bureau of Land Management, National Park Service, U.S. Fish and Wildlife Service, Bureau of Indian Affairs, Geologic Survey, Bureau of Reclamation), U.S. Department of Agriculture Forest Service, Department of Energy, Department of Defense, Department of Commerce (National Oceanic and Atmospheric Administration/National Weather Service), U.S. Environmental Protection Agency, Federal Emergency Management Agency, National Association of State Foresters. 2001. Review and Update of the 1995 Federal Wildland Fire Management Policy.

Van Lear, D.H., and T.A. Waldrop. 1989. History, Uses, and Effects of Fire in the

Appalachians. Gen. Tech. Rep. SE-54. U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. Asheville, NC.

Wade, D. 1988. A Guide for Prescribed Fires in Southern Forests. U.S. Department of Agriculture, Forest Service, Southern Region. Technical Publication R8-TP 11. 56 p.

Wade, D., J. Ewel, and R. Hofstetter. 1980. Fire in South Florida Ecosystems. U.S. Department of Agriculture, Forest Service. Gen. Tech. Report. SE-17. 125 p.

Wells, C. G., R. E. Campbell, L. F. Debano, C. E. Lewis, R. L. Fredrickson, E. C. Franklin, R. C. Froelich and P. H. Dunn. 1978. Effects of Fire on Soil: A State-of-Knowledge Review. U.S. Department of Agriculture, Forest Service Gen. Tech. Report WO-7. 34 p.

Werner, H. W. 1978. The Effect of Fire Type along a Relative Humidity Gradient in a Rockland Pine Forest. Mimeo. Report. U.S. Department of the Interior, Everglades National Park, Homestead, FL. 31 p.

Appendix B: Definitions of Terms, as they Pertain to Fire Management

Appropriate Management Response: Specific actions taken in response to a wildland fire to implement protection and fire use objectives. This term is a new term that does not replace any previously used term.

Behave Plus: A system of interactive computer programs for modeling fuels and fire behavior.

Burning Period: A 24-hour period beginning at 10:00 a.m. and ending at 10:00 a.m. the following day.

Chain: Unit of measure used in land survey equal to 66 feet. Commonly used to report fire perimeters and rates of spread.

Confinement: The restriction of a wildland fire within specific boundaries identified prior to or during the fire event. The boundaries, which are natural or human-made barriers, serve to confine the fire. Direct and/or indirect attack methods can be taken to hold the fire at the barriers, including backfiring, cold trailing, use of hose lays, and patrolling or mopping up the fire perimeter.

Cultural Resource: Any physical evidence of past human activity used to reconstruct human history and prehistory.

Direct Attack: Any treatment applied directly to burning fuel such as wetting, smothering, or chemically quenching the fire or by physically separating the burning from unburned fuel.

Ecosystem: An interacting system of interdependent organisms and the physical set of conditions upon which they are dependent and by which they are influenced.

Extended Attack: Occurs when a wildland fire cannot be controlled through initial attack and requires more than two operational periods to be controlled, and/or when the appropriate management response has not been successful. Extended attack implies that the complexity level of the incident will increase beyond the capabilities of initial attack incident command.

Fire-Dependent or Fire-Maintained Ecosystem: An ecosystem in which periodic fire is essential to the functioning of the system.

Fire Management Plan (FMP): A strategic plan that defines a program to manage wildland and prescribed fires and documents the Fire Management Program in the approved land use plan. The plan is supplemented by operational plans such as preparedness plans, preplanned dispatch plans, prescribed fire plans and prevention plans.

Fire Management Unit (FMU): Any land management area definable by objectives, topographic features, access, values to be protected, political boundaries, fuel types, major fire regimes, etc. that set it apart from management characteristics of an adjacent unit.

Fire Monitoring: The act of observing a fire to obtain information about its environment, behavior, and effects in order to evaluate the fire and its prescription.

Fire Regime: The pattern of fire in an area as determined by its systematic interaction with the biotic and physical environment. It includes the timing, number, spatial distribution, size, duration, behavior, return interval, and effects of natural fires.

Fire Weather: Weather conditions that affect fire ignition, behavior, and suppression.

Fuel: All combustible material, including grasses, dead branches and pine needles on the ground, standing live and dead trees, flammable minerals near the surface (e.g. coal) and human-built structures. Fuels are generally divided into four size classes based on their ability to ignite:

- ❑ 1 - hour time lag - $< \frac{1}{4}$ " diameter (grass, litter, duff)
- ❑ 10 - hour time lag - $\frac{1}{4}$ " to 1" diameter (twigs, small stems)
- ❑ 100 - hour time lag - 1" to 3" diameter (branches)
- ❑ 1000 - hour time lag - > 3 " diameter (large branches and stems)

Fuel Model: A simulated fuel complex for which all fuel descriptors required for the solution of a mathematical rate of spread model have been specified.

Fuel Loading: Amount of dead and live fuel present on a particular site at a given time.

Hazard Fuels: Large or abnormal fuel concentrations that form a special threat of ignition and resistance to control.

Holding Actions: Planned actions required to achieve wildland and prescribed fire management objectives. For prescribed fires, these actions are developed to restrict the fire inside the planned burn unit. For suppression actions, holding actions may be implemented to prohibit the fire from crossing containment boundaries. These actions may be implemented as firelines are established to limit the spread of fire.

Ignition Specialist: A person trained and experienced in ignition methods and equipment.

Incident Commander (IC): Person responsible for incident activities including the development and implementation of strategic decisions, and for approving, ordering and releasing resources.

Indirect Attack: A method of suppression in which the control line is located some considerable distance away from the fire's active edge. Generally done in the case of a fast-spreading or high-intensity fire and to utilize natural or constructed firebreaks or fuel breaks and favorable breaks in the topography. The intervening fuel is usually backfired; but occasionally the main fire is allowed to burn to the line, depending on conditions.

