Pine Island Conservation Area

Management Plan

July 2024

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I. EXECUTIVE SUMMARY

Pine Island Conservation Area (Pine Island) is part of the sanctuary network established by the Environmentally Endangered Lands (Endangered Lands) Program in Brevard County. One of the goals of the program is to acquire environmentally sensitive lands as a first step "towards long-term protection of essential natural resources, open space, green space, wildlife corridors and maintenance of natural ecosystem functions" (Brevard County Sanctuary Management Manual). The program also establishes a network of public lands to provide passive recreation and environmental education programs to Brevard County residents and visitors.

Pine Island Conservation Area consists of approximately 904.6 acres in Merritt Island, Florida. It is situated approximately 5 miles north of State Road 528, 1 mile south of State Road 407, and 3 miles west of State Road 3 (Figure 1). The majority of the Pine Island property was purchased between 1996 and 1998 and was a fifty percent acquisition by the Environmentally Endangered Lands Program (the Program) and a fifty percent acquisition by the St. Johns River Water Management District (the District). The County is the lead site manager under a Management Agreement with the District. Additional properties were subsequently added to Pine Island from Brevard County and the District. These additional properties are addressed in Appendix A, as will be any future agreements or amendments.

There are two gated public access points to the Sanctuary, 6195 North Tropical Trail and 2100 Pine Island Road. The property boundary and these two access roads are shown on the Site Map in Figure 2. The North Tropical Trail gate is open from 9AM to 5PM Tuesday through Sunday, but closed Mondays and County-approved holidays. This gate provides access to the Education Center (1875 cabin, 1888 house, kitchen/public restroom building, screened pavilion), the Land Management Center (maintenance building, equipment storage areas, tool sheds), ADA trail and outdoor educational exhibits, hiking trails, and event parking. The Pine Island Road gate is open from 8:30AM to Sunset, 7 days a week, 365 days a year. This gate provides access to parking, trails, kayak launches, and a non-motorized watercraft lake access.

Pine Island Conservation Area is a Category 1 site as described in the Program's Sanctuary Management Manual. Category 1 sites function as regional Management and Education Centers. They represent excellent examples of Brevard County's rich biological diversity, have extensive public access, sponsor significant environmental education and volunteer programs, and are staffed by a full-time manager. Pine Island Conservation Area is managed for: conservation of natural communities, restoration of ecosystem functions, promoting the County's natural and cultural assets, allowing passive recreation, environmental stewardship, educational opportunities for students and the public, benefiting the local community, and supporting the Environmentally Endangered Lands referendum goals.

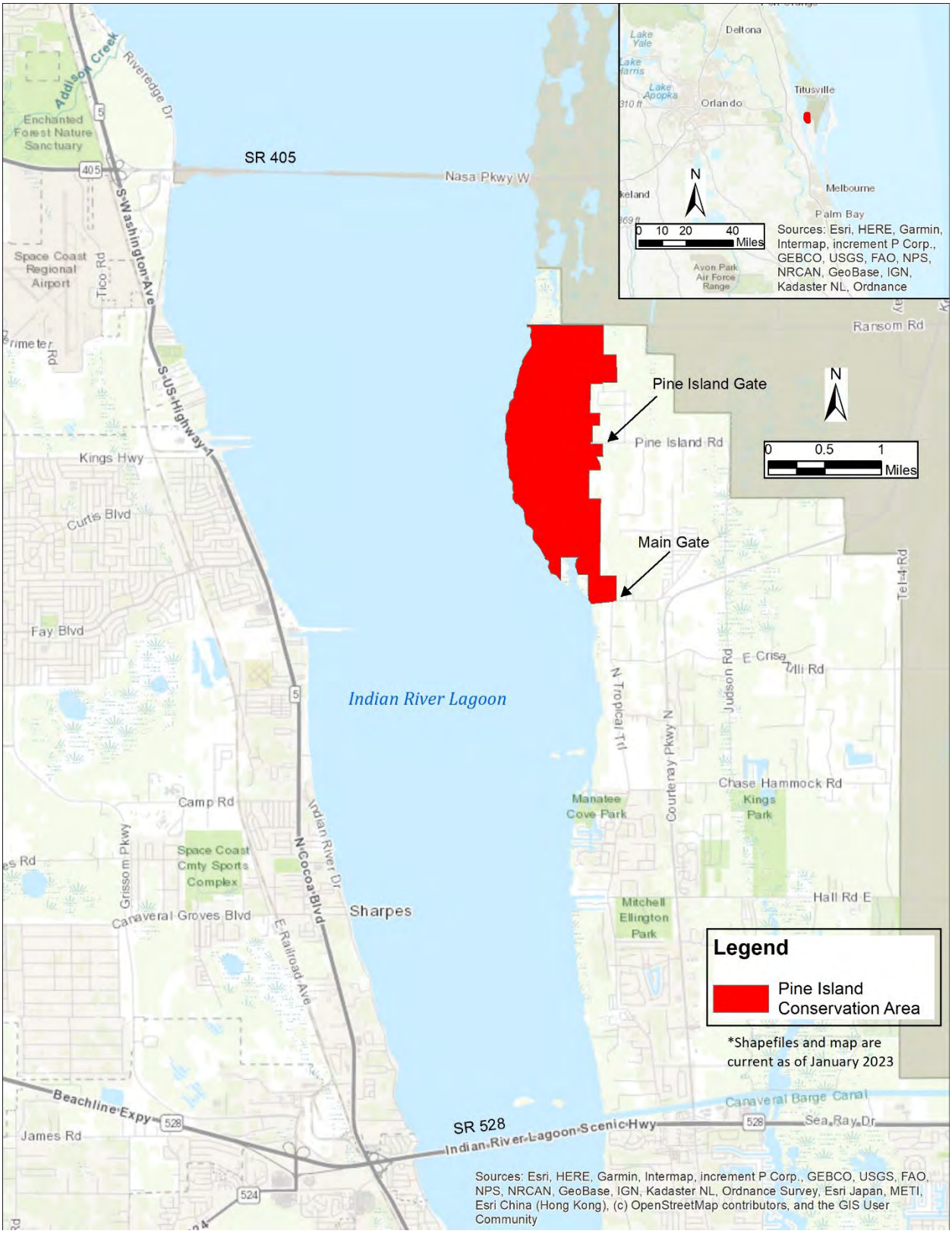

Figure 1. Location Map for Pine Island Conservation Area

Figure 2. Site Map of Pine Island Conservation Area

This Management Plan serves as the conceptual and procedural document to guide resource management decisions and implement the conservation goals of the Program and the District for the Pine Island Conservation Area. This management plan is a revision of the original management plan completed in 1999. Portions of that plan are incorporated herein. The Brevard County Environmentally Endangered Lands Program is the lead agency in the development of the Management Plan with input and participation from the Brevard County Stormwater Program (formerly the Brevard County Surface Water Improvement Program), part of the Natural Resources Management Department.

Pine Island was acquired in a joint acquisition with the District to meet the conservation, passive recreation, and environmental education goals of the Program pursuant to the voter-approved referendums (in 1990, 2004 and 2022) and the Participation and Interim Management Agreement with the District (Appendix A).

Management of the property has been consistent towards meeting the goals and actions identified in the above programs. Management efforts consistent with these goals and objectives are documented within this plan in Sections IV (Natural Resource Descriptions), V (Factors Influencing Management) and VI (Management Action Plans) and are all consistent with the Environmentally Endangered Lands Sanctuary Management Manual.

Pine Island is managed and maintained by the Program pursuant to the directives of the Sanctuary Management Manual and with inter-agency support from the District and Brevard County Natural Resources Department and Stormwater Program. This management plan identifies the following specific management goals to guide management actions at Pine Island:

- Conservation and Restoration of Natural Ecosystem Functions
- Conservation and Restoration of Natural Communities
- Conservation of Rare, Threatened, Endangered and Endemic Species
- Conservation of Biological Diversity
- Removal of Invasive Exotic Species
- Conservation of Indian River Lagoon Resources and Water Quality
- Conservation of Resources with Significant Archaeological and Historic Value
- Coordination and Monitoring of Stormwater Management Activities
- Provision for Public Access, Passive Recreation and Environmental Education
- Capital Improvements
- Development and Coordination of Effective Intra and Interagency Partnerships and Contractual Agreements for Land Management
- Collect and Evaluate Ecological and Visitor-Impact Data to improve planning

II. INTRODUCTION

In the 1990, 2004 and 2022 referendums Brevard County voters approved the Environmentally Endangered Lands Program (the Program). The Vision Statement is as follows:

The Program acquires, protects and maintains environmentally endangered lands guided by scientific principles for conservation and the best available practices for resource stewardship and ecosystem management; protects the rich biological diversity of Brevard County for future generations through land acquisition and management; provides passive recreation and environmental education opportunities to Brevard's citizens and visitors without detracting from primary conservation goals; encourages active citizen participation and community involvement.

The Program established a conceptual framework and funding mechanism to implement a sanctuary network in Brevard County. The sanctuary network represents a collection of protected natural areas that form a regional conservation effort focused upon protection of biological diversity. Within the county-wide sanctuary network, four management areas are geographically defined within Brevard County. For each management area, a specific site is identified as a Center for Regional Management. The sites that will function as centers for regional management are:

- Barrier Island Center - Regional Management Center for South Beaches
- Enchanted Forest Sanctuary - Regional Management Center for North Mainland
- Pine Island Conservation Area - Sams House - Regional Management Center for Central Mainland
- –Proposed Regional Management Center for South Mainland

These centers provide strategically located hubs for implementing the countywide conservation, passive recreation, and environmental education goals of the Program. These sites provide significant public access and environmental education and land management centers. The Program's Sanctuary Management Manual guides conservation and land stewardship decisions implemented by the Program. The Manual contains detailed principles and directives for conservation, public access and environmental education within the sanctuary network.

As outlined in the Sanctuary Management Manual, the Program adopted and implemented an ecosystem approach to environmental management. Ecosystem management is defined as an integrative, flexible approach to the management of natural resources. Key themes of ecosystem management include the following:

- Adaptive Management - Natural areas must be managed in the context of the landscape in which they exist and based on scientific knowledge. Resource managers must adapt to continuing advances in the scientific understanding of ecosystems and changing environmental and human influences on the resources.
- Partnerships - Interagency and private sector partnerships are essential to manage and protect ecosystems. Natural resource management is complex and requires multi-disciplinary skills and experiences.
- Holistic Approach - Ecosystem management includes the maintenance, protection and improvement of both natural and human communities. This systems approach to

management considers the "big picture" of natural resource protection, community economic stability and quality of life.

Land management issues, such as fire management, protection and restoration of natural hydrologic cycles, threatened and endangered species, and removal of invasive exotics must be integrated with issues, such as provisions for public access and levels of human use. The integration of ecosystem protection and human needs should combine to form the foundation of an effective ecosystem management strategy. In situations where conflicts arise between site conservation goals and public use interests, the conservation goals and objectives for which the site was acquired will remain the priority for decision-making and conflict resolution.

Principals of Conservation

The Sanctuary Management Manual also establishes a general framework for management of specific sites and establishes ten Principles of Conservation. These principles are designed to achieve the following:

- Maintain all sites in a natural state and/or restore sites to enhance natural resource values.
- Protect natural resource values by maintaining biological diversity and using conservation as a primary goal for decision-making.
- Balance human use with the protection of natural resources.
- Apply the most accurate scientific principles to strategies for conservation.
- Collect and use the most accurate data available for developing site management plans.
- Consider the interests and values of all citizens by using scientific information to guide management policy making.
- Promote effective communication that is interactive, reciprocal, and continuous with the public.
- Promote the value of natural areas to Brevard County residents and visitors through the maintenance of the quality of resource values, public services, and visitor experiences.
- Promote the integration of natural resource conservation into discussions of economic development and quality of life in Brevard County.
- Provide a responsible financial strategy to implement actions to achieve long-term conservation and stewardship goals.

Principle 1

Maintain all sites in a natural state and/or restore sites to enhance natural resource values pursuant to management plans as approved by the Board of County Commissioners. All sites in the EEL Sanctuary Network shall be maintained in a desirable natural state or restored to enhance natural resource values for species, natural communities and ecosystems.

The EEL Program shall:

a. Make management decisions recommendations to ensure that natural resource values are maintained, restored or enhanced as natural assets for future generations.

Principle 2

Protect natural resource values by maintaining biological diversity and using conservation as a primary goal for decision-making. The EEL Program will strive to maintain biological diversity at genetic, species, natural community, and ecosystem levels to secure present and future natural resource values and options.

The EEL Program shall:

a. Make resource management decisions with the understanding that resource conservation was the primary goal of the voter-approved referenda (1990, 2004 and 2022).
b. Manage and monitor total impacts on ecosystems and sites within the natural areas network.
c. Work to preserve essential natural features of the ecosystem.
d. Identify natural communities, species and processes that are particularly important to the maintenance of an ecosystem, and make special efforts to protect them.
e. Manage and monitor in ways that do not further fragment natural areas.
f. Maintain, mimic or enhance patterns of natural processes; including disturbances at scales appropriate to the natural system.
g. Avoid disruption of food webs, especially removal of top or basal species.
h. Avoid significant genetic alteration within populations.
i. Recognize that biological processes are often nonlinear, are subject to critical thresholds and synergism's, and that these issues must be identified, understood and incorporated into management strategies.
j. Recognize that events, like hurricanes, damaging wildfires, or epidemics are unpredictable and potentially devastating to species viability. The EEL sanctuary network should be developed with consideration for the probability of uncontrolled natural events.

Principle 3

Balance human access to EEL Sanctuary sites and public use with the protection of natural resources.

The EEL Program shall:

a. Recognize that an acceptable balance can be attained between resource protection and public use. Land management practices and sanctuary development plans will use spatial, temporal, visual or auditory controls (like elevated boardwalks, scenic overlooks, specific trail location and educational signage) to provide appropriate public access and use, rather than to exclude the public from EEL sanctuaries.
b. Recognize that the total impact of humans on natural resources is the product of human population size, per capita consumption, extent of public access, incidental taking of habitats, and habitat degradation caused by human activities.

c. Recognize that public interest in recreation on protected natural areas is high and that public interest is projected to increase over time.
d. Take appropriate actions to successfully meet the conservation needs of a natural area site with provisions for responsible public access and use.
e. Recognize that natural resource conservation by private land owners on private lands is an important part of the statewide conservation effort in Florida and Brevard County.

Principle 4

Apply the best most accurate current scientific principles to strategies for conservation. Strategies to conserve and manage living resources should be formulated and implemented using the best available scientific and natural resource management principles. The full range of knowledge and skills from both the natural and social sciences is required to achieve a balance between resource conservation and human use.

The EEL Program shall:

a. Identify the local and regional pool of scientific and resource management experts and provide opportunities for their active participation with the EEL Selection and Management Committee and EEL Staff.
b. Establish formal financial partnerships through contracts with interested scientific and land management agencies and institutions, as approved by the Board of County Commissioners, to apply local, regional and national expertise to EEL Program initiatives.
c. Recognize that science is a vital part of natural resource conservation. Science can be used to describe resource inventories, understand natural processes, and provide predictive capabilities.
d. Identify a local and regional pool of individuals recognized for their expertise and knowledge in social sciences (i.e., education, recreation, individuals with special needs, art, literature, tourism, etc.). Encourage their active participation in the EEL Program projects through active participation in the EEL Volunteer Programs.
e. Encourage EEL Staff to consult with a wide range of knowledgeable individuals and institutions recognizing that all conservation issues have biological, economic, and social implications. Ignoring any of these may lead to conflicts that will impair effective conservation.
f. Encourage public participation in land management and stewardship through active community involvement in EEL sanctuary programs and projects.

Principle 5

Collect and use the best data available for developing site management plans. Resource inventories, ecological surveys, and land management assessments should precede and guide the provision of public access and use. The information should be made available for critical scientific and public review.

The EEL Program shall:

a. Develop Interim Management Plans within 90 days and Management Plans within one year after the acquisition of a management unit or sanctuary site. In cases where a management unit may be composed of multiple properties, a management plan would not be required until one year after all the essential properties are assembled. Interim Management Plans can be developed for individual management units within large multi-parcel projects.
In cases where property ownership is to be transferred to the State of Florida Board of Trustees of the Internal Improvement Trust Fund as part of Multi-Party Acquisition Agreements in the Conservation and Recreational Lands (CARL) Program, Management Plans or Interim Management Assignment Letters will be completed within one year of the property transfer to the State as directed in §259.032 F.S. and §253.034 F.S. The EEL Program will comply with future amendments to the Florida Statutes and state land management policies as applicable to joint CARL Projects.
b. Prepare Interim Management Plans, Management Plans or Interim Management Assignment Letters to the Board of County Commissioners for review and ratification to allow for public comment and discussion.
c. Identify uncertainties and assumptions regarding natural history, size and productivity of site resources.
d. Identify major ecological and sociological uncertainties and assumptions regarding resource uses and visitor impacts.
e. The EEL Program shall ensure that the level of resource use does not risk degradation of the resource nor allow expansion of public use at rates that exceed the known vulnerability of the resource and its relationship with other ecosystem components.
f. Evaluate human use impacts through on-going visitor impact analyses. The results of these observations shall guide all resource management decisions.
g. Encourage private sector - public sector partnerships to implement site management or specific programs so that: 1. the partnership shall not result in the exclusion of the public from acceptable resource uses defined in the Management Plan, and 2. the partnership shall result in a net economic and/or resource management benefit to the EEL Program, the sanctuary site and the citizens of Brevard County.

Principle 6

Consider the interests and values of all citizens by using scientific information to guide management policy making.

The EEL Program shall:

a. Whenever possible, provide positive incentives to the users of living resources that correspond to the values those resources have to society. Ensure that these incentives promote conservation, and constrain uses that do not promote, or are inconsistent with, the conservation objectives of the EEL Program.
b. Implement conflict resolution mechanisms to minimize conflicts over resource uses among competing stakeholders.

c. Encourage the integration of science and best management practices with policy making, independent of resource users and special interests.
d. Require that policy makers and resource managers be held accountable for the use of the best possible data and analysis in establishing policy and management decisions.
e. Use the criteria and procedures in the EEL Land Acquisition Manual and EEL Sanctuary Management Manual to guide policy and conservation decisions.
f. Ensure that formal institutions responsible for resource management decisions have temporal and spatial perspectives consistent with the ecological character of the resources and organizational structures.

Principle 7

Promote communication that is interactive, reciprocal and continuous.

The EEL Program shall:

a. Ensure that communication is provided to the general public and is based on mutual respect and sound information.
b. Require external and internal review of all reports and analyses to verify objectivity and results.
c. Inform and motivate the public regarding conservation, land stewardship and responsible use of the EEL Program natural areas network.
d. Encourage inter-disciplinary communication to inform decision makers, land managers and the general public.
e. Promote enhanced public understanding and awareness of Brevard's rich biological diversity through programs that support public use of the EEL Program Sanctuary Network, environmental education and responsible nature-based tourism.

Principle 8

Promote the value of natural areas to Brevard County residents and visitors through the maintenance of the quality of resource values, public services and visitor experiences. The environmental and economic values of the EEL Program sanctuary network depend upon high quality natural resources and the provision of exceptional visitor experiences.