Initial Attack: The actions taken by the first resources to arrive at a wildland fire to protect lives and property, and prevent further extension of the fire.

Mixing Height: Height a column of smoke will rise in the atmosphere.

Mop-Up: Extinguishing or removing burning material near control lines to make the area safe or to reduce residual smoke.

National Fire Danger Rating System (NFDRS): A set of computer programs and algorithms that allow a unit to estimate fire danger, based on an evaluation of the upper limit of predicted fire behavior.

Normal Fire Year: The normal fire year for suppressed wildland fires is the year with the third highest number of wildland fires in the past ten years of record. The normal wildland fire managed for resource benefits year is the year with the third highest number of acres burned by wildland fire managed for resource benefits in the past ten years of record.

Pine Plantation: An area where pine trees have been planted in rows, usually slash pine, to maximize the production of wood fiber.

Preparedness: Activities that lead to a safe, efficient, and cost-effective fire management program in support of land and resource management objectives through appropriate planning and coordination.

Prescribed Fire: A management-ignited wildland fire that burns under specified conditions of weather, fuel moisture, soil moisture, etc., that allow confinement of the fire to a predetermined area, and at the same time produce the fire behavior and fire characteristics required to accomplish planned management objectives.

Prescribed Fire Plan: A plan required for each fire application ignited by managers. It must be prepared by qualified personnel and approved by the appropriate agency administrator prior to implementation. Each plan will follow specific agency direction and must include critical elements described in agency manuals. Formats for plan development vary among agencies, although content is the same.

Prescription: Measurable criteria, which define conditions under which a prescribed fire may be ignited, guide selection of appropriate management responses, and indicate other required actions. Prescription criteria may include safety, economic, public health, environmental, geographic, administrative, social or legal considerations.

Rate of Spread: The relative activity of a fire extending its horizontal dimensions, expressed as rate of increase in perimeter, rate of increase in area, or rate of advance of its flaming front. Generally expressed in chains per hour.

Suppression: All actions intended to extinguish or limit the growth of a fire, regardless of the strategies or tactics chosen.

Unplanned Ignition: A wildland fire not ignited by management actions.

Values: Areas where losses from wildland fire are unacceptable, such as archeological sites, developments, endangered species, adjacent land, etc.

Wildland Fire: Any non-structural fire, other than prescribed fire, that occurs in the wildland. This term encompasses fires previously called both wildfires and prescribed natural fires.

Wildland Fire Implementation Plan (WFIP): A progressively developed assessment and operational management plan that documents the analysis and selection of strategies and describes the appropriate management response for a wildland fire. A full WFIP consists of three stages. Different levels of completion may occur for differing management strategies (i.e., fires managed for resource benefits will have two-three stages of the WFIP completed, while some fires that receive a suppression response may only have a portion of stage I completed.)

Wildland Fire Management: All activities related to the prevention, preparedness, suppression of fire burning through vegetation.

Wildland Fire Management Program: The full range of activities and functions necessary for planning, preparedness, emergency suppression operations, and emergency rehabilitation of wildland fires, and prescribed fire operations, including non-activity fuels management to reduce risks to public safety and to restore and sustain ecosystem health.

Wildland fire situation analysis (WFSA): A systematic decision-making process that evaluates alternative management strategies to determine the most appropriate management strategy for a particular situation. Reasonable management alternatives are identified, analyzed and evaluated, consistent with the expected probability of success/consequences of failure. Evaluation criteria include firefighter and public safety, anticipated costs, resource impacts, and environmental, social and political considerations. From the management alternatives, a preferred alternative is selected, and the decision documented. The evaluation must clearly identify the point at which failure of the alternative is imminent. This becomes the triggering mechanism for re-evaluation of the WFSA, at which point the WFSA is amended or a new WFSA is completed to develop new alternatives.

Wildland Fire Suppression: An appropriate management response to wildland fire that results in curtailment of fire spread and eliminates all identified threats from the particular fire. All wildland fire suppression activities provide for firefighter and public safety as the highest consideration, but minimize loss of resource values, economic expenditures, and/or the use of critical firefighting resources.

Wildland Fire Use: The permitting of a naturally-ignited fire to burn under specific, predetermined environmental conditions, in pre-designated areas, in order to achieve defined resource management objectives.

Appendix C: Preserve Species Lists

Appendix D: Standard Protection Measures for the Eastern Indigo Snake

1. An eastern indigo snake protection/education plan shall be developed by the NPS for staff and contractor personnel to follow. The educational materials for the plan may consist of a combination of posters, videos, pamphlets, and lectures (e.g., an observer trained to identify eastern indigo snakes could use the protection/education plan to instruct construction personnel before any land clearing or mowing activities occur). Educational/identification information will be provided to all employees (but NPS and contractor) and contain the following information:
 - a. A description of the eastern indigo snake, its habits, and protection under Federal Law;
 - b. Instructions not to injure, harm, harass or kill this species;
 - c. Directions to cease clearing activities and allow the eastern indigo snake sufficient time to move away from the site on its own before resuming clearing; and,
 - d. Telephone numbers of pertinent agencies to be contacted if a dead eastern indigo snake is encountered. The dead specimen should be thoroughly soaked in water, then frozen.
2. Only an individual who has been either authorized by a section 10(a)(1)(A) permit issued by the Service, or designated as an agent of the State of Florida by the Florida Fish and Wildlife Conservation Commission for such activities, is permitted to come in contact with or relocate an eastern indigo snake.
3. If necessary, eastern indigo snakes shall be held in captivity only long enough to transport them to a release site; at no time shall two snakes be kept in the same container during transportation.
4. An eastern indigo snake monitoring report must be submitted to the appropriate Florida Field Office within 60 days of the conclusion of clearing phases. The report should be submitted whether or not eastern indigo snakes are observed. The report should contain the following information:
 - a. Any sightings of eastern indigo snakes;
 - b. Summaries of any relocated snakes if relocation was approved for the project (e.g., locations of where and when they were found and relocated);
 - c. Other obligations required by the Florida Fish and Wildlife Conservation Commission, as stipulated in the permit.

Appendix E: NEPA Compliance

Appendix F: Fire Call-Up List

Appendix G: Memoranda of Understanding

NPS Agreement No.
H5023-02- 0515

Memorandum of Understanding
Between the
United States Department of Interior
(National Park Service, Southeast Region and the
U.S. Fish & Wildlife Service, Southeast Region)
and the
Florida Department of Agriculture and Consumer Services
(Division of Forestry)

ARTICLE I – BACKGROUND AND OBJECTIVES

This Memorandum of Understanding is hereby entered into this October 30, 2002 by and between the **Florida Division of Forestry**, a state agency (the STATE), and the **National Park Service and U.S. Fish and Wildlife Service**, agencies of the U.S. Department of the Interior (DOI), (the SERVICE), covering a reciprocal fire protection agreement.

The SERVICE is mandated to protect and perpetuate natural and cultural resources found within national parks and wildlife refuges, and is responsible for conducting fire management activities in federal parks and wildlife refuges in Florida which are adjacent to areas protected by the STATE; and

The STATE is responsible for conducting fire management activities on state owned and privately owned lands in Florida which are adjacent to and interspersed with National Park and National Wildlife Refuge lands; and

It is to the mutual advantage of both the STATE and the SERVICE to coordinate their efforts in the prevention, detection, suppression, and investigation of wildfires in and adjacent to their areas of responsibility.

Each agency shall render mutual assistance in law enforcement activities and the gathering of evidence and in actual court prosecutions to the fullest extent allowable by law and policy.

ARTICLE II –AUTHORITY

This agreement is entered into under the authority of 42 USC § 1856a (1994) and Florida Statue, Title XXXV, Chapter 589.04 and 590.02.

ARTICLE III –STATEMENT OF WORK

The SERVICE and the STATE agree to:

A. General Operations

1. Working in close consultation with one another, the corresponding field units may conduct fire management activities and preliminary fire-related investigations on the lands located within each other's jurisdictions, all in accordance with the provisions of this Memorandum of Understanding (MOU) and their respective annual operating plans. The plans will be drafted upon execution of this MOU and will be revised or modified as necessary on an annual basis. The prescribed content and format for the plans are set forth in the Attachment "A", the Annual Operating Plan.
2. Each corresponding field unit, upon the request of the other field unit, will dispatch fire fighting equipment and personnel to assist in the emergency suppression of fires in areas for which the requesting field unit is responsible, provided that in the judgement of the sending field unit, the fire danger and risk on lands for which it is responsible are such that the said equipment and personnel may safely be released.
3. Each corresponding field unit, to the best of its knowledge and ability, when suppressing fires for the receiving field unit will adhere to the suppression and mop-up standards of the receiving field unit insofar as resources are available. The fire management strategy to be used within the lands under the jurisdiction of the each field units will be addressed in the annual operating plans or specific Incident Action Plans. If adequate resources are not available to meet such standards, the field unit providing assistance shall notify the field unit requesting assistance at the earliest possible time.
4. Each corresponding field unit will aggressively investigate and report on wild fires under its jurisdiction. Coordination activities will be outlined in the annual operating plan.
5. Each corresponding field unit will keep the other field unit informed of major changes within its own unit with respect to facilities, personnel, equipment, services, and supplies that affect day to day operations.
6. Fire prevention and education programs will be coordinated to achieve the

fire prevention objective outlined in the annual operating plans, without duplication of effort.

7. Field units will ensure that coordinated dispatching of resources will be initiated as rapidly as can be provided.
8. For purposes of making employment compensation claims, personnel dispatched by either corresponding field units for the benefit of the other field unit will be considered as employees of their own government agency. The STATE and the SERVICE will instruct their employees to act under the direction of the receiving field unit when so dispatched. When personnel of a sending unit is working for the benefit of a receiving unit, the receiving unit shall provide or arrange for immediate medical treatment of any injuries which may be incurred at the scene of the fire.
9. Each corresponding field unit will be responsible for the training of its respective fire management personnel and will invite representatives at all levels of the other field unit to attend and participate in training sessions and meetings.
10. Each agency shall provide authorization and identify radio frequencies for cooperative fire management use. Space and or facilities for electronic equipment, radios, and antennas shall be set forth in the annual operating plan. Applicable federal and state laws and regulations will govern use of radio communications.
11. Either corresponding field unit in accordance with its applicable rules and regulations may restrict activity or close areas to the public. However, before such action is taken, the corresponding field units will determine the severity of the situation. Every reasonable effort will be made to insure uniform and simultaneous action by both corresponding field units.
12. Fuel management and prescribed fire activities will be coordinated in order to provide training opportunities and to increase experience and qualifications. Either agency may provide personnel to assist the other on a non-reimbursable basis for fuel management and prescribe fire activities. Local managers may include language in the Annual Operating Plan to further clarify the roles and expectations of fuel management and prescribe fire cooperation. Assistance may also be provided on a reimbursable basis when both parties agree to this beforehand. Actual cost for personnel and prevailing rates for equipment as described in the Annual Operating Plan may be used or the parties will mutually agree upon the reimbursement rate prior to the activities being conducted.
13. Wildfires resulting from escaped prescribed fires ignited by or at the direction or under the supervision of one of the parties to this agreement shall

be the financial responsibility of that party. All suppression costs shall be borne by the responsible party. A party may take appropriate suppression action when lands under its protection jurisdiction are involved in or threatened by the fire. Such suppression action may be taken on its own initiative or at the request of the responsible party. A party may take appropriate suppression action, at the request of the responsible party, when lands under its protection jurisdiction are not involved in or threatened by the fire. The responsible party shall reimburse the other party for all suppression costs incurred in accordance with this claim.