The EEL Program shall:

a. Develop public-use facilities and programs that create a positive visitor experience.
b. Hire sufficient EEL Program staff or contract outside land management services as approved by the Board of County Commissioners to ensure that conservation objectives are achieved and quality passive recreation and environmental education are provided.
c. Implement a long-term economic plan that provides sufficient funding for resource protection, public access and environmental education.
d. Encourage the development of programs that provide natural or human transportation corridors or connections to the surrounding landscape and community. The EEL Program shall ensure that all public access points or trails are compatible with the conservation

goals of EEL Sanctuary sites. Examples of connectors include greenways, pedestrian trails, bicycle paths, horse trails and wildlife corridors.
e. Ensure that sanctuary site design and development contributes to environmental and cultural protection and interpretation.
f. Integrate cultural, archaeological, historical and architectural considerations into site protection, site design and interpretive programs.
g. Develop environmental education programs with support from local and regional educators, education programs, nature-based tourism interests, non-profit groups, private corporations and other interested organizations.

Principle 9

Promote the integration of natural resources conservation into community discussions of economic development and quality of life.

The EEL Program shall:

a. Initiate and enhance communication and cooperation with local governments, chambers of commerce, economic development councils, tourist development councils, school boards and other community programs within Brevard County and Florida.
b. Actively participate in local, state and national discussions and planning efforts to expand and promote responsible nature-based tourism in Florida.
c. Recognize that the EEL Sanctuary Network is an integral part of the local community and Brevard County. Public use of a sanctuary site and development within a site shall be compatible with the interests of the local community.
d. Encourage public recognition and understanding of the value of history, natural resource protection and human community development to promote a common vision, pride and respect for Brevard County and Florida.
e. Encourage public sector/private sector partnerships for conservation, education and nature-based tourism.

Principle 10

Provide a responsible financial strategy to support implementation of management actions to achieve long-term conservation and stewardship goals.

The EEL Program shall:

a. Recognize that conservation, passive recreation and environmental education are long-term EEL Program responsibilities that require a financial commitment extending beyond the sunset date of the EEL Program ad valorem revenue collection.
b. Identify and implement a financial strategy that provides sufficient funds for conservation, passive recreation and environmental education programs.
c. Provide a long-term financial plan to the Board of County Commissioners that allows the EEL Program to be economically self-sufficient. The plan shall decrease the future need for increased taxes above and beyond the 1990 EEL Referendum.

d. Acknowledge that all lands acquired by the EEL Program will require varying levels of management and experience varying levels of public use.

In addition to these principles found in the Sanctuary Management Manual, this management plan documents past accomplishments and provides site-specific goals, strategies and actions to guide management of the Pine Island Conservation Area in meeting the objectives of the Environmentally Endangered Lands Program.

Sections

The plan is divided into the following 10 sections:

i. Executive Summary identifies the location, size, general natural resource features and primary management goals for the site
ii. Introduction provides a brief introduction to the Program as well as a description of the structure of the management plan
iii. Site Description and Location provides a detailed site location and description
iv. Natural Resource Descriptions includes physical resources (climate, geology, topography, soils, and hydrology), biological resources (ecosystem function, flora, fauna, special concern species, and biological diversity), and cultural (archeological, historical, land-use history, public interest)
v. Factors Influencing Management includes natural trends, human-induced trends, external influences, legal obligations and constraints, management constraints, and public access and passive recreation
vi. Management Action Plans include specific goals, strategies and actions, and a projected Timetable for Implementation prioritizes activities and provides a timeframe for management plan implementation
vii. Financial Considerations discusses funding mechanisms and projected management costs
viii. Bibliography cites original research and publications used to develop the Management Plan
ix. Appendices

The majority of the Pine Island Conservation Area property was purchased in 1996 through a fifty percent acquisition by the Program and a fifty percent acquisition by the District. Additional property was added to the Management Agreement in 1998 and 2000. Several other contiguous parcels were later acquired by Brevard County and transferred to the Environmentally Endangered Lands Program. A detailing of all the parcels contained within Pine Island, including ownership and date of acquisition, is provided in Table 1 of the following section (Section III). Transcripts of the Participation and Interim Management Agreement between Brevard County and the District, its amendments, documentation of subsequent property transfers, and legal descriptions are contained in Appendix A. Any future agreements or amendments will also be subsequently attached there.

Following the severe 1994 flooding, Brevard County contracted with a consultant to formulate a master plan for addressing flooding problems. The primary goal was to minimize peak flood stages and flooding durations during major storm events within populated areas of North Merritt Island. The secondary objective was to provide water quality improvement during smaller, more frequent storm events. The Interim Management Agreement required "the development, construction, operation, maintenance and management of a Stormwater Facility on site."

This plan is in conformance with the Brevard County, Florida 1988 Comprehensive Plan as amended and adopted (Brevard County, 1988). The letter confirming compliance is contained in Appendix B.

III. SITE DESCRIPTION AND LOCATION

The Pine Island Conservation Area's approximately 904.6 acres is located on North Merritt Island in Brevard County, Florida. A list of parcels comprising the property is provided in Table 1. It is approximately five miles north of State Road 528, 1 mile south of State Road 407, and 3 miles west of State Road 3 in Township 23 South, Range 36 East, Sections 9, 10, 15, 16, and 22 (Figure 1). It lies along the eastern shore of the Indian River Lagoon, and is contiguous with the southern border of the Merritt Island National Wildlife Refuge. It is bordered by residential and undeveloped private properties to the east and south. Approximate boundaries are shown on the aerial photograph site map in Figure 2. The Legal Descriptions for the site are contained in Appendix A. Protected natural areas in proximity to the site include the Merritt Island National Wildlife Refuge which is contiguous with the northern boundary and also lying approximately three miles to the east. The Kabboord and Ulumay Sanctuaries are approximately three miles and five miles respectively to the southeast.

Optimal boundaries for the Pine Island Conservation Area would include private inholdings and several abutting and adjacent parcels to the north and east. Properties within the optimal boundary that are either under mitigation easement, owned by St. Johns Water Management District, or exist within other departments of Brevard County government are considered favorable for inclusion in Pine Island. A map of the optimal boundaries is presented in Figure 3.

There are gated public access points at 6195 North Tropical Trail and 2100 Pine Island Road. The North Tropical Trail gate is open from 9AM to 5PM Tuesday through Sunday, and closed

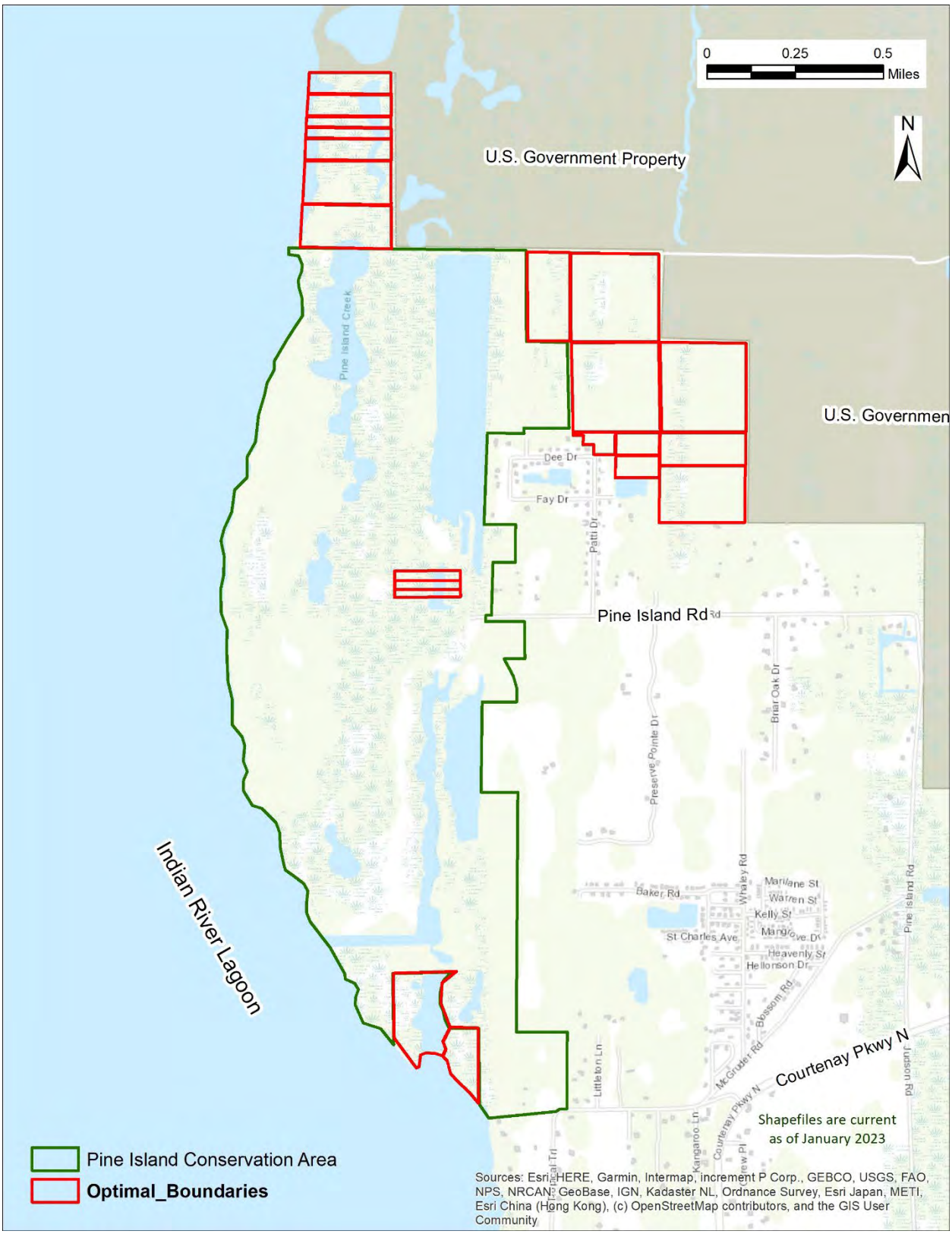

Figure 3. Optimal Boundaries Map of Pine Island Conservation Area

Parcel ID	Tax ID/Account	Acreage	Owner & Acquisition Date
23-36-09-00-1	2315148	12	SJRWMD/Brev Co; 1996
23-36-09-00-2	2315149	229	SJRWMD/Brev Co; 1996
23-36-10-00-251	2315156	19.5	Brevard Co, 2006
23-36-10-00-252	2315157	139	SJRWMD/Brev Co; 1996
23-36-10-00-503	2315163	2.28	SJRWMD/Brev Co; 1996
23-36-10-00-504	2315164	2.28	SJRWMD/Brev Co; 1996
23-36-10-00-508	2315168	5.9	SJRWMD/Brev Co; 1996
23-36-10-00-513	2315173	9.0	Brevard Co, 2003
23-36-16-00-1	2315616	81	SJRWMD/Brev Co; 1996
23-36-16-00-2	2315617	95.4	SJRWMD/Brev Co; 1998
23-36-16-00-4	2315618	10.43	SJRWMD; 1998
23-36-16-00-5	2315619	37	SJRWMD/Brev Co; 1996
23-36-15-00-253	2315495	11.95	SJRWMD/Brev Co; 1996
23-36-15-00-254	2315496	2.28	SJRWMD/Brev Co; 1996
23-36-15-00-255	2315497	2.07	SJRWMD/Brev Co; 1996
23-36-15-00-256	2315498	134.83	SJRWMD/Brev Co; 1996
23-36-15-00-257	2315499	1.68	SJRWMD/Brev Co; 1996
23-36-15-00-258	2315500	8.69	SJRWMD/Brev Co; 1996
23-36-15-00-259	2315501	6.95	SJRWMD/Brev Co; 1996
23-36-15-00-504	2315506	9.79	SJRWMD/Brev Co; 1996
23-36-15-00-505	2315507	3.3	SJRWMD/Brev Co; 1996
23-36-15-00-506	2315508	6.18	SJRWMD/Brev Co; 1996
23-36-15-00-507	2315509	14.08	SJRWMD/Brev Co; 1996
23-36-21-00-1	2316235	11.22	SJRWMD/Brev Co; 1996
23-36-22-00-252	2316270	13.0	SJRWMD/Brev Co; 1996
23-36-22-00-253	2316271	22.62	SJRWMD/Brev Co; 1996
23-36-22-00-255	2316273	9.06	Brevard Co; 2013
23-36-22-00-258	2316275	4.12	SJRWMD/Brev Co; 1996
Total		904.61	

Table 1. A summary of parcels comprising the Pine Island Conservation Area based on Brevard County Property Apraiser information available online at https://www.bcpao.us/Home.aspx.

Mondays and County-approved holidays. This gate provides access to the Education Center which includes the 1875 Sams family cabin, the 1888 Sams family house, a kitchen and public restroom building, and a screened pavilion. The area has an ADA-accessible trail, outdoor educational exhibits, hiking trails and event parking. It is also the site of the Land Management Center which consists of a maintenance shop/office building, equipment storage areas and several tool sheds. Land management and education personnel staff for the Central Region are staged at this location (Figure 4). The Pine Island Road gate is open from 8:30AM to Sunset, 7 days a week, 365 days a year.

This gate provides access to parking, informational kiosks, trails, kayak launches, and a boat launch (for non-motorized watercraft lake access). These trails and amenities are shown on the Pine Island Public Access Map (Figure 4).

The land that is now Pine Island Conservation Area has had significant past alterations including ditches, impoundments, agriculture, pioneer homesites, sand mining and stormwater retention lakes. It has over 10,200 feet of shoreline along the Indian River Lagoon as can be seen in Figure 2. The natural shoreline, vast marshes, mangrove swamps, forests, ponds, brackish creeks and abundant avifauna provide a unique setting for wildlife viewing and outdoor recreational activities.

There are no portions of the Sanctuary that should be declared surplus.

IV. NATURAL RESOURCE DESCRIPTIONS

This section provides descriptions of natural resources which include physical, biological and cultural resources. Physical resources on site are: climate, geology, topography, soils and hydrology. Biological resources include: ecosystem function, flora, fauna, special concern species, and biological diversity. Cultural resources are: archeological, historical, past land-use, and public interest.

Review of the 1943 historical aerial and subsequent aerial imagery of Pine Island (Appendix C) shows that a predominant salt marsh swale system, interspersed by numerous open water ponds, creeks and marshes served to isolate the pine flatwoods habitat on the western portion of the site near the Indian River Lagoon from nearby upland ridge communities to the east. This isolation from the rest of Merritt Island, together with the large pines which historically grew there, created a prominent geographic feature. When viewed from the Indian River Lagoon it would have been appropriately referred to as a “pine island.”

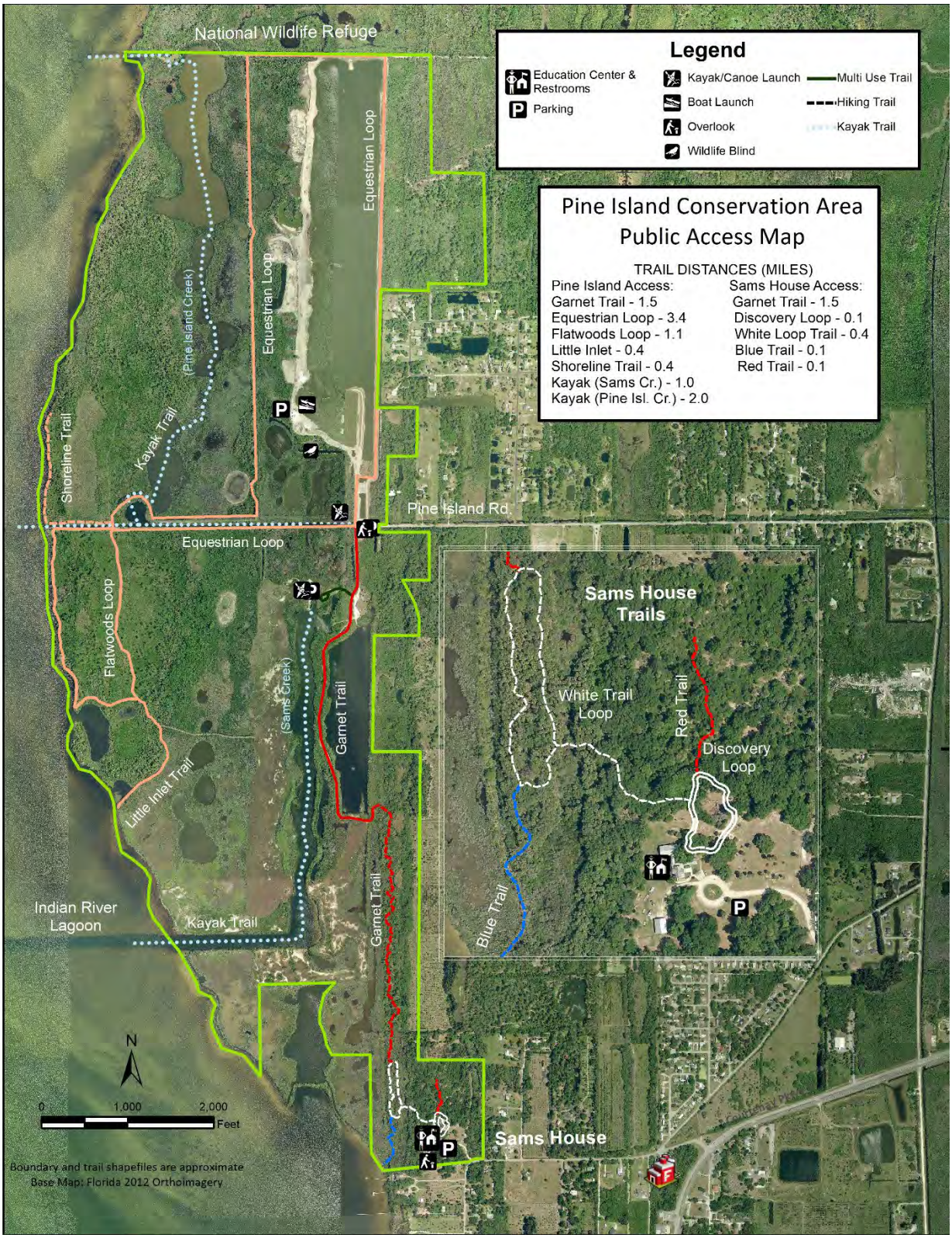

Figure 4. Public Access Map for Pine Island Conservation Area.

A. Physical Resources

1. CLIMATE

The Pine Island Conservation Area is located in east central Florida on Merritt Island, a relic barrier island. It falls within the subtropical climatic zone and lies just southeast of the isothermal junction with the temperate climatic zone. The National Oceanic and Atmospheric Administration's U.S. Climate Normals provides 30-year averages of temperature and precipitation. The following are the 1991-2020 Climate Normals based on Melbourne Weather Prediction Office. Data indicate an average annual temperature of 72.9 degrees Fahrenheit. The maximum Summer temperature is 90.2 degrees Fahrenheit, and the minimum Winter temperature is 52.4 degrees Fahrenheit. Average annual precipitation is 55.28 inches with 21.82 inches occurring in Summer, 16.4 inches occurring in Autumn, 9.28 inches occurring in Spring, and 7.78 inches occurring in Winter (National Oceanic and Atmospheric Administration, 2021.Summer temperatures are moderated by frequent afternoon thunderstorms. Periods of extreme cold weather are infrequent due to the site's latitude and proximity to the Atlantic Ocean and Indian River Lagoon.