B. Operations within Mutual Threat Zones

For those Service lands where a mutual threat zone is applicable, the SERVICE and STATE agree to define mutual threat zone as a geographical area between two or more jurisdictions onto which representatives from these jurisdictions would respond on initial attack. Due to complexities of boundary locations and maintaining detailed maps on these mutual threat zones, both agencies agree to define the mutual threat zones in the respective Annual Operating Plans.

1. Mutual aid, which is any form of free direct assistance from one fire agency in support of another during an emergency, based upon a pre-arrangement between the agencies involved is detailed in the Annual Operating Plan. Initial attack and extended attack responsibilities of each agency within and outside the mutual threat zone are included in the Annual Operating Plan.
2. SERVICE personnel acting as authorized agents of the STATE, or anyone acting at the direction of the STATE, shall have the same rights the STATE has, pursuant to Florida Statue 590.02 (3) at any or all times upon state or privately owned lands for the purpose of taking fire suppression actions.

C. The parties further agree as follows:

1. Each party to this agreement waives all claims against the other party for compensation for any loss, damage, personal injury, or death occurring in consequence of the performance of this agreement.

ARTICLE IV –TERM OF AGREEMENT

This MOU shall be effective on the date herein above first written and shall terminate five (5) years from that date. The term of this Memorandum of Understanding may be extended for an additional five (5) years if warranted and agreed to in writing by both parties.

ARTICLE V –KEY OFFICIALS

National Park Service

Ken Garvin
Southeast Regional Fire Management Officer
National Park Service
Atlanta Federal Center
1924 Bldg., 100 Alabama St., S.W.
Atlanta, GA 30303
404-562-3108 ext. 653

U.S. Fish and Wildlife Service

Roger Boykin
Southeast Regional Fire Coordinator
U.S. Fish and Wildlife Service
1875 Century Boulevard
Atlanta, GA 30345
404-679-7191

State of Florida

Jim Karels
Chief, Forest Protection Bureau
Florida Division of Forestry
3125 Conner Boulevard
Tallahassee, FL 32399-1650
850-488-6106

ARTICLE VI –PRIOR APPROVAL

Not applicable.

ARTICLE VII –REPORTS AND/OR OTHER DELIVERABLES

A. Reports

1. Each corresponding field unit will furnish to the other field unit, or make available upon request, any maps, documents, instructions, records and reports, including fire reports and law enforcement reports, which either field unit considers necessary in connection with this Agreement. Provision of such information shall be subject to the rules and regulations of the federal government, the State of Florida, and the DOI.
2. For statistical purposes each corresponding field unit will report fires in accordance with its current procedures. The field units will exchange fire report data as they deem appropriate.

B. General Payment Provisions

1. When assistance with fire management activities is requested and received by one corresponding field unit, said field unit may reimburse the field unit that rendered the assistance. If a reimbursement is to be made, payment will be made in accordance with this MOU and the annual operating plan. Payment will be based on the actual costs incurred by the field unit rendering assistance.
2. To the extent possible, rates to be charged or reimbursed for equipment used in firefighting shall be set forth in the annual operating plan. If one corresponding field unit agrees to reimburse the other field unit for equipment, (including aircraft), reimbursement will be made at the rates set forth in the annual operating plan. If rates for certain equipment used for fire management activities are not specified in the annual operating plan, the reimbursement rate will be mutually agreed upon by the parties upon conclusion of the fire.
3. One corresponding field unit also may reimburse the other field unit for the cost of the personnel services. Salary or wages will include the actual cost to the sending field unit for work performed during the time between departure from and return to the official station. Overtime may be included, if and when overtime is earned under the laws or rules governing the employees of the sending field unit. It is not intended that salary, overtime, travel or subsistence costs will be reimbursed for the administrative personnel not

directly associated with the fire management activities unless specifically agreed upon in the annual operating plan.

4. Payments for reimbursable services rendered under this MOU may be made only upon receipt of an itemized statement that conforms to the requirements set forth herein. Within 60 days of each reimbursable fire, the field unit rendering the assistance shall furnish the field unit receiving the assistance an itemized statement containing the following information:
 - a. The date and location of the fire.
 - b. Name(s) of person(s) who ordered equipment and name(s) of person(s) from whom the equipment was ordered.
 - c. Type of truck or transportation furnished, number of miles traveled, rental rate, and the total evaluated cost as set forth in the annual operating plan.
 - d. Type of tractor, plow, engine, aircraft, or other equipment furnished, hours actually operated, rental rate, and total evaluated cost as set forth in the annual operating plan.
 - e. Names and Social Security Numbers of personnel dispatched to the fire, time of dispatch and time of return to official station, total elapsed time, rate of pay, and total pay.
5. Equipment owned and used by one corresponding field unit to suppress fires on lands for which the other field unit is responsible will be operated, serviced, and repaired by the field unit that owns the equipment unless specified otherwise in the annual operating plan.

C. Reimbursements to the State

1. After a reimbursable fire occurs upon SERVICE lands, the STATE's Regional Forester or designee may prepare and send to the SERVICE's Park Superintendent or Refuge Manager at the receiving unit an itemized statement in accordance with the provisions set forth herein and in the annual operating plan for the field unit involved. The SERVICE, upon receipt of the itemized statement, shall ensure the proper processing of a funding document package.
2. Reimbursements to the STATE shall be made payable to the local field office of the Florida Department of Agriculture and Consumer Services, Division of Forestry.
3. The SERVICE shall not be bound to make any expenditure under the terms of this MOU or any annual operating plan except as funds are appropriated

by the Congress of the United States, or otherwise are made available for such purpose.