There are reliable rainfall records from Titusville that span approximately 100 years, and average 53.8 inches per year. Wet and dry seasons are typically well defined, with the wet season occurring between May and October and the dry season between November and April. Annual and seasonal rainfall is subject to large variation in both amount and distribution. During spring and summer, Brevard County experiences numerous thunderstorms often coupled with frequent lightning strikes.

Prevailing winds are generally from the north to northeast during the dry season (November-April) and from the east-southeast during the wet season (May-October). Weather patterns such as cold fronts and thunderstorms will affect local wind direction depending upon the time of year (Eastern Space and Missile Center, 1989).

Short-term events such as hurricanes and wildfires are common in Florida and can have great impacts on the composition and distribution of species and natural communities in Florida, and Brevard County.

2. GEOLOGY

Merritt Island represents a prominent land feature of the Indian River Lagoon located west of the Cape Canaveral beach-ridge plain. Holocene sea-level rise has been the most significant natural influence on the evolution of both the physical and biological aspects of east central Florida's continental margin (Parkinson 1995). Fluctuating sea levels and glacial-interglacial cycles have shaped the formation of the barrier island (Parkinson 1995). Merritt Island is an old geological feature whose formation may have begun as much as 240,000 years ago, although most of the surface sediments are younger. Surface deposits of Merritt Island and Cape Canaveral are probably of Pleistocene and recent (Holocene) age (Schmalzer and Hinkle 1990). The Cape Canaveral-Merritt Island barrier island complex is unique along the Florida coast. This barrier island complex has been greatly influenced by sea-level changes, erosion and natural

barrier island migration. The Pine Island Conservation Area exhibits typical features of a coastal barrier island; however, some unusual topographic features include the abrupt transition of pine flatwoods to lagoon and the natural depression ponds through the central and western portions of the site.

3. TOPOGRAPHY

The majority of the natural topography of the Pine Island Conservation Area lies at 0' to 5' above sea level. A significant portion of the southeast corner of the site and a small area in the northeast contain elevations from 5' to 10' above sea level. These contour elevations are based upon the 2003 Florida Geological Survey Topographic map (Figure 5).

4. SOILS

Within the Pine Island Conservation Area, mapped soil types vary from excessively drained to very poorly drained. Extensive disruption of natural soil characteristics has occurred in areas of previous sand mining and dredging operations.

The soils within Pine Island were obtained from the Soil Survey Geographic Database (Natural Resource Conservation Service, 2019). These soils are mapped in Figure 6. Soil mapping units occurring within Pine Island are listed below along with approximate percent coverage, general location and a brief description based on the Natural Resource Conservation Service (formerly Soil Conservation Service) Soil Survey of Brevard County (Huckle et al., 1974).

- Anclote sand is mapped on approximately 2% of the site. This soil series consist of a nearly level, very poorly drained sandy soil in marshy depressions in the flatwoods, in broad areas on flood plains, and in poorly defined drainage ways. These soils were formed in sandy marine sediments.
- Basinger sand is mapped on approximately 2% of the site. This soil series is a nearly level, poorly drained, sandy soil in sloughs of poorly defined drainageways and depressions in the flatwoods. These soils formed in sandy marine sediments.
- Bessie muck is mapped on approximately 5% of the site. This soil series consists of very deep, very poorly drained, slow or very slow permeable organic soils in coastal mangrove swamps that are subject to daily or periodic flooding by high tides. They formed in marine deposits of organic materials over clayey and sandy sediments.
- Candler fine sand is mapped on approximately 2% of the site. This soil series consists of very deep, excessively drained, very rapidly to rapidly permeable soils on uplands of Atlantic Coast Flatwoods. They formed in thick beds of eolian or sandy marine deposits.

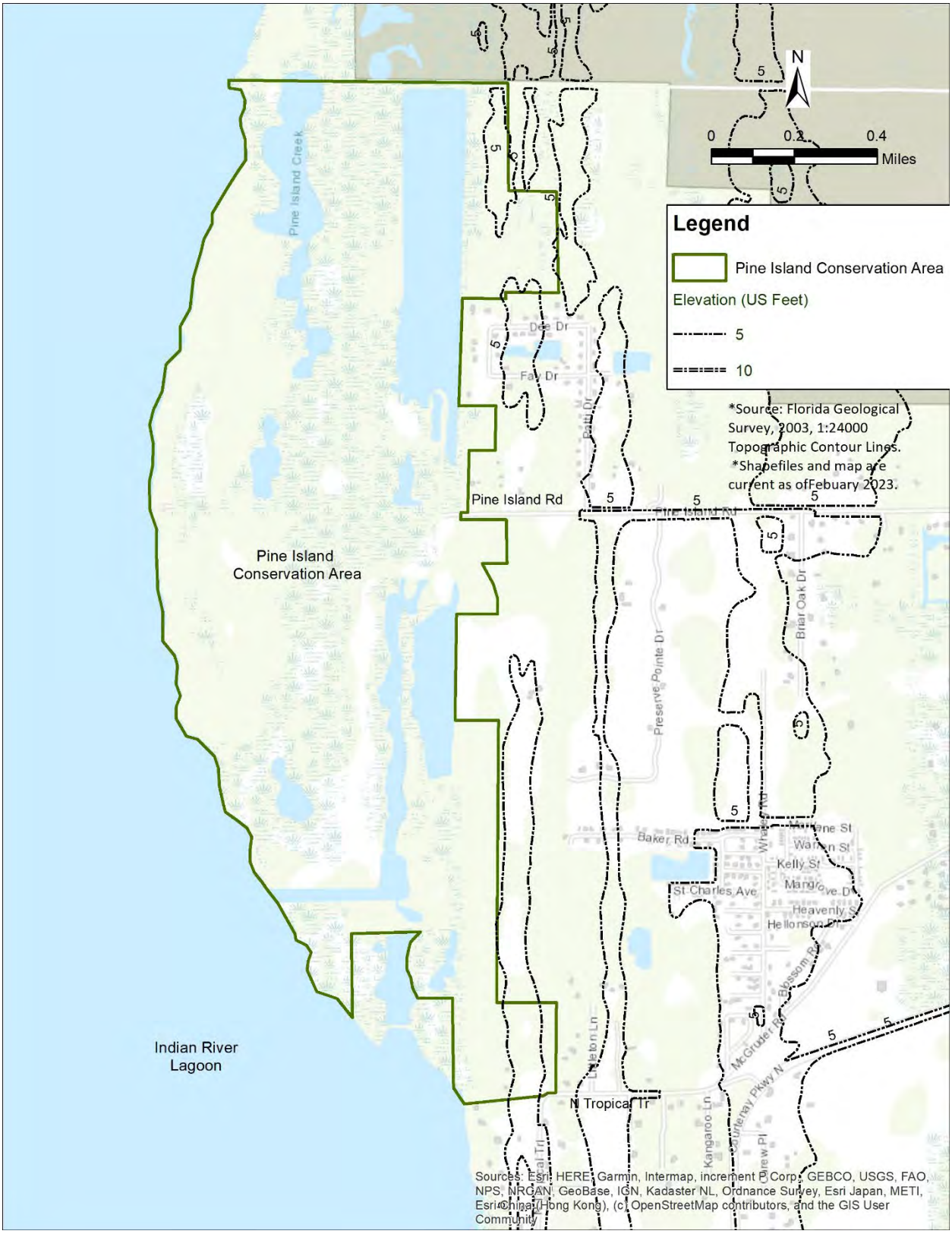

Figure 5. Topographic Map of Pine Island Conservation Area

Figure 6. Soils Map of Pine Island Conservation Area

- Canaveral-Anclote Complex is mapped on approximately 11% of the site. This soil series consists of very deep, somewhat poorly to moderately well drained, very rapidly permeable soils on side slopes of dune-like ridges bordering depressions and sloughs along the coast in peninsular Florida. They formed in thick marine deposits of sand and shell fragments. Anclotesoils are on lower positions [within this complex] and are very poorly drained.
- Immokalee sand is mapped on approximately 7% of the site. This soil series consists of very deep, very poorly drained soils that formed in sandy marine sediments. They are on flatwoods and low broad flats on marine terraces.
- Myakka sand is mapped on approximately 4% of the site. This soil series consists of nearly level, poorly drained sandy soils in broad areas in the flatwoods, in depressions, and in area between sand ridges and ponds and sloughs. These soils formed in beds of marine sands.
- Pomello sand is mapped on approximately 0.2% of the site. This soil series consists of very deep, moderately well to somewhat poorly drained soils that formed in sandy marine sediments. These soils are on ridges, hills, and knolls in the flatwoods on marine terraces.
- Quartzipsamments, smoothed is mapped on approximately 6% of the site. These are nearly level to steep sandy soils that have been reworked and shaped by earthmoving equipment. Many areas are former sloughs, marshes, or shallow ponds that have been filled with various soil material to surrounding ground level or above natural ground level.
- St. Johns sand is mapped on approximately 9% of the site. This soil series consists of nearly level, poorly drained sandy soils on broad low ridges, in sloughs, in poorly defined drainageways, and in shallow intermittent ponds in the flatwoods. These soils formed in marine sands.
- Turnbull and Riomar soils are mapped on approximately 26% of the site. These soil series consist of very deep, very poorly drained, very slowly permeable soils near sea level and are flooded periodically by tidal overwash. They formed in clayey and sandy estuarine deposits. Riomar soils [a Competing Series] are moderately deep to limestone bedrock.
- Water is mapped on approximately 14% of the site. This is open water within the site that is not contiguous with the IRL (includes borrow/stormwater lakes and interior bays).
- Waters of the Atlantic Ocean is mapped on approximately 12% of the site. This is open water within Sams Creek/Rinker Canal.

5. HYDROLOGY

The Pine Island Conservation Area lies within the Federal Emergency Management Agency's FIRMETTE Maps Numbered 12009C0330H, 12009C0327H and 12009C0240H, revised January 29, 2021. These maps are available online at the Agency's Flood Map Service Center website (FEMA, 2021). The majority of Pine Island lies within Zone AE, which is within the 100-year flood plain. A low ridge runs through the southeast portion of Pine Island (the site of the historic home). This area is designated as Zone X, which is an area of minimal flood hazard.

The Florida Department of Environmental Protection was contacted regarding surface water quality classifications on or near Pine Island. The response letter is contained in Appendix B.

The northwest corner of Pine Island Conservation Area is adjacent to the Merritt Island National Wildlife Refuge. The Indian River Lagoon in this area was designated by the Florida Department of Environmental Protection as an Outstanding Florida Water under subsection 62-302.700(9)(b)19, Florida Administrative Code. The Indian River Lagoon adjacent to Pine Island is designated by Florida Fish and Wildlife Conservation Commission as part of Body C Shellfish Harvesting Area #77; it is also a "Class II shell fishing waters" under subparagraph 62-302.700(9)(b)5, Florida Administrative Code.

Review of a sequence of historical aerial photographs reveals approximate dates for the primary man-made disturbances to Pine Island hydrology. Construction of Pine Island Road and the adjacent Judson Canal, and Ransom Road with its adjacent ditch occurred previous to 1943 (Appendix C). The impounding of salt marsh communities for management of the salt marsh mosquitos (*Aedes sollicitans* and *A. taeniorhynchus*) through a method known as "source reduction" took place during the 1960's. The dredging of Sams Creek, and sand mining operations that created the North and South borrow pits (precursors of the current stormwater retention lakes) and various associated berms and spoil piles began in the late 1960s (Appendix C). Mining operations within the borrow pits continued through 1975. Sam's Creek was dredged and its mouth redirected to the west to serve a planned future development. With these alterations it was referred to as "Rinker Canal." This re-direction required dredging a new channel through salt marsh and dumping spoil on the adjacent salt marsh habitat. Spoil from dredging other portions of Sams Creek was also placed in the adjacent marshes.

The physical alterations from the impoundment activities include a system of abandoned perimeter ditches and dikes. Isolation of the salt marshes from the estuarine waters of the Indian River resulted in changes to the floristic and faunal composition of these systems. The greatest impact of the impoundment appears to be to the interior estuarine marshes located north of Pine Island Road (Taylor, 2011). This high marsh community was historically influenced by the Indian River Lagoon through a series of tidal creeks and ponds. The 40 or more years of hydrologic isolation favored the growth of freshwater species such as coastal plain willow (*Salix caroliniana*), wax myrtle (*Morella cerifera*), cordgrass (*Spartina bakeri*), and cattail (*Typha domingensis*). The submerged vegetation within the chain of natural marsh ponds consists of a dense monospecific community of the green alga, Chara (*Chara* spp.), and southern naiads (*Najas quadalupensis*). These impoundment dikes have been breached by erosion in many places, and several culverts have been installed to restore greater hydrological exchange with the Indian River Lagoon. As a result, more salt-tolerant species have returned.

Major hydrological features of the site are:

- Natural Ponds – a chain of natural brackish water ponds lie in the floodplain of the western portion of the property from the north boundary to the mouth of Sams Creek/Rinker Canal. These ponds are shallow water systems surrounded by mangroves, marshes, and pine flatwoods communities. They appear to exhibit seasonal fluctuations in water quality and depth, although no formal studies have evaluated the system.
- Sams Creek/Rinker Canal – represents a predominant deep-water feature within the southern one-half of the site. The canal was dredged between 1967 and 1969 mostly within the natural boundary of Sams Creek but also through high marsh to provide a direct east-

west connection to the Indian River Lagoon. It was excavated to a depth of 12.5 feet to provide access to the Lagoon for a planned development (Parkinson et al., 2012). A variety of estuarine species occur within this open water system.

- Mosquito Impoundments - The berms used to enclose marsh habitat are generally several feet above mean high water and have an adjacent borrow ditch along their interior side. These impoundments generally have a profoundly negative impact on plant, fish, and invertebrate habitat, as well as water quality, in both the impounded marsh and the adjacent IRL (Brockmeyer, 1997). Over time, many of these berms, especially perimeter berms, have suffered significant erosion, and in some areas have been completely washed out. This process has restored some of the natural saltmarsh hydrology at Pine Island. Culverts have also been installed on several interior berms to maintain some flow of water and tidal exchange between marsh areas, ditches and lakes within the Pine Island boundary.
- Judson Canal – This large County-maintained drainage ditch (approximately 25 feet wide) parallels Pine Island Road and dissects Pine Island. The canal drains approximately 6,000 acres of North Merritt Island to the Indian River Lagoon at Pine Island. It also connects to the Sykes Creek basin to the south which drains into the Banana River. This canal appears on the 1943 aerial photo, but not on the 1923 aerial photo (Appendix C).
- North and South Borrow Pits – Pine Island includes two borrow pits that were re-engineered. Prior to the stormwater improvements, untreated stormwater runoff from the surrounding 6,000-acre watershed, composed of residential and agricultural land, drained through the Pine Island Road drainage ditch system into the Indian River Lagoon. From 2011 through 2015, stormwater improvements were constructed to reduce the duration of flooding on North Merritt Island and to enhance the quality of the water conveyed to the Indian River Lagoon. Due to funding constraints, the Pine Island Conservation Area Stormwater Improvement Project was divided into two construction phases. Phase I was completed in August 2012 and included the expansion of the existing north borrow pit into an 80-acre wet retention pond/lake, construction of a diversion weir and an outfall weir, and the installation of a pump station with a single hydraulic pump. Phase II was completed in January 2015 and included the expansion of the existing south borrow pit into a 26-acre wet retention pond/lake, construction of an outfall weir, and the installation of two additional hydraulic pumps. Additional work included removal of Brazilian pepper (*Schinus terebinthifolia*) and the restoration and preservation of salt marsh areas along Sams Creek.

B. Biological Resources

Protection of the natural communities, biological diversity and restoration of altered habitats within the Pine Island Conservation Area depends upon several key management issues such as prescribed burning, exotic vegetation, hydrologic functions, recreational impacts, and monitoring. Species viability is ultimately dependent upon the conservation and restoration of elements that influence ecosystem function. At Pine Island, key management actions consist of: approximating natural fire regimes, removal of invasive exotic species using integrated pest management, restoration of natural hydrologic regimes, reconnecting impounded wetlands, restoring wetlands and creeks, conserving natural shoreline vegetation, protecting against

habitat loss or degradation. Areas of Pine Island along the Indian River Lagoon are experiencing erosion due to periodic storm events.

The distribution and areal extent of large areas of native upland plant species has been significantly altered by the impacts of the past mining operations. Before the establishment of Pine Island Conservation Area, Brazilian pepper (*Schinus terebinthifolia*) was common, forming dense monospecific stands on upland spoil sites created from historic mosquito impoundment, dredging, and sand mining activities. Restoration efforts in these areas have resulted in successful removal and/or control of Brazilian pepper and other exotic invasive plant species, as well as, the removal of approximately 24 hectares of deposited spoil material and the restoration of significant acreage of salt marsh habitat (Taylor, 2011).

1. ECOSYSTEM FUNCTION

After the Merritt Island National Wildlife Refuge, the Pine Island Conservation Area represents one of the largest public acquisition areas adjacent to the northern Indian River Lagoon. With approximately 10,200 feet of continuous shoreline along the Lagoon's eastern shore, Pine Island was identified as being of high importance for providing environmental protection and buffering functions to the Indian River Lagoon ecosystem. Pine Island is contiguous with the southern boundary of the Merritt Island National Wildlife Refuge, thus decreasing the adverse consequences of fragmentation, and increasing contributions to good ecosystem function. Approximately 75 to 95 percent of the original mangrove and saltmarsh acreage historically bordering the Indian River Lagoon has been lost or impacted by filling for development, or impounding and ditching for mosquito control (Taylor, 2011). The Pine Island Conservation Area is a good example of this, having been ditched and impounded in the past for mosquito control and drainage projects, as well as formerly containing 25.4 ha of dredge spoil from a former development project. Since acquisition of Pine Island, many areas of spoil have been removed and restored to historic saltmarsh, and several culverts have been installed to reconnect estuarine systems (Taylor, 2011). The St. John's Water Management District's Stormwater Improvement Project consisting of large hydraulic pumps, re-engineering of two large borrow pits for retention lakes, and installation of various inflows and outfalls have mitigated nutrient load, sediment, and other pollutants flowing into the Indian River Lagoon from the Judson Canal.

2. FLORA

Preliminary floristic lists have been developed for the Pine Island Conservation Area. Plant ecologist Dr. Paul Schmalzer has documented his observations on several visits from 2006 through 2011, and a "bioblitz" event was held in 2016. These lists are contained in Appendix D. Pine Island Conservation Area is characterized by a wide variety of upland and wetland natural community types (Figure 7) as well as disturbed habitats and landscaped areas. There are many examples of high-quality habitats containing a diverse assemblage of native plant species. The location near a climatic isotherm allows many tropical species common further south, like strangler fig (*Ficus aurea*), to exist alongside temperate species like Southern Magnolia (*Magnolia grandiflora*). The ecosystems of Pine Island are adapted to the coastal Florida

environment which includes hurricanes, flooding, tidal surge, salt water intrusion, shoreline erosion, and lightning ignited wildfires. They have also been impacted by changes in the local ecology from historic and present land use practices that include agriculture, sand mining, ditching and stormwater management, mosquito control, impoundments, hunting, roads, powerlines, and residential development.