D. Reimbursements to the Service

1. After a reimbursable fire occurs upon STATE lands, the Park Superintendent or Refuge Manager may prepare and send to the STATE's Regional Forester an itemized statement in accordance with the provisions set forth herein and in the annual operating plan for the field unit involved. The STATE, upon receipt of the itemized statement, shall ensure the proper processing of a funding document package.
2. Reimbursements to the SERVICE shall be made payable to the National Park Service or the U.S. Fish and Wildlife Service.
3. The STATE shall not be bound to make any expenditure under the terms of this MOU or any annual operating plan except as funds are appropriated by the State of Florida, or otherwise are made available for such purpose.

ARTICLE IX –MODIFICATION AND TERMINATION

- A. This agreement may be modified only by a written instrument executed by all the parties.
- B. Either party may terminate the MOU by providing sixty (60) days advance written notice. In the event that one party provides the other party with notice of its intention to terminate, the parties shall meet promptly to discuss the reasons for the notice and to try to resolve their differences amicably. The parties commit to using every reasonable means available, including the use of a neutral mediator if necessary, to try to avoid terminating this agreement.

ARTICLE X –STANDARD CLAUSES

A. Civil Rights

During the performance of this agreement, the participants agree to abide by the terms of USDI-Civil Rights Assurance Certification, non-discrimination, and will not discriminate against any person because of race, color, religion, sex, or national origin. The participants will take affirmative action to ensure that applicants are employed without regard to their race, color, sexual orientation, national origin, disabilities, religion, age or sex.

B. Promotions

The State of Florida shall not publicize or otherwise circulate promotional material (such as advertisements, sales brochures, press releases, speeches, still and motion pictures, articles, manuscripts, or other publications) which states or implies Governmental, Departmental, bureau, or Government employee endorsement of a product, service, or position which the State of Florida represents. No release of information relating to this agreement may state or imply that the Government approves of the State of Florida's work product or considers the State of Florida's work product to be superior to other products or services.

C. Public Information Release

Both the Service and the State will cooperate in seeking out and utilizing media opportunities associated with fire management activities in on state and federal lands. When both agencies are involved in a joint fire suppression effort, or when a news release by one agency is likely to have a direct impact on the other agency, a joint release will be developed and issued by the spokesperson of each agency. Specific information procedures and interface requirements with Incident Management Teams are addressed in the Annual Operating Plan.

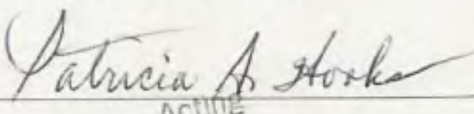
D. Liability Provision

Each party to this agreement will indemnify, save and hold harmless, and defend each other against all fines, claims, damages, losses, judgments, and expenses arising out of, or from, any omission or activity of such person organization, its representatives, or employees.

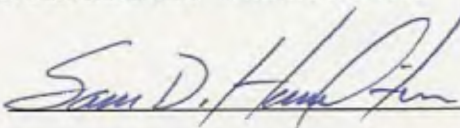
ARTICLE XI -SIGNATURES

IN WITNESS HEREOF, the following authorized representatives of the parties have signed their names on the dates indicated, thereby executing this agreement.

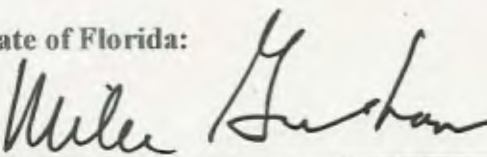
For the National Park Service:

 Date 10/31/02
ACTING
Southeast Regional Director
National Park Service

For the U.S. Fish and Wildlife Service

 Date 11/23/02
Southeast Regional Director
U.S. Fish and Wildlife Service

For the State of Florida:

 Date 2-3-03
Director of Administration
Florida Department of Agriculture and Consumer Services

COOPERATING AGENCIES

National Park Service

Superintendent
Big Cypress Natl. Preserve
HCR 61 Box 110
Ochopee, FL 33943
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Superintendent
Biscayne National Park
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Homestead, FL 33090-1369
Telephone (305) 230-1144 x3002

Superintendent
Canaveral National Seashore
308 Julia Street
Titusville, FL 32799-3521
Telephone (321) 267-1110

Superintendent
Castillo De San Marcos Natl. Monument
Fort Matanzas National Monument
1 South Castillo Drive
St. Augustine, FL 32084
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Superintendent
DeSoto National Monument
P.O. Box 15390
Bradenton, FL 34280-5390
Telephone (941) 792-0458 x14

Superintendent
Everglades National Park
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Telephone (305) 242-7710

State of Florida

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District Manager
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District Manager
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8431 S. Orange Blossom Trail
Orlando, FL 32809
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Brunnell, FL 32110
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National Park Service

State of Florida

Superintendent
**Fort Caroline National Monument
Timucuan Ecological & Historical
Preserve**
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District Manager
Jacksonville District, D-7
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Bryceville, FL 32009
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Superintendent
Gulf Islands National Seashore
1801 Gulf Breeze Pkwy
Gulf Breeze, FL 32563

Center Manager
Blackwater Forestry Center, D-1
11650 Munson Highway
Milton, FL 32570
Telephone (850) 957-6140

U.S. Fish & Wildlife Service

State of Florida

Refuge Manager
**Arthur R. Marshall Loxahatchee NWR
Hobe Sound NWR**
19216 Lee Road
Boynton Beach, FL 33437-4796
Telephone (561) 732-3684