The vegetation of Pine Island can be described to include natural communities and anthropogenic habitats. A natural community is a distinct and recurring assemblage of plants, animals, fungi and microorganisms naturally associated with each other and their physical environment. Based on the Florida Natural Areas Inventory Guide to the Natural Communities of Florida (FL Natural Areas Inventory, 2010), natural community types occurring on Pine Island are: mesic to hydric flatwoods, mesic hammock, hydric hammock, depression marsh, basin marsh, salt marsh, mangrove swamp, estuarine unconsolidated substrate and tidal creek; (Figure 7). Other habitats or land cover types on Pine Island are the result of significant anthropogenic alteration. These habitats are: stormwater lakes, berms and powerlines, ruderal woodland, scrub restoration (abandoned citrus groves) and landscaped areas.

Mesic Flatwoods

This habitat occurs mostly on the western, central portion of the property and is the feature that gave Pine Island its name. Mesic flatwoods is characterized by an open canopy of tall slash pine (*Pinus elliotti*) or longleaf pine (*Pinus palustris*) and a dense, ground layer of low shrubs, grasses, and forbs on relatively flat, moderately to poorly drained terrain. On the Pine Island Conservation Area, this community is found mostly on the western portion of the site. Typical understory vegetation consists of saw palmetto (*Serenoa repens*), gallberry (*Ilex glabra*), fetterbush (*Lyonia lucida*), and grasses. Occasionally pawpaw (*Asimina reticulata*), tar flower (*Bejaria racemosa*), dahoon holly (*Ilex cassine*), redbay (*Persea borbonia*), and mallow (*Kosteletzkya pentacarpos*) are present. Ground cover contains yellow-star grass (*Hypoxis juncea*), pennyroyal (*Piloblephis rigida*), and big yellow milkwort (*Polygala rugelii*) and various native bunch grasses.

This habitat has been affected by the interruption of historic fire frequencies and the logging of large pines in the past; however, most of the flatwoods habitat has been restored and is under an ecological burning rotation. Prescribed fire in this habitat is planned on a 1 to 3-year rotation with attention to seasonality and intensity of burns. Nearly all plants and animals inhabiting this community are adapted to periodic fires, and many species depend on fire for their continued existence.

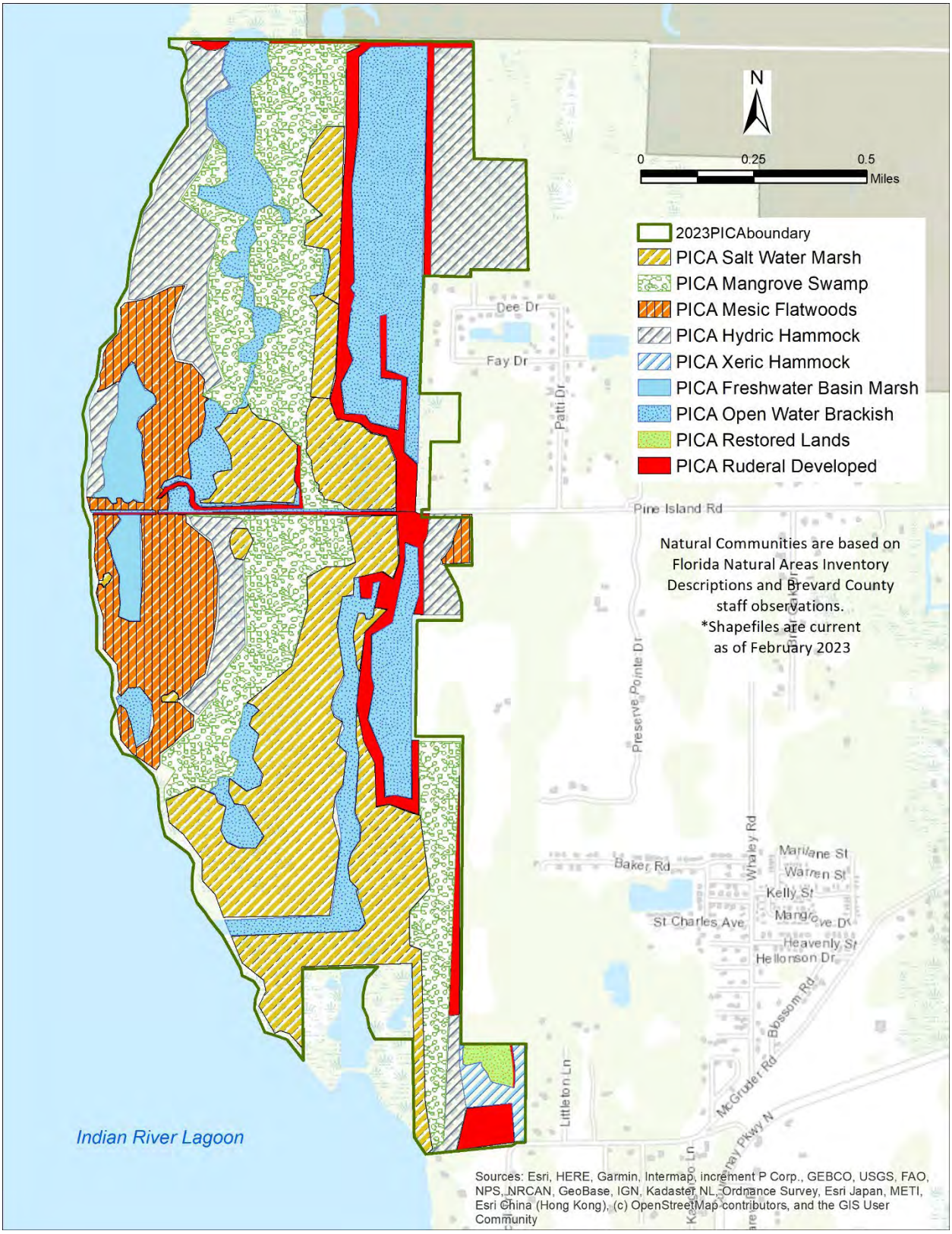

Figure 7. Natural Communities Map of Pine Island Conservation Area.

Hydric Hammock

Hydric hammocks on Pine Island Conservation Area are found adjacent to marsh and mangrove habitats and in swales throughout the site. This community has an evergreen hardwood and palm overstory with a variable understory typically dominated by younger palms (*Sabal palmetto*), wax myrtle (*Morella cerifera*), red cedar (*Juniperus virginiana*), red maple (*Acer rubrum*), wild coffee (*Psychotria nervosa*) and ferns occurring on moist soils. Species composition is mainly influenced by flooding patterns. Frequency and depth of inundation have a pronounced effect on oak canopy composition as well, with saturated soils supporting more laurel oak (*Quercus laurifolia*), and areas of infrequent flooding supporting more live oak (*Quercus virginiana*). Increased salinity is a factor often limiting certain species. Rises in terrain as well as ecotones to mesic hammock induce a greater cover of upland species, specifically southern magnolia, pignut hickory (*Carya glabra*), and saw palmetto.

Basin Marsh

This large wetland area is found in the flatwoods area near the Indian River Lagoon. It is a regularly inundated, freshwater, predominantly herbaceous wetland. It contains southern cattail (*Typha domingensis*), sawgrass (*Cladium jamaicense*), softstem bulrush (*Scirpus tabernaemontani*) and sand cordgrass (*Spartina bakeri*), accompanied by a diverse mixture of less common forbs such as sweetscent (*Pluchea odorata*), spadeleaf (*Centella asiatica*), and lemon bacopa (*Bacopa caroliniana*).

Salt Marsh

These areas are adjacent to or connected to the Indian River Lagoon. They are largely herbaceous habitats in the coastal zone affected by tides and seawater along a bay or estuary. The vegetative composition of the salt marsh communities of the Pine Island Conservation Area have been significantly disturbed by historic mosquito impoundment activities, and the dredging of Rinker Canal (Sams Creek) within the historical tidal creek bed, and through the marsh to intercept the Indian River Lagoon. However, much of the dredged spoil material has been removed to restore salt marsh habitat along Rinker Canal. A few of the perimeter mosquito dikes have eroded over time in several areas allowing for the exchange of estuarine waters to and from the lagoon.

Prevalent species are saltwort (*Batis maritima*), glasswort (*Salicornia virginica*), sea oxeye (*Borrichia frutescens*), salt grass (*Distichlis spicata*), and knotgrass (*Paspalum distichum*). Coastal plain willow is common within the interior marshes located between the flatwoods and Sam's Creek and south of Pine Island Road. Marsh elder (*Iva frutescens*), and christmasberry (*Lycium carolinianum*) often mark the transition to upland vegetation or low berms along the seaward marsh edge.

Mangrove Swamp

This habitat on the Pine Island Conservation Area is a dense forest occurring along relatively flat, low wave energy, marine and estuarine shorelines. Mangroves are common within the high marshes and along the shoreline of Sam's Creek, the Pine Island Canal, and the natural marsh

ponds. The dominant plants of mangrove swamp are red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*), white mangrove (*Laguncularia racemosa)*, and buttonwood (*Conocarpus erectus*). Generally, these four species can occur either in mixed stands or often in differentiated, monospecific zones that reflect varying degrees of tidal influence, levels of salinity, and types of substrate. Many areas on Pine Island formerly of salt marsh have converted to white mangrove-dominated habitat. Mangroves also flourish on the lower edge of the old mosquito dykes and ditches. Mangrove swamp are known to provide important habitat for many rare animal species, including mangrove Gambusia (*Gambusia rhizophorae*), opossum pipefish (*Microphis brachyurus*), and mangrove rivulus (*Rivulus marmoratus*).

Estuarine Open Water Brackish (Marsh Ponds and Tidal Creek)

These areas are generally characterized as expansive, relatively open areas of subtidal, intertidal, and supratidal zones which lack dense populations of sessile plant and animal species. These areas on Pine Island include marl, mud, mud/sand, sand or shell. They temporarily exhibit freshwater conditions during periods of heavy rainfall or upland runoff or marine conditions when rainfall and upland runoff are low. Seawater coming in to these areas is significantly diluted with freshwater inflow from heavy rain events.

Retention Lakes

These two stormwater and flood control retention lakes are part of an engineered drainage system connected to the Judson Canal, Sams Creek, and ultimately the Indian River Lagoon. These two lakes (created from former borrow pits) receive freshwater through Judson Canal from the surrounding approximately 6,000-acre watershed, composed of residential and agricultural land. They also receive backflow of brackish water from Sams Creek and the western portion of Judson Canal. Stormwater from the lakes is not discharged into wetlands on the Pine Island Conservation Area. Avoiding any direct stormwater discharges to natural wetlands on-site protects the ecological and hydrological integrity of natural wetlands on the site. Based on analysis by Dustin Everitt of Florida Fish and Wildlife Conservation Commission (personal Communication) in September 2018, salinity levels in these lakes are best suited to saltwater fish species or euryhaline freshwater species, water quality is adequate, dissolved oxygen is 4.9mg/L, pH is 8.2 and specific conductivities are from 6000-8000µS (Appendix I). The lake south of Pine Island road contains several small rookeries composed mostly of mangroves.

Scrub Restoration Area

The abandoned citrus grove being restored to Florida scrub and scrubby flatwoods occurs on a low relief ridge of well-drained Candler fine sand in the southeast portion of the site near the historic home. The predominant vegetation cover within this disturbed area before restoration efforts began was remnant citrus trees (*Citrus* spp.), Guinea grass (*Panicum maximum*), cabbage palms (*Sabal palmetto*), lantana (*Lantana camara*), muscadine grape (*Vitis rotundifolia*), laurel oak (*Quercus laurifolia*) and greenbrier (*Smilax* spp.). Other pioneering native species are also colonizing within this area including: beautyberry (*Callicarpa americana*), winged sumac (*Rhus copalina*), sand hickory (*Carya floridana*), coral bean (*Erythrina herbacea*), broomsedge (*Andropogon* spp.), slash pine (*Pinus elliottii*), St. Johns wort (*Hypericum sp.*).

The natural community types generally associated with undisturbed Candler fine sands on Merritt Island are oak-saw palmetto scrub or scrubby flatwoods. This area was chosen for restoration due to the high density of exotic/invasive plants and the opportunity to restore a historic natural community that would support native wildlife in the area, especially the sizable population of gopher tortoises around Sams House.

The project's first phase included working with the Florida Forest Service and installing the perimeter firebreaks and roller chopping in 2015. Cabbage palms and larger laurel oaks were reduced and chipped or left onsite. Guinea grass took control of the unit over the next 6 months and the unit was included in the overall October 2015 Invasive Plant Management Grant through FWC. The unit was burned on March 22, 2016. The second phase included dividing up the six acres into three separate and equal units numbered 5, 6, and 7 in Figure 8. After the initial burn, returning plant growth consisted of 90-95% exotics. Guinea grass being the main plant species within the six acres.

Due to the small size of the area invasive exotic vegetation is being targeted by backpack herbicide sprayer to avoid collateral damage to non-target species. We are allowing native species to out compete the invasive exotic vegetation, then managing these species using mechanical reduction, prescribed fire and limited herbicide to allow for the establishment of more desirable native scrub and scrubby flatwoods vegetation. We are supplementing natural regeneration from surrounding seed source with seeds from local scrub/scrubby flatwoods plants. The burn history of this restoration project is included in Figure 8.

Ruderal Berms and Powerlines

The stormwater lakes are surrounded by mowed berms, and the portion of Pine Island Road within the site boundary also includes a mowed berm. These areas are mostly turf grasses and weedy vegetation bordered by various natural communities. The old mosquito dikes are found along salt marsh and mangrove swamp edges. They support hammock-adapted species like live oak, red cedar, cabbage palm, groundsel tree (*Baccharis halimifolia*) and wax myrtle. A large power transmission line right-of way runs east-west just north of Judson Canal. Vegetation within this footprint varies from wet flatwoods to mangrove swamp to open water and is mechanically reduced by others on an as needed basis to maintain the powerline.

Ruderal Woodlands

Former agricultural areas have been colonized by native pioneer species. These areas vary from tall canopy, open understory to shrubby, vine-covered openings and occur on a low relief ridge of well-drained Candler fine sand in the southeast portion of the site near the historic home.

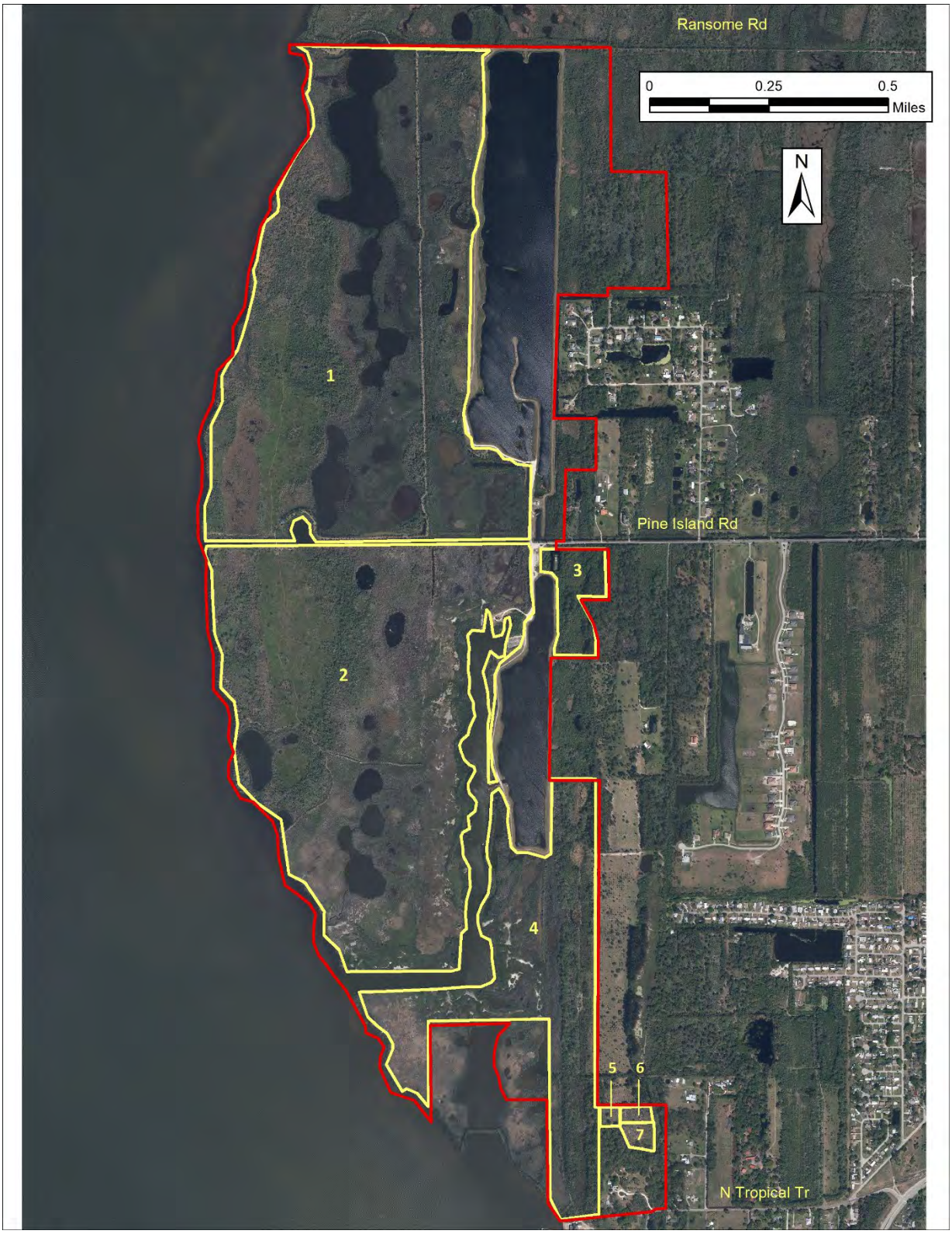

Figure 8. Pine Island Conservation Area Land Management Units.

These areas tend to be dominated by laurel oak, slash pine, cabbage palm, sand hickory, sour orange, (*Citrus x aurantium*), beautyberry, muscadine grape, greenbrier (*Smilax sp*.), and various weedy herbs and grasses.

Landscaping

Landscaped areas are located around the Sams House site and consist of turfgrass parking and event areas, landscaping (mostly native) around buildings, exhibits, parking areas, and a native habitat garden.

3. Fauna

Faunal surveys have been completed for various categories of fauna, and there have been many documented observations by staff and other experts. This has resulted in Several species lists for the Pine Island Conservation Area. Union University (Jackson, Tennessee) Ornithology students have provided bird counts in 2014, 2016 and 2020. A Bioblitz event in 2016 has documented observations of various fauna categories on the Pine Island property. Butterfly and skipper surveys have been conducted by Mr. Jim Escoffier for the past 16 years on the property. A snake survey by Mr. Frank Robb was conducted in 2017. The high natural community heterogeneity characterizing the site provides suitable habitat conditions for use by a broad range of native animal species.

Species readily visible on the Pine Island Conservation Area include: American alligator (*Alligator mississippiensis*), West Indian manatee (*Trichecus manatus latirostris*), bottlenose dolphin (*Tursiops truncatus*), otter (*Lutra canadensis*), white-tailed deer (*Odocoileus virginianus*), gopher tortoise (*Gopherus polyphemus*), bobcat (*Lynx rufus*), Virginia opossum (*Didelphis virginiana*), Eastern cottontail rabbit (*Sylvilagus floridanus*), feral hog (*Sus scrofa*), bald eagle (*Haliaeetus leucocephalus*), a variety of wading birds, migratory game birds, neotropical migrants like the painted bunting (*Passerina ciris*), black racer (*Coluber constrictor*), garter snake (*Thamnophis sirtalis*), and a variety of butterflies, moths, bees and other native pollinators. Pine Island is also known as a productive site for recreational saltwater fishing. Large schools of mullet (*Mugil cephalus*) and other salt water species occur in Sam's Creek, the Indian River Lagoon, and the retention lakes. Below are further details regarding the fauna of Pine Island.