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Refuge Manager
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Telephone (352) 563-2088

Center Manager
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Brooksville, FL 34601
Telephone (352) 754-6777

Refuge Manager
**Florida Panther NWR
Ten Thousand Island NWR**
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Suite 300
Naples, FL 34114
Telephone (941) 353-8442

District Manager
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Fort Myers, FL 33905
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Refuge Manager
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1 Wildlife Drive
Sanibel, FL 33957
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U.S. Fish & Wildlife Service

State of Florida

Refuge Manager
Lake Woodruff NWR
P.O. Box 488
DeLeon Springs, FL 32130-0488
Telephone (904) 985-4673

Refuge Manager
Lower Suwanne NWR
Cedar Keys NWR
16450 NW 31ST Place
Chiefland, FL 32626
Telephone (352) 493-0238

Refuge Manager
Merritt Island NWR
Archie Carr NWR
Lake Wales Ridge NWR
Pelican Island NWR
St. Johns NWR
P.O. Box 6504
Titusville, FL 32782
Telephone (321) 861-0667

Refuge Manager
National Key Deer NWR
Crocodile Lake NWR
P.O. Box 430510
Big Pine Key, FL 33043-0510
Telephone (305) 872-2239

Refuge Manager
St. Marks NWR
P.O. Box 68
St. Marks, FL 32355
Telephone (850) 925-6121

Refuge Manager
St. Vincent NWR
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District Manager
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District Manager
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District Manager
Tallahassee District, D-4
865 Geddie Road
Tallahassee, FL 32304
Telephone (904) 488-1871

District Manager
Tallahassee District, D-4
865 Geddie Road
Tallahassee, FL 32304
Telephone (904) 488-1871

GUIDELINES FOR THE ANNUAL OPERATING PLAN

(to be formulated between the units of the FL Division of Forestry and the NPS or FWS area)

PURPOSE:

Describe the purpose of this plan and how it is to function. Describe the operating procedures between the participating agencies within the framework of the Memorandum of Understanding. Cite the Memorandum of Understanding by title and effective date.

RESOURCE MANAGEMENT:

Discuss each agency's mandates; fire management policies; resource issues and concerns; consequent resource management objectives.

MUTUAL THREAT ZONES:

Discuss the initial attack suppression strategies that are acceptable where the boundary between the two agency's suppression responsibilities are not immediately distinguishable. Include a geographic description and map.

PRESCRIBED BURNING:

List any arrangements for the issuance of burning authorizations by agency. Detail arrangements. Discuss State and local notification procedures for conducting prescribed burns.

OPERATIONS:

Outline the fire organization in the mutual threat zone; list personnel in fire jobs. Discuss procedure for releasing resources and transitioning the fire to the responsible agency. Address acceptable fire suppression strategies. Detail who has first call, second call, support, ICS procedures, and unified command and how it is to function.

COMMUNICATIONS:

Include dispatch procedures and the procedures for keeping each other informed on fire potential and activity, and the status of fire equipment and personnel. Include under what condition radios will be made available including the type of equipment and where it is located.

PERSONNEL AND EQUIPMENT:

Detail resource listing of available equipment and personnel. Include a telephone directory. Discuss the types of equipment and under what conditions and where they may be used. List key personnel and any applicable qualifications. If applicable, list rates for equipment and personnel. Require full Personal Protective Equipment on fire activities, prescribed or wildland fire.

FIRE PREVENTION:

Detail interagency cooperation in fire prevention and fire education efforts.

INCIDENT REPORTS:

Detail arrangements to furnish incident reports to each agency.

TRAINING:

Discuss interagency training to be carried out at the local level. Include courses to be offered, qualified instructors, and location and facilities.

FACILITIES:

List facilities for meeting, training, and for emergency management functions.

FINANCIAL ARRANGEMENTS:

Include under what condition reimbursements will be made. Address the procedures for making reimbursements as outlined in the Memorandum of Understanding.

OTHER:

Detail any other applicable considerations.

PLAN APPROVAL:

District Forester and Park Superintendent approve the annual operating plan.

Appendix H: Record of Wildland Fires Within or Near Preserve Boundaries, 1993-2002

Date	Acres	Cause	Fuel Type	Location
03/93	4.0	Stolen car	Palmetto	Pecan Park
03/93	22.0	Warming fire	Palmetto	Black Hammock*
03/93	3.0	Children	Palmetto	Pecan Park area
04/93	15.0	Incendiary	Palmetto	Black Hammock area
04/93	1.5	Incendiary	Grass	Shark Road
05/93	4.0	Railroad	Palmetto	New Berlin
06/93	15.0	Lightning	Pine	Pecan Park
06/93	0.5	Incendiary	Palmetto	Eagerton
06/93	3.0	Incendiary	Palmetto	Faye Road
06/93	390.0	Unknown	Palmetto	Pecan Park
06/93	1.0	Lightning	Pine	Pecan Park
06/93	0.1	Incendiary	Grass	Eastport Road
07/93	1.0	Incendiary	Pine	Blue Whale Road
07/93	40.0	Lightning	Palmetto	Boney Road
07/93	0.1	Lightning	Palmetto	Shark Road
07/93	40.0	Lightning	Palmetto	Pumpkin Hill
07/93	110.0	Lightning	Palmetto	Burton Island*
07/93	2.0	Incendiary	Pine	Black Hammock
07/93	3.0	Incendiary	Pine	Boney Road
07/93	177.0	Lightning	Pine	Thomas Creek*
08/93	10.0	Lightning	Grass	Thomas Creek*
08/93	1.0	Equipment	Pine	Lem Turner Road
09/93	50.0	Lightning	Pine	Pumpkin Hill
09/93	0.8	Incendiary	Palmetto	Duval Road
11/93	3.0	Incendiary	Palmetto	Pecan Park
01/94	20.0	Incendiary	Palmetto	New Berlin
01/94	2.0	Incendiary	Pine	Starrett Road
02/94	10.0	Escaped RX	Palmetto	Tisonia
02/94	30.0	Incendiary	Palmetto	Braddock Road
03/94	1.0	Incendiary	Palmetto	Pecan Park
02/95	2.0	Incendiary	Palmetto	Black Hammock
02/95	1.0	Debris burn	Pine	New Berlin
02/96	3.0	Incendiary	Grass	Pecan Park
03/95	4.0	Incendiary	Pine	Starrett Road
04/95	6.0	Incendiary	Grass	Eastport Road
04/95	10.0	Incendiary	Palmetto	Boney Road
04/95	1.0	Stolen auto	Palmetto	Pecan Park
05/95	8.0	Children	Pine	Pecan Park
05/95	5.0	Incendiary	Swamp	Oceanway
08/95	2.0	Incendiary	Palmetto	Oceanway
10/95	3.0	Incendiary	Pine	Eastport Road
01/96	30.0	Incendiary	Palmetto	Pumpkin Hill
02/96	15.0	Incendiary	Pine	Duval Station Road
02/96	10.0	Incendiary	Palmetto	Eastport Road
03/96	0.1	Incendiary	Grass	Dunn Creek Road
04/96	0.4	Incendiary	Pine	Duval Station Road
04/96	2.0	Incendiary	Grass	Boney Road
Date	Acres	Cause	Fuel Type	Location

04/96	0.1	Incendiary	Grass	Lannie Road
05/96	5.0	Incendiary	Swamp	Starrett Road
05/96	20.0	Incendiary	Pine	Dunn Ave.
05/96	1.0	Incendiary	Pine	Faye Road
05/96	2.0	Incendiary	Palmetto	Dunn Creek Road
06/96	2.0	Incendiary	Swamp	Pecan Park
07/96	30.0	Lightning	Pine	Boney Road
07/96	2.0	Escaped RX	Palmetto	Pumpkin Hill
08/96	2.0	Incendiary	Palmetto	Duval Station Road
10/96	3.0	Incendiary	Leaves	Alta Drive
02/97	25.0	Incendiary	Pine	Lannie Road
05/97	6.0	Incendiary	Pine	Dunn Road
07/97	15.0	Lightning	Palmetto	Pumpkin Hill
07/97	100.0	Lightning	Palmetto	Pumpkin Hill
07/97	20.0	Lightning	Palmetto	Pumpkin Hill
07/97	7.0	Lightning	Grass	Black Hammock Road
08/97	0.5	Debris burn	Grass	Black Hammock Road*
08/97	1.0	Lightning	Grass	Thomas Creek*
08/97	0.1	Lightning	Palmetto	Black Hammock Road
09/97	3.0	Incendiary	Pine	Duval Road
09/97	0.5	Incendiary	Palmetto	Pumpkin Hill
05/98	3.0	Incendiary	Palmetto	Grover Road
05/98	2.0	Incendiary	Palmetto	Duval Station Road
06/98	8.0	Stolen auto	Leaves	Faye Road
06/98	1.0	Incendiary	Pine	Cole Road
06/98	2.0	Lightning	Pine	Pecan Park
06/98	0.1	Lightning	Pine	Duval Station Road
06/98	55.0	Incendiary	Palmetto	Black Hammock Road
06/98	55.0	Incendiary	Swamp	DeSoto Rd/Hwy 17
06/98	250.0	Incendiary	Pine	Grover Road
06/98	0.5	Unknown	Palmetto	Starrett Road
06/98	2.0	Incendiary	Grass	DeSoto Road
06/98	4.0	Incendiary	Grass	Duval Road
06/98	0.1	Lightning	Swamp	Pumpkin Hill
07/98	5.0	Lightning	Palmetto	Heckscher Drive
07/98	2.0	Debris burn	Grass	Sawpit Road
07/98	3.0	Lightning	Palmetto	Pecan Park
07/98	1.0	Lightning	Grass	Duval Road
12/98	0.1	Incendiary	Grass	45th Street
02/99	2.0	Unknown	Grass	Eastport Road
02/99	30.0	Lightning	Palmetto	Broward Island*
03/99	0.4	Incendiary	Swamp	Duval Road/Hwy 17
04/99	0.5	Incendiary	Grass	Starrett Road
05/99	0.2	Children	Pine	Lem Turner Road
06/99	0.5	Unknown	Pine	Pecan Park
08/99	18.0	Land clearing	Grass	Sawpit Road
08/99	15.0	Lightning	Palmetto	Duval Road
08/99	10.0	Lightning	Swamp	Pumpkin Hill
08/99	25.0	Lightning	Pine	Pumpkin Hill**
10/99	7.0	Car fire	Swamp	Pecan Park
12/99	5.0	Incendiary	Palmetto	Sawpit Road
Date	Acres	Cause	Fuel Type	Location
05/00	10.0	Incendiary	Grass	Not available

07/00	0.1	Incendiary	Brush	Cedar Point-NPS
07/00	2.0	Lightning	Grass	Not available
07/00	0.5	Lightning	Grass	Not available
08/00	1.0	Lightning	Brush	Not available
02/01	3.0	Unknown	Palmetto	Boney Road
05/01	0.4	Incendiary	Trash dump	New Berlin Road
08/01	12.0	Lightning	Palmetto	Pecan Park Road
08/01	6.0	Lightning	Not available	Duval Road
02/02	4.0	Burned car	Grass	Not available
05/02	0.3	Burned car	Brush	Spanish Pond-NPS
05/02	0.1	Burned car	Palmetto	Not available
05/02	1.0	Kids playing	Grass	Black Hammock Island

*Fires on lands National Park Service responsible for

**Mutual aid response by National Park Service personnel

All of the above fires were located inside preserve boundaries or to the north of the boundary. Areas to the south of preserve boundaries are generally more urban, and the areas of wildland capable of sustaining a fire are very limited. Due to this fact, the Jacksonville Fire and Rescue Department has the primary responsibility for fire suppression south of preserve boundaries. No attempt was made to collect their records regarding wildland fires in the vicinity to the south, due to the small number of fires that have occurred in that area. Likewise, any structural fire that has occurred within or near preserve boundaries has not been listed above.