Insects

General insect surveys should include the use of year-long methods, such as Malaise and pitfall traps. These quantifiable methods of surveying in the future will document any listed insect species and provide a survey of insects through the seasons.

Extensive surveys of butterfly and skipper species going back to 2004 has been conducted on the site by Jim Escoffier of Merritt Island. Mr. Escoffier and his volunteers have gathered data that includes species identification, number or individuals, time of day and notes on conditions. His surveys were conducted throughout each year and cover all seasons. These surveys identified nearly 40 species of butterflies and skippers (Appendix E).

In accordance with Florida Statutes Section 388.4111, all environmentally sensitive and

biologically highly productive lands are required to have a state approved arthropod control plan. The Brevard County Mosquito Control Department has provided an arthropod control plan for designated public lands that that cover all Environmentally Endangered Lands Program properties including Pine Island and identifies procedures for managing mosquito populations there. Brevard County Mosquito Control will adulticide only when populations exceed the landing rate thresholds, or when the potential for transmission of a mosquito-borne disease outbreak becomes sufficient, or if there is a quantifiable increase in numbers of pestiferous mosquitoes or other arthropods.

According to the Plan, "surveillance shall be conducted to determine the species and numbers of both pestiferous and disease bearing arthropods. The surveillance program provides information as to species and amounts of mosquitoes which may require larviciding and adulticiding." Surveillance techniques proposed are landing rate counts, light traps, sentinel chickens, citizen complaints and larval dips. Arthropod species for which control is proposed are: *Aedes taeniorhynchus, Aedes sollicitans, Culex nigripalpus* and *Culex salinarius*. Proposed larval monitoring is three or more dips per location at specific sites with action for 10 percent or more positive dips. Biological contorl of larvae may include predacious fish, *Bacillus thuringiensis israeliensis*, *Bacillus sphaericus*, Methoprene and non-petroleum surface film. This can be done by ground or aerial (except for fish). Proposed adulticide for use by ground or aerial is Divrom/Permethrin through ultra-low-volume application. The Mosquito Control Department may request special exception to the plan during a threat to public or animal health declared by State Health Officer or Commissioner of Agriculture. The approval of the plan acts as notification procedure for control activities. The Brevard County Arthropod Control Plan is available by request from the Mosquito Control Department, 800 Perimeter Road, Titusville, FL 32780, phone: 321-264-5032.

Currently, the Environmentally Endangered Lands Program does not possess any documentation of past aerial mosquito spraying. However, the most recent spray dates are publicly posted on the Brevard County Mosquito Control website and the area containing Pine Island is listed as being sprayed by aircraft during "daylight hours" (Brevard, 2024).

Birds

Wading birds and migratory birds are some of the most widely recognized elements of biological diversity in the Indian River Lagoon region and the Pine Island Conservation Area. On February 14, 1998, a team of local Audubon birders identified 62 species of birds during a one-day survey of the Pine Island Conservation Area. Union University has also done surveys, as did the 2016 Bioblitz participants (Appendix F).

There are eagles and ospreys nesting in the Sanctuary. High-priority species, as determined by Florida Fish and Wildlife Conservation Commission, observed on site are American black duck (*Anas rubripes*), mallard (*Anas platyrhynchos*), mottled duck (*Anas fulvigula*), northern pintail

(*Anas acuta*) and blue-winged teal (*Anas discors*). Priority waterfowl species, as designated by the U.S. Fish and Wildlife Service, observed on site include ring-necked duck (*Aythya collaris*), canvasback (*Aythya valisineria*), wood ducks (*Ais sponsa*) and redhead ducks (*Aythya americana*). Other species present on the Sanctuary include white ibis (*Eudocimus albus*), wood stork (*Mycteria americana*), great egret (*Casmerodius albus*), brown pelican (*Pelecanus occidentalis*), American white pelican (*Pelecanus erthrorhynchos*), reddish egret (*Egetta rufescens*), snowy egret (*Egretta thula*), roseate spoonbill (*Ajaia ajaia*), tricolored heron (*Egretta tricolor*), little blue heron (*Egretta caerulea*), black-crowned night heron (*Nycticorax nycticorax*), killdeer (*Charadrius vociferous*) and a variety of species of terns.

Formerly duck hunting was allowed on the chain of open water natural ponds within the interior marshes north of Pine Island Road in accordance with Florida State regulations and during the appropriate season. These open water areas support a great variety of migratory waterfowl. Hunting was discontinued on Pine Island previous to 2005. Currently there is no hunting allowed on the property with the exception of trapping or shooting invasive feral hogs by County-approved trappers.

Reptiles and Amphibians

There is a need for more extensive species surveys, especially in the depression marshes and ponds, which may support a wide variety of frogs and other amphibians. Lists of observed amphibians and reptiles from the 2017 BioBlitz event, as well as a snake survey conducted April to July of 2017 by Mr. Frank Robb, are shown in Appendix G.

Staff members conducted a survey of gopher tortoise burrows at Pine Island in 2016 a short time after a prescribed burn. They documented the location of burrows within the burned units which included Units 5, 6, and 7, and recorded evidence of tortoise occupation by labeling each burrow as “active” or “inactive.” This survey found 41 total burrows with 30 being active and 11 being inactive.

Mammals

There is a need for more extensive mammal surveys, especially for small rodents. A small mammal survey using Sherman traps should be conducted in the future. A list of mammals observed on Pine Island is shown in Appendix H.

Fish

On September 11, 2018 Dustin Everitt and team from Florida Fish and Wildlife Conservation Commission made field observations within the North and South Retention Lakes. Fish species observed on and adjacent to the site include: Spotted seatrout (*Cynoscion* spp.), red drum (*Sciaenops ocellatus*), black drum (*Pogonias cromis*), ladyfish (*Elops saurus*), common snook (*Centropomus undecimalis*), redfish (*Sebastes* spp.) tilapia (*Oreochromis aureus*), bluegill (*Lepomis macrochirus*), Atlantic needlefish (*Strongylura marina*), striped mullet (*Mugil cephalus*) and tarpon (*Magalops atlantus*). Mr Everitt’s email containing the observations from the site visit and recommendations for future management is in Appendix I.

4. Designated Species

The US Fish and Wildlife Service under the Endangered Species Act of 1973 and the State of Florida under the auspices of the Florida Department of Agriculture and Consumer Services are responsible for the listing of protected species. Classifications of protected plants and animals are either “Endangered” or “Threatened.” These are species under the possible threat of extinction. The Florida Fish and Wildlife Conservation Commission utilizes two additional categories called, “species of special concern,” for several animal species that may ultimately be listed as endangered or threatened, and “Commercially Exploited.” These classifications provide the listed species with a particular level of protection that varies from species to species.

The Florida Natural Areas Inventory was consulted for a list and descriptions of designated species documented on or near the Pine Island Conservation Area (Element Occurrences). Kerri Brinegar from the Inventory responded on January 8, 2019 with the following information. Her letter is included in Appendix B and indicates that there are no element occurrences within the boundaries of Pine Island. Nearby element occurrences consist of Florida scrub-jay (*Aphelocoma coerulescens*) documented in 1981, Curtiss’ sandgrass (*Calamoviifa curtissii*) in 1994, bald eagle (*Haliaeetus leucocephalus*) in 2003, sand pine scrub ataenius beetle (*Haroldiataenius saramari*) in 2001, and scrubby flatwoods habitat type in 1981. These locations are not provided to the general public but can be obtained through the Florida Natural Areas Inventory, 1018 Thomasville Road, Suite 200-C, Tallahassee, FL 32303. Other designated State or Federal protected species that have been seen on the property during various surveys or by staff include: sandhill crane, brown pelican, white pelican, wood stork, roseate spoonbill, reddish egret, tricolored heron and little blue heron.

A primary management goal is to develop and implement strategies to enhance conservation of threatened, endangered, or endemic species. The following is information on existing listed species or species that may occur on the Pine Island Conservation Area.

Plants

Curtiss’ sandgrass (*Sporobolus vaseyi*) is a State Threatened (T) endemic grass and the only listed plant species documented near Pine Island.

Animals

There is a significant population of gopher tortoise throughout the property, especially in the southeast portion. The gopher tortoise is currently listed as Threatened (T) by the state of Florida and is listed as a Candidate species currently under review by the United States Fish and Wildlife Service. In 2020 the Fish and Wildlife Service wrote that “the gopher tortoise warrants listing range wide. Thus, we consider the eastern population of the gopher tortoise, which is not yet listed, to be a candidate species.” (Federal Register, 2020)

Bald eagles have been observed and there is currently there is at least one active nest on Pine Island. The USFWS removed the Bald Eagle from the list of federally endangered and threatened species in August 2007. Although no longer protected under the Endangered Species Act, the level of protection has not changed and continues to be federally protected

under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. In Florida, it continues to be protected under the State's Bald Eagle rule, F.A.C. 68A-16.002.

The diamondback terrapin (*Malaclemys terrapin*) is a rare and potentially endangered species. Florida Fish and Wildlife Conservation Commission is currently conducting a biological status assessment of the diamondback terrapin in Florida. The Florida coastline represents approximately 20% of the species' range and is home to five of seven subspecies, three of which occur only in Florida. However, little is known about the status and distribution of diamondback terrapins in Florida, and stakeholders are concerned about a perceived decline. One of the subspecies, the east coast terrapin (*Malaclemys terrapin tequesta*), has been studied in the Merritt Island area to assess a "density and multistate occupancy sampling approach." This study includes some observational data on occurrence and behavior of the east coast terrapin but is mostly aimed at advancing the methodology of future studies (Breininger 2019).

5. Biological Diversity

The Pine Island Conservation Area exhibits a diverse plant community reflected by the complex diversity of soil types and hydrological regimes. The maintenance and protection of this diversity will rely on the continued use of prescribed fire. No surveys have been performed on the property specifically designed to measure biological diversity, (both richness and evenness) and surveys of this type should be done as staff and resources are available. Sampling protocols exist for all flora and fauna groups. Quantitative information on the abundance of species will enable the land manager to make more informed decisions on such issues as public access and usage.

C. Cultural

1. Archaeological

Pine Island Conservation Area contains a great deal of history throughout the site. Multiple sites are listed in the Florida Department of State's Division of Historical Resources Master Site File. Extensive archeology has been conducted on the property by Thomas E. Penders and is documented in the Master Site Files. The Master Site File sites currently within Pine Island Conservation Area include: 8BR61, 8BR63, 8BR889, 8BR1872, 8BR1873, BAR permit 1516.003, 8BR2350, 8BR2351, 8BR1890 and 8BR1891. A letter of response from the Florida Division of Historical Resources detailing information in the Florida Master Site File is provided in Appendix B. Because of the potential for vandalism and looting, the Division of Historical Resources requests that distribution of location information for archaeological sites be limited. To obtain a copy of any of the site files mentioned here, contact the Florida Master Site File, R. A. Gray Building, 500 South Bronough Street, Room 425, Tallahassee, FL 32399-0250, or the Brevard County Environmentally Endangered Lands Program, 91 East Drive, Melbourne, FL 32904.

As significant archaeological sites are discovered, specific policies will be implemented that will serve to protect these sites from disturbance. Program staff will consult with the State Archives of Florida before taking actions that may adversely affect archaeological resources. It is intended that all management staff be certified Archaeological Resource Managers and receive

training through the State Authority to conduct active monitoring of all sites. If significant archaeological sites are discovered, policies will be implemented that will serve to protect them from disturbance. Environmentally Endangered Lands staff will consult with the Division of Historical Resources before taking actions that may adversely affect archaeological resources.

Sams Mound, Master Site File 8BR63, is the site of an aboriginal earthen mound structure that straddles the southern property boundary lying both on Pine Island Conservation Area and on the abutting private property to the south. The portion of the mound on Brevard County property is forested and marked with signs limiting visitor access. A trail to the foot of the mound with an interpretive kiosk allows the public to view and appreciate this site. This mound was partially excavated in 1895 by C.B. Moore and at that time it was approximately 100 feet in diameter and 11 feet tall. According to the Master Site File, Moore stated that "The mound, entirely surrounded by a trench, presents a striking appearance, giving the impression of greater altitude..." Moore excavated five to six feet deep within an area 28 feet in diameter in the central portion of the mound. Moore found only "a few scattered human bones immediately beneath the surface," and an undescribed "sherd of considerable size" at five feet depth. A fragment of chipped chert was also found "loose in the sand." Beyond that, he says that "nothing was encountered and the sand, coarse and yellow, had the raw look peculiar to mounds containing no organic remains." Erving Rouse (Rouse, 1950), who studied Moore's documents, confirms that Moore did find "a few scattered human bones immediately beneath the surface." No further archeology has been done on this site. However, a ground-penetrating radar survey was conducted in 2005 which, according to the Master Site file, detected "anomalies" in the mound. However, the survey results were inconclusive as to what the anomalies represented.

Archeological studies were commissioned during the salt marsh restoration along Sams Creek when large fossils were discovered in the spoil being removed (BR1890). These fossils included well-preserved mastodon vertebrae and tusks, giant land tortoise, camel, glyptodont, horse, giant armadillo, peccary, and tapir. Paleo-environmental analysis of subsurface data suggests that the accumulation and preservation of late Pleistocene coastal bone beds around Sams Creek were initiated after the "sea-level high stand" that occurred around 125 thousand years ago. Faunal remains accumulating in the karst landscape depressions before or during the subsequent Holocene sea-level rise were less likely to be disturbed and may have been submerged by anoxic groundwater (Parkinson, 2012).

The Sams House site is a multi-component site which spans from the Middle Archaic Period (5,000-3,500 BC) through Malabar I period (500 BC to AD 750) with a historic occupation dating from 1879 to present (BR63). The prehistoric site consists of a scatter of material, mostly potsherds known as St. Johns Plain, Sand-Tempered Plain, and Belle Glades Plain, some flakes of stone from making tools, a coquina grinding stone, and one spear point. There is a pattern suggesting individual homes (or family units) or areas where specific activities were happening. The site is unique for the coastal area as there is almost no shell or areas that archaeologists call middens.

2. Historical

Oral history indicates that the Pine Island Conservation Area may have been used for turpentine collection, and the typical “cat face” scars resulting from this operation have been noted on some pines. The portion of the site associated with the two historic houses dates to the 1870s. Artifacts from this site included dishes and bottle fragments, square nails, and animal bones. The Sams cabin (Sams House #1, 8BR1873) was attached to the northeastern corner of the main house (Sams House #2, 8BR889) via a kitchen which was constructed in the 1950s. The Sams cabin was constructed in 1875 in Eau Gallie by John H. Sams. After crop failure the house was disassembled and moved via the Indian River to its present location in 1878. Some of the windows retain their original glass panes. The house originally sat upon pine piers that have been replaced with block. The interior of the house is a mixture of recent (1890s-1950s) improvements including partially covering the walls with bead board panels and the installation of gas and electrical light fixtures. Square nails from its original construction can be seen on the house.

Historic Properties Associates, Inc. identified Sams House #2 in 1990 during a survey of Brevard County. It was described as dating to the Spanish American War Period. However, research by local historian Bob Gross suggests the house was actually built circa 1888. It is a two-story wood frame vernacular house with an exterior façade of wooden drop siding.

There is a high potential for more information to be recovered from future excavations within and around the historic component of the site. According to the Master Site File, remains of the citrus packing house, dock and kitchen structure have not been officially located, and only one privy location has been found. However, the location of cement footers and pieces of old machinery most likely belonging to the packing house is known to staff. Also, the location, remains, and possible artifacts from the homestead of Martha Edwards Sams LaRoche and her husband Benjamin B. LaRoche have not been located. Martha (daughter of John Hanahan and Sarah Stanyarne Sams) is known to have established a home with her husband just north of Sams House around 1886 on what is now Pine Island Conservation Area land (Pine Island Preservation Society, 2020). The old road, Possum End Road, and adjacent ditch that served these families is still there.

Environmentally Endangered Lands Program staff will consult with the Florida Division of Archives, History, and Records Management before taking actions that may adversely affect historical resources.

c. Land-Use History

The property has likely been used for turpentine collection, grazing, fishing and hunting, and logging in the past. Pioneer settlers, the Sams family and others, cultivated citrus trees, vegetables and pineapples along the upland ridge in the southeast portions of the property.

Sand mining operations that created the North and South Borrow Pits and various associated berms, spoil piles, and the dredging of Sams Creek began in the late 1960s. Mining operations continued through 1975 leaving large areas of upland spoil, dirt roads, and open water pits. Mr.

Sal Palma operated the mine which also had support facilities including a weigh scale, vehicle fueling area and vehicle maintenance area. Dredging and filling activities conducted in support of the mining operation altered large areas of historic salt marsh.

As a large, vacant private property, Pine Island was exposed to illegal access for many years. Land use impacts associated with illegal dumping, unauthorized hunting, firearm use and arson caused previous landowners, Pine Island Harbor Associates, Inc., to enter into a verbal agreement with the Pine Island Hunting Club to use the property. This greatly reduced the undesirable activities.

A hunt camp structure was formerly located in the northwest corner of Pine Island as is evident on the 1972 aerial (Appendix C), and several duck blinds were within the northern marsh ponds. These structures no longer exist.

The property was slated for residential development at some time after mining operations ceased, but development did not progress much past the planning stage. Today the borrow pits have been converted into stormwater treatment ponds and many other disturbed areas restored to natural habitat.

4. Public Interest

Before purchase, the portion of the property accessible from Pine Island Road was a popular off-roading site for all-terrain vehicle (ATVs) users. Because of their very damaging impact on the environment, the use of off-road vehicles such as ATVs, are not authorized on Environmentally Endangered Lands Sanctuaries. Appropriate portions of the property boundary have been fenced off, partly in an effort to enforce this policy. The five-year waterfowl hunting plan for Pine Island that was approved in 1999 is no longer in effect. No hunting (with the exception of invasive feral hogs by permit) is allowed on the Sanctuary. Fishing of all waterbodies on site is allowed and follows Florida Fish and Wildlife Conservation Commission regulations. Motorized, gas powered watercraft are not allowed in the two retention lakes due to pollution concerns. The Environmentally Endangered Lands Program encourages passive recreational use within Pine Island Conservation Area.

V. FACTORS INFLUENCING MANAGEMENT

A. Natural Trends

Past and future natural trends that influence resource values or management strategies are associated with regional climate, storm events, water quality, hydroperiod, fire characteristics, and biological diversity. Global trends like climate change and sea-level rise can cause potential threats that are difficult to accurately predict or assess. In each case, appropriate management strategies that protect natural ecosystem functions and biological diversity will enable the site to respond to these stochastic trends.

Alterations associated with climate have significant effects on these ecosystems due to the natural landforms contained within the Pine Island Conservation Area (low ridges, estuaries,

shorelines), and its location near the subtropical-temperate climatic isotherm. Several natural trends are evident on site including natural erosion along the Indian River Lagoon shoreline associated with periodic storm events. This is resulting in the gradual loss of natural upland habitat in some areas adjacent to the Lagoon, but in areas containing shoreline dikes it is resulting in the restablishment of hydrologic connections to interior marsh habitats. Predicted sea-leval rise could accelerate erosional forces and increase flooding in low-lying habitats leading to changes in the types of natural communities on site (Foster et al., 2017).

According to the National Climate Assessment, ecosystems of the Southeast and Caribbean are exposed to and at risk from sea-level rise, especially tidal marshes and swamps. Some mangrove forests around the world, which are adapted to coastal conditions, are expanding landward, and the pace of sea-level rise will increasingly lead to inundation of coastal wetlands (National Climate Assessment 2014). The Environmental Protection Agency has documented how shorelines constantly change because of erosion, sedimentation, and sea-level rise, and that during the last century, sea levels rose approximately 6 to 9 inches worldwide and 9 inches along the coast of East Central Florida (McCue 2010). Changes in hydroperiod, water level, storm surge events and erosional processes have the potential to significantly alter community structure. These ecological conditions should be monitored and mitigated for when appropriate. Further improvements and restoration projects that re-establish or approximate natural hydrologic conditions or restore natural shorelines can be undertaken as funding and staff time allows. Specifically, remaining opportunities for restoration include the installation of living shorelines (National Oceanic and Atmospheric Administration, 2015) and the removal of derilict mosquito impoundments (Taylor, 2011; Brockmeyer et.al., 1997).

Fire is a critical natural disturbance in many Florida habitats including several of those on the Sanctuary. These pyrogenic systems which include pine flatwoods, scrub, and grass-dominated marsh are adapted to periodic fires. They depend on fire to maintain their plant and animal diversity and natural ecology. The lack of fire in these habitats changes both their composition and the structure. In the absence of fire, invasion by non-fire adapted species like laurel oak and white mangrove changes the character and quality of these natural communities eventually converting them to other types of habitats that are less desirable. Within the Pine Island Conservation Area, prescribed fire is being used where possible to approximate the historic natural fire regime and to insure the continuation of flora and fauna unique to these pyrogenic natural communities.

B. Human-Induced Trends

Human influences on site include fire suppression and alteration of natural fire cycles, invasion of exotic species, alterations in hydroperiod and water quality, past sand mining operations, vegetation management on powerline right-of-ways and impoundments and recreational use.

Naturally occurring fires have been suppressed during the last three decades in an effort to protect the public, agriculture, towns, homes, infrastructure, and other development. Human

fragmentation of the landscape further acts to suppress natural fires. The legacy of fire suppression can result in plant and animal compositions that are different than what might have existed historically as fire-maintained ecosystems. A more natural cycle under the prescribed burn plan is addressing this problem. The Fire Units are shown in Figure 8.

Invasion of exotic species is most often the result of human disturbance. Guinea grass (*Panicum maximum*), cogon grass (*Imperata cylindrica*) and Ceasar weed (*Urena lobata*) can spread via grass mowers and feral hog fur, and they are well adapted to soil disturbance. Other problematic plant species include Brazilian pepper, rosary pea (*Abrus precatorius*), melaleuca (*Melaleuca quinquenervia*), Cogon grass and Lygodium (*Lygodium microphyllum*). Soil disturbance is the most significant impact from feral hogs, which are the only exotic animal species being controlled by staff on site. Any new occurrences or infestations of invasive plants or animals will be addressed immediately where possible.

There are historical land alterations throughout the property. These alterations have likely caused significant changes to drainage patterns, surface water and ground water levels in the site. The primary changes in the hydrologic character of land within Pine Island has come from mosquito control operations, drainage canals/ditches, dredging operations in Sams Creek, past sand mining, past development site preperations, and most recently the construction of stormwater management facilities. These factors have reoriented the natural hydrologic trends on site. However, the largest and most recent alteration was the establishment of the stormwater control structures.

Past sand mining operations occurred in the central-eastern portion of the site to the north and south of Pine Island Road. This activity created two large ponds/lakes, and extensive spoil deposits which include levees and graded uplands. Dredging took place within and adjacent to Sams Creek to a depth of approximately fifteen feet. Spoil from this was deposited on adjacent marsh habitat. These activities resulted in major loss of wetland habitats on site, and a change in topography and hydrology in the area. Past restoration efforts in this area have included re-grading spoil piles, replanting of native species, and hydrologic reconnections.

A major electric transmission line runs through the center of the property just north of Pine Island Road. The easement is mowed/mulched periodically to reduce woody vegetation by the managing utility.

C. External Influences

There is evidence that access by foot for the purposes of hiking, hunting and fishing occurred along the eastern boundary of the Sanctuary for many years. Off-road vehicles have also entered the site from Pine Island Road and certain points on the eastern boundary. The Environmentally Endangered Lands Program has responded to this by replacing fence sections where necessary, making sure that boundary signs are replaced when damaged or stolen, and meeting regularly with law enforcement to review specific problems.

Pine Island is partially surrounded by residential development. Possible influences from this include stormwater runoff, groundwater pollution, light pollution, noise, road kill, habitat fragmentation, hydrologic alterations, invasive plant and animal species, and feral domestic animals. The introduction of exotic plant species by wind and animal dispersed seeds and

spores are particularly prevalent where abandoned citrus groves abut the property. Adjacent natural areas may also harbor invasive species of both plants (like Brazilian pepper) and animals (like feral hogs).

D. Legal Obligations and Constraints

There is a 100-foot wide Florida Power and Light easement located on the north side of Pine Island Road, which runs in an east-west direction. This easement is recorded in Official Record (OR) Book 586, page 90 and 103 of the Brevard County Public Records. The previous owners of Pine Island granted an easement over the main canal in Sam's Creek to Merritt Island Road Materials, Inc. for the purpose of dredging. The easement was granted in November 1968, as recorded in OR Book 1160, page 538 of the Brevard County Public records. According to the specifications of the easement, upon completion of the canal, the sole users can be the grantor (Pine Island Development Corp.), the grantee (Merritt Island Road Materials, Inc.), and their successors. It appears that this easement has reverted back to the grantor and is no longer in effect.

Florida Power and Light requires access through the Sanctuary to maintain their lines. The appropriate gates have a Florida Power and Light lock to allow them access to the site. For prescribed fires, Florida Power and Light will be notified when a burn is planned near powerlines.

Table 2. A list of the recorded easements on the property:

Official Record Book Number	**Page Number**	**Recorded on Survey**	**Brief Description from Survey**
48	35		
2307	1930		
1590	106, 110		Granted in Quit Claim Deed
3508	3027		Granted in Quit Claim Deed
2999	661	Briel & Ass. 1996, 2004	Ten-foot wide for fire hydrant access at 6195 N Tropical Trail
2248	472	Briel & Ass. 1996	FPL easement associated with past development planning along Sams Creek
3508	3027		Surveyor was unable to locate (66' wide)
1111	563		Does not encumber acquisition parcel or any adjoining parcel

Official Record Book Number	Page Number	Recorded on Survey	Brief Description from Survey
1816	790		Does not encumber acquisition parcel
586	99, 103	Briel & Ass. 1996	100-foot Florida Power & Light easement
969	925	Briel & Ass. 1996	50-foot wide access running north from Pine Island Rd. near present pump station
555	504, 506, 508	Briel & Ass. 1996	100-foot Florida Power & Light easement
707	393	Briel & Ass. 1996	Unimproved road right-of-way (Newtown Rd)
709	310	Briel & Ass. 1996	Unimproved road right-of-way (Newtown Rd)
1921	457	Briel & Ass. 1996	Near east property boundary, in south-central portion of property
1926	472, 476, 774,478	Briel & Ass. 1996	Near east property boundary, in south-central portion of property
1160	538	Briel & Ass. 1996	Sams Creek canal cut through to Lagoon
2248	472	Briel & Ass. 1996	Florida Power & Light near Sams Creek
863	856, 858, 860	Briel & Ass. 1996	Drainage easement along east-west ditch, southeast portion of property
N/A	N/A	Briel & Ass. 1996	33-foot wide, 422.95-foot long, unimproved Road R/W running north from Pine Island Rd.

Two 3.74-acre parcels and one 1.4-acre parcel remain under private ownership within the boundaries of the Pine Island Conservation Area (Figure 3). These in-holdings, containing marsh ponds and mangrove swamp that were formerly part of the headwaters of Sams Creek, are contiguous with one another and located just north of Pine Island Road. Acquisition of these parcels would be important to the restoration and management success of the Pine Island Conservation Area. There is no vehicle access within the Pine Island Conservation Area to the subject in-holdings. There is a potential for prescriptive rights claims associated with the in-holdings. A temporary License Agreement has been approved for an adjacent property owner to access their land-locked property through the sanctuary with their vehcile for recreational purposes.

1. Encumberments

The following table lists past permits pertaining to Pine Island Conservation Area. Copies of St Johns Water Management District permits are available on their website at: http://permitting.sjrwmd.com/ep/#/ep.

Table 3. A list of permits and permit modifications from St. Johns River Water Management District and US Army Corps of Engineers. Note, the following list may not be inclusive of all permits pertaining to Pine Island Conservation Area:

Date	**Permit #**	**Regulatory Agency**	**Description**
12/07/1999	52161-1	St. Johns River Water Management District	Construction of drainage improvements to address flooding, including Pine Island borrow pit improvements.
06/23/2000	65563-1	St. Johns River Water Management District	Replace deteriorating wood bridge with concrete bridge.
07/11/2006	52161-2	St. Johns River Water Management District	Modifications for Pine Island outfall structures from borrow pits and perimeter drainage for south borrow pit.
06/28/2007	110450-1	St. Johns River Water Management District	Construction of a stormwater management system with stormwater treatment by dry retention for Sams House Restoration project.
08/31/2010	52161-5	St. Johns River Water Management District	Modification to Bald Eagle monitoring requirements.
11/05/2013	52161-7	St. Johns River Water Management District	Modification to permit 52161-5 to address changes in the status of onsite bird rookery and DHR requirements for an onsite archaeological resource.
1/15/2013	SAJ-1998-03380 (MOD-	St. Johns River Water Management District	Department of the Army – Regulatory Division. Installation of

Date	Permit #	Regulatory Agency	Description
	MAA). Modification 3		manatee exclusion device on north lake.
08/01/2014	52161-6	St. Johns River Water Management District	Modification of construction plans to include 1550 feet of berm and 1340 feet of berm, and mitigation for these impacts.
8/28/2014	SAJ-1998-03380 (SP-TSD). Modification 4	Department of the Army, Regulatory Division	Installation of a baffle (berm) in north lake and a berm along north property line.
12/28/2016	52161-9	St. Johns River Water Management District	Modification to offset deficiency in salt marsh mitigation.

E. Management Constraints

a. Fire

Utilizing prescribed fire within the Sanctuary will maintain and restore the fire-adapted (pyrogenic) ecosystems. The Environmentally Endangered Lands Program prescribed fire goals as stated in our Fire Management Manual (White, 2000) include:

- Restore and preserve fire-adapted communities with the reintroduction of fire
- Maximize biological diversity by the creation and maintenance of a habitat mosaic
- Manage Threatened and Endangered species
- Provide educational opportunities
- Reduce fire hazards by managing fuels and fire
- Conduct safe prescribed fires
- Actively encourage cooperation between all parties with a vested interest in prescribed fire

The Environmentally Endangered Lands Program Fire Management Manual addresses in great detail the overall fire objectives of the Program, lists equipment needed to perform prescribed fires, outlines fire's effects on natural communities, and on Threatened and Endangered species found within the Sanctuary network. The Florida Forest Service issues permits for prescribed fires to staff that possess certified burn numbers. Authorization from the Florida Forest Service is required for prescribed fires conducted in the Sanctuary.

The Pine Island Conservation Area has been divided into Burn Units that allow staff to safely conduct prescribed fires. A map of the burn units is provided in Figure 8. Unit 1 contains all the managed habitats north of Pine Island Road, Unit 2 contains the habitats between Pine Island Road and Sams Creek. These two units contain large portions of natural flatwoods habitat and

are the main focus of prescribed fire management activities on the Sanctuary. The Fire Management Manual states that fire keeps flatwoods from succeeding into a hardwood-dominated forest, reduces the accumulation of litter to allow for pine germination, and increases the vigor of some species including wire grass, and some flowering plants. Vigor is reduced in some species due to fire exclusion, such as dwarf huckleberry and dwarf blueberry. However, fires that occur too frequently or under conditions that are hotter than usual can damage the community by eliminating pine recruitment. The natural fire interval in a pine flatwoods community is every 1 to 8 years (White, 2000). Staff assess the condition of these habitats before deciding when and how to implement a burn within that suggested time frame. To date, prescribed fires have been conducted in units 1 and 2 on several occasions and these areas are now in a maintenance burn rotation.

Units 5, 6, and 7 are small two-acre units and are the focus of a habitat restoration project to convert abandoned citrus groves back to natural scrubby flatwoods. According to the Fire Management Manual, natural fires burn through these habitats in Brevard County on an interval of 2-20 years. Without these stand replacing fires, oak shrub height and biomass will increase, open spaces will decrease, and eventually, they will develop into xeric hammock habitat (White, 2000).

Units 3 and 4 are not actively burned due to the hydric nature of the habitats there and do not have any firebreaks other than natural water bodies. However, portions of these areas may benefit from prescribed fire and staff will assess the potential to conduct burns in certain portions of these units in the future. Units 5, 6, and 7 have been burned once and more prescribed fire is planned in the future.

2. Exotic Control

Plants

Invasive-exotic plants have the potential to displace native species and to significantly alter natural ecosystem function. Plants that are of concern on the Sanctuary include; Brazilian pepper, cogon grass, melaleuca, Australian pine, climbing fern, rosary pea and Guinea grass. These and others are being controlled and eliminated when possible within the Sanctuary's borders. Long-term monitoring is ongoing to ensure that these invasive-exotic plants are kept at very low levels on site.

The Environmentally Endangered Lands Program regularly uses State funds from the Florida Fish and Wildlife Conservation Commission's Invasive Plant Management program to hire contractors for larger treatment areas with severe infestations. The fund also provides chemicals to re-treat these areas using existing Program staff. Smaller areas not treated through the Invasive Plant Management program, as well as maintenance of treated areas, are handled within the Program using Environmentally Endangered Lands staff and funding.

Pine Island has had initial treatment of all exotics and is now in a maintenance stage. Staff performs periodic monitoring and maintenance removal of any regrowth seen.

Animals

There are currently no major problems with exotic animals on site with the exception of feral hogs. Feral hogs are a constant challenge and can be problematic on many Program sanctuaries, including this one. Pine Island Conservation Area has addressed this with Feral Hog Trappers assigned to the site and registered with the Program. All trapping is reported on a monthly basis.

3. Stormwater Improvements

The County agreed to implement site management on the Pine Island Property consistent with the Participation and Interim Management Agreement between Brevard County and the St. Johns River Water Management District (Appendix A). This Agreement specifically states that management on Pine Island Conservation Area will be implemented consistent with the goals and objectives of:

- The County's Environmentally Endangered Lands Program
- The Indian River Lagoon National Estuary Program
- The Indian River Lagoon Surface Water Improvement Program
- And programs of the District as set forth in Chapter 373, Florida Statutes, or other Florida Statutes as applicable

The Agreement also states that the Pine Island Conservation Area Management Plan will include the development of a Stormwater Management Plan with specific guidance for the development, construction, operation, maintenance and management of the Stormwater Facility on site. This document resides with the Brevard County Stormwater Program within the Natural Resources Department. This County department has assumed responsibility for the Surface Water Improvement Program which is sited in the Participation and Interim Management Agreement. The Brevard County Stormwater Program is charged with management of the stormwater facilities at Pine Island, and all information pertaining to the stormwater facilities at Pine Island can be obtained from that department.

The need for stormwater improvements on North Merritt Island is associated with historic land use patterns and natural topographic features of Merritt Island. North Merritt Island was historically developed as an agricultural area for citrus production. In order to manage the groundwater in this low-lying area, grove owners excavated rim ditches around groves and pumped stormwater to the Sykes Creek marsh area and the Indian River Lagoon via large conveyance canals. Two large conveyance canals/ditches emptying to the Lagoon are along Ransom Road (on the northern boundary of the property) and Pine Island Road (the Judson Canal). Much of North Merritt Island drains through the Judson Canal, and it previously had no stormwater treatment before entering the Indian River Lagoon. As residential development in the area increased, the occurrence of localized flooding became more frequent. Many low-lying areas were developed without providing positive drainage outfalls. In recent years, major storm

events resulted in localized road, property and structure flooding which lasted for several days to weeks.

Acquisition of the Pine Island Conservation Area presented several important opportunities to provide a regional stormwater retrofit project pursuant to Brevard County Comprehensive Plan requirements. In May 1996, Post, Buckley, Schuh, & Jernigan, Inc. completed a stormwater masterplan study of North Merritt Island, which was approved by the Board of County Commissioners. The retrofit included the construction of two stormwater pump stations and associated conveyance improvements. The two man-made borrow pits on Pine Island were modified to temporally store stormwater to reduce water quality impacts to the Indian River Lagoon and localized flooding events on North Merritt Island.

The North Merritt Island Stormwater Improvement Design uses a pump station to divert stormwater from the Pine Island Road canal to the North Retention Lake and the South Retention Lake. The lakes provide stormwater treatment for an approximately 6,000-acre watershed under gravity-fed low flow and higher (pumped) flow conditions. This decreases discharges and freshwater loads to the Indian River Lagoon and reduces adverse impacts from sediment, suspended solids, nutrients, petroleum products and other pollutants which are harmful to the diminishing seagrasses and aquatic health in the Lagoon near the Judson Canal outfall at the west end of Pine Island Road.

Reconstruction of the borrow pits to provide for stormwater retention and treatment resulted in removal of Brazilian peppers along the edge of the borrow pit and along the western portion of the north-south dirt road that extends from Pine Island Road to Ransom Road. The mitigation plan included the installation of four (4) 36” culverts with 48” risers within the mosquito impoundment berm isolating the chain of natural marsh ponds from the Indian River Lagoon via the Pine Island canal. The primary objectives of the re-connection actions were to restore the exchange of materials and organisms between the Lagoon and this marsh system and to enhance floral diversity within the southern marsh pond by reducing the extensive coverage by cattail. Permits for these projects are listed in Table 3.

F. Public Access and Passive Recreation

Public access and opportunities for passive recreation are provided at Pine Island Conservation Area pursuant to public use and recreational policies of the Environmentally Endangered Lands Program Sanctuary Management Manual. It has been determined that passive recreational activities best support the Program goals. The Sanctuary Management Manual defines passive recreation as “A recreational type of use, level of use and combination of uses that do not, individually or collectively, degrade the resource values, biological diversity, and aesthetic or environmental qualities of a site." Any recreational activities or amenities causing adverse impacts to, or the degradation of, the resources mentioned above should be reviewed and

modified to accommodate the Program's goals as defined by the Manual. This may include closing or moving certain trails or sections of trails.

Activities that are encouraged on the Pine Island Conservation Area include: hiking, kayaking, biking, fishing, equestrian use, and nature observation. The Environmentally Endangered Lands Program Recreation and Education Advisory Committee advises on the recreational plans of the Program's sanctuaries. The committee meets on a quarterly basis to discuss and vote on the recreational opportunities allowable for Pine Island and other Environmentally Endangered Lands Program properties. The Environmentally Endangered Land Program's Selection and Management Committee reviews and approves public access plans. The Recreation and Education Advisory Committee (January 10, 2019) and the Selection and Management Committee (February 24, 2020) meeting minutes pertaining to this management plan are included in Appendix J. Any additional public meeting minutes pertaining to this management plan with also be included in Appendix J.