Appendix I: Wildland and Prescribed Fire Monitoring Plan

Appendix J: Five-Year Prescribed Fire Schedule

The immediate goal of the prescribed fire program at the preserve is reintroducing fire to the ecosystem. Over the next five years, a rotational series of burns will begin in a 140-acre unit, coinciding with the historic fire return interval, and creating and maintaining a mosaic of burned and unburned areas that will approximate natural conditions. Prescribed fire application will occur within specified weather and fuel moisture parameters. The prescription may be adjusted as deemed necessary by monitoring results, information gained from research burns, and further refinement of the prescribed fire program. The ultimate objective of the cyclic burning of this unit is to restore the area as a pine flatwoods, as per preserve planning guidance.

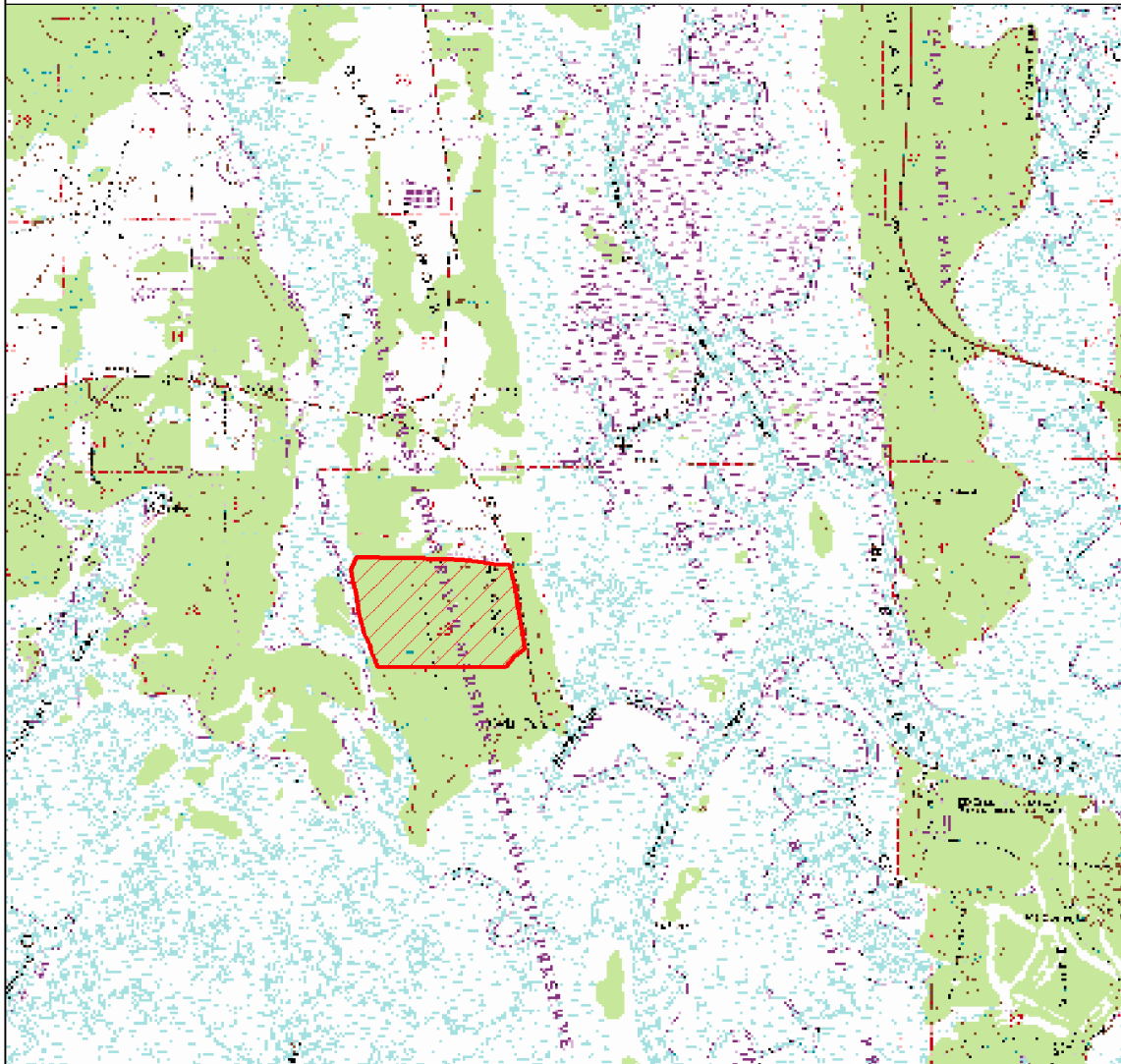
Prescribed fire application will follow the schedule below. See the following map for the treatment location.


Five-Year Prescribed Fire Schedule

Treatment Unit Name	Acreage	Timing of Treatment	Fuel Description
Cedar Point Burn Unit	140 acres	Early January through mid-March 2005 Early January through mid-March 2008	Pine Flatwoods NFDERS Fuel Model D Condition Class 3

Figure 8

Timucuan Ecological and Historic Preserve Black Hammock Island



 Cedar Point Burn Unit