An advertised public access meeting for this management plan was also held on October 18th, 2018 where plans were presented and public comments were considered.

The Pine Island Conservation Area is the Management and Education Center for the Central Region, and as such, has extensive public access. It is a Category 1 site as described in the Program's Sanctuary Management Manual. It is managed for the following: conservation and restoration of natural communities and ecosystem functions, promoting the County's natural and cultural assets, allowing passive recreation, fostering a greater understanding of environmental stewardship, providing educational opportunities for students and the public, benefiting the local community, and supporting the Environmentally Endangered Lands referendum objectives.

1. Parking and Public Access

Three dirt parking areas are available at or near the Pine Island Road entrance. One is located immediately inside the main gate (the Main Parking area), another is adjacent to the manatee overlook/Sams Creek kayak launch to the south of the main gate (the Manatee Parking area), and a third is adjacent to the North Retention Lake (North Lake Parking area). A kiosk is located at the main parking area by the Pine Island Road entrance to inform visitors about the site and provide an informational brochure with trail map. Vehicle access for the public is limited to the three parking areas mentioned above. Future ecological restoration of Sams Creek will create opportunities to:

- Consolidate and better manage vehicle access and parking.
- Improve access for kayaks and canoes
- Improve non-motorized watercraft access to the north lake and fishing access to the north and south lakes

- Reduce the opportunity for vandalism and unlawful activities resulting from vehicle access to secluded areas
- Reduce road maintenance costs on the dirt roads accessing the south and/or north parking areas
- Beautify the Pine Island Road entrance.

The Education Center with a coquina-surfaced parking area and a large grass parking area for events is located at the North Tropical Trail entrance. Information is available at several kiosks and inside the historic home (Cabin). There are approximately 8.2 miles of marked hiking, biking and equestrian trails throughout Pine Island and approximately 3 miles (not including the Indian River Lagoon) of kayak trails.).

2. Hiking

Many of the trails at Pine Island Conservation Area are best suited to hiking. They are single-track, primitive, uneven surface trails with boardwalks over wetlands. Others (through flatwoods or atop berms) are wider with relatively level surfaces. There is also a 0.1-mile ADA accessible paved loop trail. These trails bring visitors through the diverse habitats of Pine Island. Informative signs have been placed along the trails. There are approximately 8.2 miles of trails that can be hiked throughout Pine Island (Figure 4).The proposed maintenance trail to the central and northern portions of the sanctuary will be open to the public.

The hiking trails offer excellent opportunities for bird watching and general wildlife observation. A bird blind is accessible via a hiking trail located near the south end of the north lake.

4. Mountain Biking

Mountain biking is encouraged on multi-use trails within Pine Island however bikes are not permitted on the Garnet Trail The Flatwoods Loop traverses an expansive area of mesic flatwoods habitat with access to the Indian River Lagoon. The south retention lake berm and the maintenance trail provides access to and from the North Tropical Trail entrance at Sams House to the Pine Island Road entrance. Human-powered bikes are allowed which includes human-powered bikes with electric assist. Electric bikes with a throttle which allows the operation of the electric motor without the need to pedal are considered motorized vehicles are not permitted. Additionally, all other motorized vehicles including foot scooters, electric unicycles, one-wheels, segways and other similar devices are not permitted within the sanctuary boundaries.

5. Equestrian

Horseback riding is encouraged on multi-use trails within Pine Island. These trails allow access to lakes, marshes, flatwoods and berm roads. The Equestrian Loop trail makes use of several existing berm roads from past mosquito impoundments and along the north stormwater lake.

The Flatwoods Loop traverses an expansive area of mesic flatwoods habitat with access to the Indian River Lagoon. The South retention lake berm and the Maintenance Trail connect the North Tropical Trail provides access to and from the North Tropical Trail entrance at Sams House to the Pine Island Road entrance.

6. Canoe and Kayaking

There are approximately three miles (not including the Indian River Lagoon) of kayak/canoe trails within the Sanctuary. These trails traverse the marsh and mangrove ponds, Judson Canal, Sams Creek, and connect to the Indian River Lagoon.

7. Fishing

Fishing is allowed in all areas onsite and is regulated by the Florida Fish and Wildlife Conservation Commission (FWCC).

8. Prohibited Activities / General Site Rules:

Camping is not permitted (except at Sams House youth group campsite)

No pets

Day use only

No smoking

No fires

No fireworks

No Hunting or target shooting

No dumping of trash or yard waste

No commercial activity without a permit

No removal of plants, animals or other natural resources

No relocation of wildlife to the sanctuary

No alcoholic beverages

No unlawful carry of firearms

No motorized vehicles (electric or gas)

VI. MANAGEMENT ACTION PLANS

The following is a comprehensive outline of the goals, strategies and actions necessary to manage Pine Island Conservation Area.

A. Goals

The Sanctuary Management Manual of the Environmentally Endangered Lands Program provides the following management goals for all the Sanctuaries within the Program:

1. Conservation of natural (native) communities
2. Conservation of species (including endemic, rare, threatened and endangered species)
3. Restoration of wetlands, wetland/upland ecotones and natural hydroperiod
4. Restoration of altered or disturbed uplands, including those altered by fire exclusion
5. Promote inter-agency cooperation regarding multiple use compatibility with on-site stormwater control and water quality improvement facilities
6. Establish and enforce policies and management techniques for public access and responsible public use
7. Provision of environmental education programs
8. Documentation of significant archeological and historic sites
9. General upkeep and security of the property
10. Collection of data to refine and improve management

B. Strategies and Actions

The following is an outline of specific management strategies and actions that are needed to meet each management goal for the Pine Island Conservation Area. A timetable is included after each action to denote if the action is "Completed (Year)," "Ongoing" (work will continue indefinitely), or " 5 years or 10 years" (to be accomplished within the next five or ten years).

GOAL 1: Conservation of natural communities.

Strategy: Protect, maintain and restore natural ecology of native communities of plants and animals.

Actions/Timetable:

- Control invasive plant and animal species **(Ongoing)**
- Maintain appropriate fire return intervals with prescribed burns on units currently under burning rotation **(Ongoing)**
- Conduct mechanical reduction or forestry operations when necessary on pyrogenic **(Ongoing)**
- Monitor public use impacts **(Ongoing)**
- Minimize shoreline erosion, remove or breech artificial berms, restore natural shorelines **(10 years)**

GOAL 2: Conservation of species diversity including endemic, rare, threatened and endangered species.

Strategy: Protect, maintain, and restore native diversity to the maximum acreage possible.

Actions/Timetable:

- Research and monitor baseline conditions of natural systems **(10 years)**
- Continue to restore natural hydrologic patterns in appropriate areas **(10 years)**
- Continue to implement prescribed fire regimes that provide the highest ecological benefit where possible **(Ongoing)**
- Continue to collect data to analyze species and environmental factors within native communities **(Ongoing)**
- Continue to protect communities from deleterious impacts deriving from external influences including consumptive use, pollution, off-site alterations, climatic change, and others. **(Ongoing)**

GOAL 3: Restoration of wetlands, wetland/upland ecotones and natural hydroperiod.

Strategy: Restore degraded, disturbed, or altered wetlands and adjacent ecotones.

Actions/Timetable:

- Research and monitor baseline conditions within wetlands **(Ongoing)**
- Investigate the historic hydrologic conditions of the wetland and determine the impacts of restoration to existing natural communities and off-site hydrologic patterns **(5 years)**
- Prioritize the wetland communities in need of restoration based upon ease of accomplishment, expected habitat value yield, or financial considerations **(10 years)**
- Assess possible impacts of proposed restoration on adjacent communities and offsite properties **(10 years)**
- Implement the selected restoration activities including remove exotic species, restore natural hydrologic flow and connections to the Indian River Lagoon **(Ongoing)**
- Monitor the effects of the restoration activities, evaluate the success of the restoration projects, and revise the restoration plan, as necessary **(Ongoing)**

GOAL 4: Restoration of altered or disturbed uplands, including those altered by fire exclusion.

Strategy: Implement restoration techniques including exotic/invasive plant and animal control, mechanical reduction of undesired vegetation, use of prescribed fire, replanting native plant species where appropriate.

Actions/Timetable:

- Establish baseline conditions within the upland communities **(5 years)**
- Prioritize the upland communities in need of restoration based upon ease of accomplishment, expected habitat value yield, or financial considerations **(5 years)**
- Assess possible impacts of proposed restoration on adjacent communities and offsite properties **(5 years)**

- Implement the selected restoration activities including remove exotic species, mechanical vegetation treatments, restore natural disturbance regime, reestablished native species **(5 years)**
- Monitor the effects of the restoration activities, evaluate the success of the restoration projects, and revise the restoration plan, as necessary. **(Ongoing)**

GOAL 5: Promote inter-agency cooperation regarding multiple use compatibility with on-site stormwater control and water quality improvement facilities.

Strategy: Maintain Inter-agency cooperation with St. Johns River Water Management District, and Brevard County government entities that manage stormwater, water quality and mosquito control, and State agencies including Florida Fish and Wildlife Conservation Commission. In the District's review of this Management Plan it was requested that the original management agreement (1996) be replaced with an Intergovernmental Management Agreement.

Actions/Timetable:

- Keep all stakeholders informed of conditions affecting infrastructure in the Pine Island Road area of the site. **(Ongoing)**
- Support and monitor recreational use of on-site fisheries. **(Ongoing)**
- Monitor access points used by personnel from other agencies to help protect facilities. **(Ongoing)**
- Work to ensure that conservation goals are not impacted by other agency's operations. **(Ongoing)**

GOAL 6: Establish and enforce policies and management techniques for public access and responsible public use.

Strategy: Establish and enforce specific policies that address public needs and complaints and use management techniques that allow good public access and encourage responsible public use.

Actions/Timetable:

- Perform Public Access Site Assessment. **(Completed 2021)**
- Install boundary fencing. **(5 years)**
- Post property boundaries. **(Ongoing)**
- Plan appropriate public facilities by examining the site's natural and cultural resources and reviewing public input. **(Ongoing)**
- Evaluate any proposed public facilities for consistency with ADA guidelines. **(Ongoing)**
- Install educational signs along approved trails. **(Ongoing)**
- Install informational kiosks at Pine Island entrance and Sams House. **(Completed 2015)**
- Protect Threatened and Endangered species, and ecologically sensitive areas from public use impacts. **(Ongoing)**
- Minimize unauthorized trail expansion by establishing sufficient trails and constructing natural barriers. **(Completed 2016)**

- Coordinate recreational use with the ecological burning strategies of the Program. **(Ongoing)**
- Monitor trails and access points for environmental impacts, vandalism, safety hazards, and condition. **(Ongoing)**
- Re-route users from sensitive areas or popular sites on a regular or as-needed basis. **(Completed 2016)**
- Maintain and improve parking access to accommodate horse trailers for equestrian trail use. **(10 years)**

Goal 7: Provision of environmental education programs.

Strategy: Develop a plan to provide On-going environmental education programs to Brevard County residents and visitors.

Actions/Timetable:

- Determine target audiences and types of programming best suited to those groups. **(Completed 2017)**
- Design and develop signs and printed materials. **(Ongoing)**
- Provide a trail brochure to visitors of the sanctuary. **(Completed 2017)**
- Include educators, friend's groups, and other organizations in the design, development, and delivery of programs. **(Ongoing)**
- Develop criteria and process of evaluation for program review and refinement. **(Completed 2018)**
- Provide guided hikes to school groups when requested as staff and resources allow. **(Ongoing)**
- Provide a "special collection" of books and other materials specifically related to the environmental and cultural character of the Pine Island Conservation Area. **(Ongoing)**
- Coordinate outreach and on-site programs for school-aged children with school board and area schools. **(Ongoing)**

GOAL 8: Documentation of significant archeological and historic sites.

Strategy 8: Survey for archaeological and historic sites within the Pine Island Conservation Area.

Actions/Timetable:

- Contact the State Division of Historic Resources to conduct a Phase I survey of the site. **(Completed 2023)**
- Review available maps and historic records for indications of past usage of the site. **(Completed 2023)**
- Map all archaeological and historic sites for future reference. **(Completed2023)**

GOAL 9: General upkeep and security of the property.

Strategy: Secure and maintain the Sanctuary to the highest degree possible using Environmentally Endangered Lands staff, Parks and Recreation staff, contract employees, and volunteers.

Actions/Timetable:

- Install perimeter fencing or signs clearly marking the site's boundary. **(5 years)**
- Employ full-time Land Management Staff. **(Completed 2017)**
- Develop a specific maintenance plan identifying specific task, frequency and responsible entities or individuals. **(Completed 2015)**
- Coordinate daily maintenance tasks using staff and volunteers. **(Ongoing)**
- Based on the maintenance, security, and resource management plan, develop an annual budget for the Pine Island Conservation Area. **(Ongoing)**

GOAL 10: Collection of data to refine and improve management.

Strategy: Use volunteers, experts and staff to record important aspects of the site's natural resources documenting management successes or failures with the purpose of improving practices and better understanding the resource.

- Monitor the effects of the fire management activities, evaluate Program success, and revise Program strategies as needed. **(Ongoing)**
- Monitor the effects of the restoration activities, evaluate the success of the restoration projects, and revise restoration plans as necessary. **(Ongoing)**
- Develop a methodology and work plan to accomplish the identification of designated plant and animal species. **(5 years)**
- Plot the location of identified designated species within and/or adjacent to the sanctuary for use in the implementation, or re-distribution, of amenities or site improvements. **(5 years)**
- Periodically update these baseline survey data to determine possible changes in designated species distribution or density. **(Completed 2020)**
- Establish periodic monitoring of habitat suitability, species population levels, diversity levels, and exotic/nuisance species, as a means of evaluating the success of management strategies. **(Ongoing)**
- Conduct regular monitoring to assess impacts of public use on natural habitats **(Ongoing)**

VII. FINANCIAL CONSIDERATIONS

The Brevard County Environmentally Endangered Lands Program receives land acquisition and management revenues from ad valorem revenues collected pursuant to the 1990, 2004 and 2022 voter approved Environmentally Endangered Lands Referendums. The Environmentally Endangered Lands Program allocates bond funds to capital land acquisition and one-time capital expenditures. Ad valorem revenues collected during each fiscal year that are not required for bond debt services can be used for any legal purpose within the Environmentally Endangered Lands Program pursuant to 200.181 and 125.013 of the Florida Statutes. The

Environmentally Endangered Lands Program collected ad valorem revenues from the 1990 referendum until 2011. Revenues from the 2004 referendum will be collected until 2024, the sunset date of that ad valorem collection. The 2022 referendum will continue for 20 years. Based on financial projections, the Environmentally Endangered Lands Program shall annually appropriate a portion of the Environmentally Endangered Lands Program ad valorem millage not required for bond debt services to fund annually Environmentally Endangered Lands Program capital and non-capital expenditures. The Environmentally Endangered Lands Program budget will be reviewed and adopted annually as part of the Brevard County budget process and as authorized by the Board of County Commissioners.

The annual estimated expenses for the land management operations related to the Pine Island Conservation Area, as well as past and future expenditures related to capital improvements for management and passive recreation are listed below.

Annual land management for the Pine Island Conservation Area is estimated at $39,897.

Exotic Species Control:	$4,996
Boundary Fence Maintenance:	$2,614
Prescribed Fire:	$3,107
General Security:	$5,157
Trail Management:	$10,811
Site Monitoring:	$5,683

Completed Capital Improvements:

Limited perimeter fencing: $5,000.

Fire break and maintenance access road $30,000

Kiosks: $2,000.

Gates $5,000

Interpretive signs: $5,000.

<u>Future Capital Projects:</u>

Bathroom $100,000

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APPENDIX A

Legal Descriptions and Agreements

To access copies of the following documents in their original format please request it through Brevard County's Public Request Process. Contact the Public Records Request Coordinator at (321) 633-2071, or by emailing your request to PublicRecordsRequest@BrevardFL.gov.

Participation and Interim Management Agreement Brevard County and St. Johns River Water Management District Pine Island Property, Merritt Island, Florida

This Participation Agreement is entered into this 26 day of November, 1996, by Brevard County, a political subdivision of the State of Florida, whose mailing address is 2725 Judge Fran Jamieson Way, Viera, Florida, 32940 ("County") and St. Johns River Water Management District, a public body existing under Chapter 373, Florida Statutes, whose mailing address is Post Office Box 1429, Palatka, Florida 32178-1429 ("District").

Whereas, the County, through their voter-approved Environmentally Endangered Lands Program has funding available for participation in acquisition projects associated with environmentally sensitive lands; and

Whereas, the project known as "Pine Island" is eligible for funding under the county acquisition program contingent upon the land acquisition recommendation of the Environmentally Endangered Lands Program Selection Committee ("EELSC") and approval by the Brevard County Board of County Commissioners; and

Whereas, the District has approved an Agreement of Purchase and Sale (hereinafter referred to as the "Purchase Agreement") between the District and Pine Island Harbor Associates VI, LTD., on November 13, 1996, for the Pine Island Property located in Brevard County, Florida, which Purchase Agreement is attached hereto as Exhibit A, and by this reference made a part hereof; and

Whereas, the County and the District desire to jointly purchase and hold title to the Pine Island Property.

Now Therefore, in consideration of the premises and of the mutual covenants hereinafter contained, and other goods and valuable considerations, the parties hereto do warrant and agree as follows:

1. Pursuant to the terms of the Purchase Agreement, the County hereby agrees to share equally with the District in the purchase and ownership of the Pine Island Property. On or before the date of closing, the County agrees to pay the amount of 1WO MILLION ONE HUNDRED 1WENTY FIVE THOUSAND AND NO/100 DOLLARS ($2,125,000.00), which price is subject to downward or upward adjustment based on certified acreage as set forth in the final approved survey, representing the County's fifty percent (50%) interest in the Pine Island Property. The District will provide equal funding at closing. Title to the Pine Island property shall be in County and St. Johns River Water Management District as tenants in common.

2. The County agrees to pay, at or before closing, fifty percent (50% of the closing costs attributed to the District at closing, and reimburse the District for fifty percent (50%) of the costs for appraisals of the Pine Island Property which were obtained and paid for by the

District. The District will provide reasonably acceptable evidence to the County documenting such appraisal costs.

3. The County will be entitled to participate in review of the closing procedures and documents prior to closing on the Pine Island Property. Payment of-the County's fifty percent (50%) share of funds at closing shall constitute the County's. County shall not be required to participate, if closing and marketability are not deemed acceptable to County.

4. Following closing, the District and the County will enter into an Intergovernmental Management Plan Agreement providing for primary management of the Pine Island Property by the County. _ The Brevard County Environmentally Endangered Lands Program will serve as the lead agency in t:Q.e development of the Management Plan with input and participation from the Brevard County Surface Water Improvement Program. The Management Plan will:

serve as the conceptual and procedural document to guide resource management decisions to implement the conservation goals of the District and the EEL Program for the Pine Island property;

provide conceptual and specific guidance for Management Plan implementation;

include a component that provides for the development of a Stormwater Management Plan. The Stormwater Management Plan should provide specific guidance for the development, construction, operation, maintenance and management of a Stormwater Facility on-site (hereinafter referred to as the Stormwater Facility). The Stormwater Facility shall be developed, constructed, operated and maintained by the County Surface Water Improvement Program to address both flood protection and Indian River Lagoon conservation and water quality issues.

The District will be entitled to participate in development of, and to review and approve the Management Plan along with engineering, design and construction plans or drawings associated with development of the Stormwater Facility prior to initiation of any activities by the County. The County agrees to develop the Pine Island Property, and provide long-term management in accordance with the Management Plan as approved by the District and the County, from the date of closing; provided however, the County may delegate any management activities to other environmental, educational or governmental agencies or organizations subject to approval by the District.

include a component that provides for public access and responsible public recreational activities that are consistent with the long-term resource management goals of the District and Environmentally Endangered Lands Program

identify appropriate, available and interested public-sector or private-sector partners to be involved in on-site conservation and management programs;

identify existing and potential funding sources for implementation of Management Plan components; and

provide a time table for the implementation of capital improvement projects and recurring land management activities.

5. The County agrees to implement site management on the Pine Island Property consistent with the goals and objectives of the County's Environmentally Endangered Lands Program, the Indian River Lagoon National Estuary Program, the Indian River Lagoon SWIM Program and programs of the District as set forth in Chapter 373, Florida Statutes, or other Florida Statutes, as applicable.

6. The District will take the lead role in acquisition of in-holdings and additions within the Pine Island Project area. Specific parcels for addition to the property will be mutually agreed upon by the County and the District, in writing. Any Pine Island additions will be presented to the EEL Selection Committee for environmental assessment and the District Governing Board and Brevard County Board of County Commissioners for review and acquisition authorization. Any approved additions will automatically become incorporated herein and subject to the terms and conditions bf the Participation Agreement.

7. The District and the County agree to cooperate in implementing the resource management and acquisition objectives of this Participation Agreement. Any approvals provided for herein will not unreasonably be withheld by either party.

8. Non-waiver of District's Regulatory Powers. Nothing contained in this Agreement shall be construed as a waiver of or contract with respect to the regulatory and permitting authority of the District as it now or hereafter exists under applicable laws, rules and regulations.

IN WITNESS WHEREOF, the parties hereto have duly executed this Agreement to be effective as of the date and year above written:

Randy O'Brien, Chairman, Board of County Commissioners, Brevard County Florida

William M. Segal, St. Johns River Water Management District, Governing Board Chairman

John W. Williams, Esquire, St. Johns River Water Management District, Deputy General Counsel
EXHIBIT A

Warranty made on the 19th day of December, 1996, Between Pine Island Harbor Associates, LTD., Pine Island Harbor Associates II, LTD., Pine Island Harbor Associates III, LTD., Pine Island Harbor Associates IV, LTD., and St. Johns River Water Management District, and Brevard County.

Clerk of Courts, Brevard County, FL, Book/Page: 3634/2107, January 3, 1997. ALL OF SECTION 9 AND A PORTION OF SECTION 10, TOWNSHIP 23 SOUTH, RANGE 36 EAST TOGETHER WITH LOTS 1 AND 2 OF JOSEPH ODEA & DAN'L M. McINNIS' SUBDIVISION RECORDED IN PLAT BOOK 1, PAGE 19 OF THE PUBLIC RECORDS OF BREVARD COUNTY, FLORIDA, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS; BEGIN AT THE NORTHWEST CORNER OF SAID SECTION 10 AND RUN S00'53'24"W ALONG THE WEST LINE OF SECTION 10 A DISTANCE OF 33.00 FEET TO A LINE LYING 33 FEET SOUTH BY PERPENDICULAR MEASUREMENT FROM THE NORTH LINE OF SECTION 10; THENCE RUN ALONG SAID LINE PARALLEL TO THE NORTH LINE OF SECTION 10 S89'30'43"E 1313.06 FEET TO THE EAST LINE OF THE WEST 1/4 OF SECTION 10; THENCE RUN ALONG THE EAST LINE OF SAID WEST 1/4 S00"53!47"W 2697.40 FEET TO THE CENTER EAST-WEST 1/4 LINE OF SECTION 10; THENCE CONTINUE ALONG SAID EAST LINE OF THE WEST 1/4 S00"53'47"W 2732.41 FEET TO THE SOUTH LINE OF SECTION 10 AND THE SOUTHEAST CORNER OF SAID WEST 1/4; THENCE RUN ALONG THE SOUTH LINE OF SECTION 10 S89'25'57"W 1279.84 FEET TO A POINT 33 FEET EAST BY PERPENDICULAR MEASUREMENT FROM THE WESTLINE OF SECTION 10; THENCE RUN ALONG SAID LINE PARALLEL TO THE WEST LINE OF SECTION 10 N00'53'24"E 262.89 FEET TO THE NORTH LINE OF THE SOUTH 7 213 ACRES OF THE SOUTHWEST 1/4 OF THE SOUTHWEST 1/4 OF SECTION 10; THENCE RUN ALONG SAID NORTH LINE OF THE SOUTH 7 2/3 ACRES N89'28'44"E 979.75 FEET TO THE WEST LINE OF THE EAST 300 FEET OF THE SOUTH 1/2 OF THE SOUTHWEST 1/4 OF THE SOUTHWEST 1/4 OF SECTION 10; THENCE RUN N00'53'47"E PARALLEL AND 300 FEET WEST BY PERPENDICULAR MEASUREMENT FROM THE·EAST LINE OF THE WEST 1/4 A DISTANCE OF 421.64 FEET TO THE NORTH LINE OF THE SOUTH 1 /2 OF THE SOUTHWEST 1/4 OF THE SOUTHWEST 1/4 OF SECTION 10; THENCE RUN ALONG SAID NORTH LINE S89°33'12"W 1012.78 FEET TO THE WEST LINE OF SECTION 10AND THE NORTHWEST CORNER OF THE SOUTH 1/2 OF THE SOUTHWEST 1/4 OF THE SOUTHWEST 1/4; THENCE RUN S00"53'24"W 685.87 FEET TO THE SOUTHWEST CORNER OF SECTION 10, ALSO BEING THE NORTHEA&T CORNER OF SECTION 16, TOWNSHIP 23 SOUTH, RANGE 36 EAST ANO THE NORTHEAST CORNER OF LOT. 2 OF THE AFORESAID JOSEPH ODEA & DAN'L M. McINNIS' SUBDIVISION; THENCE RUN S00'42'42"WALONG THE EAST LINE OF SECTION 16 AND LOT 2 A DISTANCE OF,1083.97 FEET TO THE SOUTHEAST CORNER OF LOT 2; THENCE RUN S89'26'2o w ALONG THE SOUTH LINE OF LOT 2 ANO LOT 1 A DISTANCE OF 2359.32 FEET TO THE MEAN HIGH WATER LINE OF THE INDIAN RIVER; THENCE RUN NORTHERLY ALONG SAIC MEAN HIGH WATER LINE 1184.68 FEET MORE OR LESS TO THE NORTH LINE OF LOT 1 AND SECTION 16, ALSO BEING THE SOUTH LINE OF AFORESAID SECTION 9; THENCE CONTINUE NORTHERLY ALONG SAID MEAN HIGH WATER LINE 6295.39 FEET MORE OR LESS TO THE NORTH LINE OF SECTION 9; THENCE RUN S89"24'52"E 1610.89 FEET TO THE POINT OF BEGINNING.

TOGETHER WITH A PORTION OF SECTIONS 15 AND 22, TOWNSHIP 23 SOUTH, RANGE 36 EAST BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS; FROM THE NORTHWEST CORNER OF SAID SECTION 15 RUN S00'42'42"W ALONG THE WEST LINE OF SECTION 15 A DISTANCE OF 60.02 FEET TO A LINE 60 FEET SOUTH BY PERPENDICULAR MEASUREMENT FROM THE NORTH LINE OF SECTION 15; THENCE RUN ALONG SAID LINE PARALLEL TO THE NORTH LINE OF

SECTION 15 N89°25'57"E 40.01 FEET TO THE POINT OF BEGINNING; THENCE CONTINUE ALONG SAID LINE N89"25'57"E 1072.74 FEET; THENCE DEPARTING FROM SAID LINE S03'49'06"E 246.82 FEET; THENCE S89"27'18"E 181.46 FEET TO THE EAST LINE OF THE WEST 1/4 OF SECTION 15; THENCE RUN N00°32'42"E ALONG SAID EAST LINE 249.99 FEET TO AFORESAID LINE LYING 60 FEET SOUTH OF THE NORTH LINE OF SECTION 15; THENCE RUN N89"25'57"E ALONG SAID LINE 626.51 FEET TO A POINT ON A LINE 30 WEST BY PERPENDICULAR MEASUREMENT FROM EAST LINE OF THE NORTHWEST 1/4 OF THE NORTHEAST 1/4 OF THE NORTHWEST 1/4 OF SECTION 15; THENCE RUN S00°27'41W ALONG SAID LINE AND PARALLEL TO THE EAST LINE OF THE NORTHWEST 1/4 OF THE NORTHEAST 1/4 OF THE NORTHWEST 1/4 A DISTANCE OF 599.14 FEET TO THE SOUTH LINE OF THE NORTHWEST 1/4 OF THE NORTHEAST 1/4 OF THE NORTHWEST 1/4; THENCE RUN ALONG SAID SOUTH LINE S89°20'15"W 327.41 FEET TO A POINT 300 FEET EAST OF THE AFORESAID EAST LINE OF THE WEST 1/4 OF SECTION 15, SAID POINT BEING THE NORTHEAST CORNER OF THAT PARCEL OF LAND DESCRIBED IN OFFICIAL RECORDS BOOK 2053, PAGE 497 OF THE PUBLIC RECORDS OF BREVARD COUNTY, FLORIDA; THENCE RUN ALONG THE EAST LINE SAID PARCEL OF LAND S29"32'31"E 240.98 FEET TO THE POINT OF CURVATURE OF A CURVE CONCAVE TO THE WEST HAVING A RADIUS OF 965.00 FEET; THENCE RUN SOUTHERLY ALONG THE ARC OF SAID CURVE 468.48 FEET AND THROUGH A DELTA ANGLE OF 27°48'55" TO A POINT ON THE NORTH LINE OF THE SOUTHEAST 1/4 OF THE NORTHWEST 1/4 OF SECTION 15, SAID POINT LYING 550 FEET EAST BY PERPENDICULAR MEASUREMENT FROM THE AFORESAID EAST LINE OF THE WEST 1/4; THENCE RUN S89"14'34"W ALONG SAID NORTH LINE, A NON•RADIAL LINE OF 550.14 FEET TO THE AFORESAID EAST LINE OF THE WEST 1/4; THENCE RUN S00"32'42"W ALONG THE EAST LINE OF THE WEST 1/4 A DISTANCE OF 1320.41 FEET TO THE NORTHWEST CORNER OF THE NORTHEAST 1/4 OF THE SOUTHWEST 1/4 OF SECTION 15; THENCE RUN N89'03'15"E ALONG THE NORTH LINE OF THE NORTHEAST 1/4 OF THE SOUTHWEST 1/4 A DISTANCE OF 550.19 FEET TO A POINT ON A LINE 550 FEET WEST BY PERPENDICULAR MEASUREMENT FROM THE EAST LINE OF THE WEST 1/4; THENCE RUN S00"32'42"W ALONG SAID LINE AND PARALLEL TO THE EAST LINE OF THE WEST 1/4 A DISTANCE OF 2638.38 FEET TO A POINT ON THE SOUTH LINE OF SECTION 15 AND THE NORTH LINE OF AFORESAID SECTION 22, SAID POINT LYING ON A LINE 550 FEET WEST BY PERPENDICULAR MEASUREMENT FROM THE WEST LINE OF GOVERNMENT LOT 1 OF SECTION 22; THENCE RUN S00°30'27"W AND PARALLEL TO THE WEST LINE OF GOVERNMENT LOT 1 A DISTANCE OF 966. 34 FEET TO A POINT 14.64 CHAINS SOUTH OF THE NORTH LINE OF SECTION 22; THENCE N88"42'55"E 781.87 FEET TO A POINT ON THE EAST LINE OF GOVERNMENT LOT 1 WHICH LIES 14.64 CHAINS SOUTH OF THE NORTH 1/4 CORNER OF SECTION 22; THENCE RUN S00°18'10"WALONG THE EAST LINE OF GOVERNMENT LOT 1 A DISTANCE OF 1160.87 FEET TO THE NORTH RIGHT OF WAY LINE OF NORTH TROPICAL TRAIL AS MAINTAINED BY BREVARD COUNTY; THENCE RUN ALONG SAID RIGHT OF WAY LINE S89"17'31"W 7.20 FEET TO THE POINT OF CURVATURE OF A CURVE CONCAVE TO THE SOUTHEAST HAVING A RADIUS OF 236.78 FEET; THENCE RUN WESTERLY ALONG THE ARC OF SAID CURVE 105.89 FEET THROUGH A DELTA ANGLE OF 25"37'26" TO THE NORTH LINE OF THAT PARCEL OF LAND DESCRIBED IN OFFICIAL RECORDS BOOK 2203, PAGE 661 OF THE PUBLIC RECORDS OF BREVARD COUNTY, FLORIDA;

THENCE RUN S84°32'41"W ALONG SAID NORTH LINE, A NON-RADIAL LINE ANO THE NORTH LINE OF THE PARCEL DESCRIBED IN OFFICIAL RECORDS BOOK 2440, PAGE 340 THROUGH A 1/2" IRON ROD AT A DISTANCE OF 292.19 FEET ANO CONTINUING ANOTHER 741.27 FEET THROUGH A 4"X4" CONCRETE MONUMENT AND CONTINUING ANOTHER 5.00 FEET TO THE MEAN HIGH WATER LINE OF THE INDIAN RIVER; THENCE RUN NORTHWESTERLY ALONG SAID MEAN HIGH WATER LINE 355.03 FEET TO THE WEST LINE OF AFORESAID GOVERNMENT LOT 1; THENCE RUN N00"30'26"E ALONG SAID WEST LINE 1931.39 FEET TO THE NORTHWEST CORNER OF SAID GOVERNMENT LOT 1, SAID CORNER LYING ON THE NORTH LINE OF SECTION 22; THENCE RUN S88"42'55"W ALONG THE NORTH LINE OF SECTION 22 AND THE SOUTH LINE OF AFORESAID SECTION 15A DISTANCE OF 1288.67 FEET TO A POINT LYING ON A LINE 40 EAST BY PERPENDICULAR MEASUREMENT FROM THE WEST LINE OF SECTION 15; THENCE RUN N00"42'42"E PARALLEL TO THE WEST LINE OF SECTION 15 A DISTANCE OF 4636.56 FEET TO THE SOUTH LINE OF THE NORTH 1/2 OF THE NORTHWEST 1/4 OF THE NORTHWEST 1/4 OF SECTION 15; THENCE RUN S89"20'15"W ALONG SAID LINE 7.00 FEET TO A POINT LYING ON A LINE 33 FEET EAST BY PERPENDICULAR MEASUREMENT FROM THE WEST LINE OF SECTION 15; THENCE RUN N00"42'42"E ALONG SAID LINE AND PARALLEL TO THE WEST LINE OF SECTION 15 A DISTANCE OF 529.34 FEET TO A POINT ON THE SOUTH LINE OF THE NORTH 133 FEET OF THE NORTH 1/2 OF THE NORTHWEST 1/4 OF THE NORTHWEST 1/4; THENCE RUN N89"25'57"E ALONG SAID SOUTH LINE 7,00 FEET TO A POINT ON A LINE 40 EAST BY PERPENDICULAR MEASUREMENT FROM THE WEST LINE OF SECTION 15; THENCE RUN N00"42'42"E ALONG SAID LINE AND PARALLEL TO THE WEST LINE OF SECTION 15 A DISTANCE OF 73.02 FEET TO THE POINT OF BEGINNING.

TOGETHER WITH LOT 6 OF JOSEPH ODEA & DAN'L M. MCINNIS' SUBDIVISION RECORDED IN PLAT BOOK 1, PAGE 19 OF THE PUBLIC RECORDS OF BREVARD COUNTY, FLORIDA, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS; BEGIN AT THE SOUTHEAST CORNER OF SECTION 16, TOWNSHIP 23 SOUTH, RANGE 36 EAST ALSO BEING THE SOUTHEAST CORNER OF SAID LOT 6; THENCE RUN S88.42'08"W ALONG THE SOUTH LINE OF SECTION 16 AND THE SOUTH LINE OF LOT 8 A DISTANCE OF 884.25 FEET TO THE MEAN HIGH WATER LINE OF THE INDIAN RIVER; THENCE RUN NORTHERLY ALONG SAID MEAN HIGH WATER LINE 2132.84 FEET TO THE NORTH LINE OF LOT 6; THENCE RUN N89°26'20"E 1598.97 FEET TO THE NORTHEAST CORNER OF LOT 6, LYING ON THE EAST LINE OF SECTION 16; THENCE RUN S00° 42'42"W ALONG THE EAST LINE OF LOT 6 AND THE EAST LINE OF SECTION 16 A DISTANCE OF 1832.72 FEET TO THE POINT OF BEGINNING.

Transcript of the First Amendment (1998) to the Participation and Interim Management Agreement

AMENDMENT TO PARTICIPATION AND INTERIM MANAGEMENT AGREEMENT BETWEEN BREVARD COUNTY, FLORIDA AND THE ST. JOHNS RIVER WATER MANAGEMENT DISTRICT PINE ISLAND PROPERTY, MERRITT ISLAND, FLORIDA

This Amendment to the Participation and Interim Management Agreement was entered into this 7th day of July, 1998, by Brevard County, a political subdivision of the State of Florida (County) and the St. Johns River Water Management District (District).

WHEREAS, the Participation and Interim Management Agreement provided for additional properties to be included in the Agreement, and

WHEREAS, the parties have identified a new parcel to be included in the original Participation and Interim Management Agreement, and

WHEREAS, the County and the District desire to jointly purchase the new parcel and hold title as the title to the Pine Island property is held.

NOW, THEREFORE, IN CONSIDERATION OF THE PREMISES AND THE MUTUAL COVENANTS HEREIN CONTAINED, the parties hereto do warrant and agree as follows:

The property described at Exhibit "A" shall be included as Pine Island property under the terms of the November 26, 1996, Participation and Interim Management Agreement ex'ecuted by the parties.

All terms and provisions of the Participation and Interim Management Agreement shall remain in full force and effect and shall be construed to include the property described at Exhibit "A".

The purchase price for the property described at Exhibit "A" is Five Hundred Twenty- Five Thousand Dollars ($525,000), based upon an estimated acreage of ninety eight (98) acres adjustable at a rate of Five Thousand Three Hundred Fifty Seven Dollars and Fourteen cents ($5,357.14) per non-sovereign surveyed acre, and the County will agree to participate as a fifty percent partner in the acquisition.

All other terms of the Participation and Interim Management Agreement shall remain in full force and effect and this property shall be included in a management agreement between the parties at a subsequent date.

IN WITNESS WHEREOF, the parties hereto have duly executed this Agreement to be effective as of the date and year first above-written.

Helen Voltz, Chairman of the Board, Board of County Commissioners, Brevard County, Florida

J. Daniel Roach, Governing Board Chairman, St. Johns River Water Management District

John W. Williams, Esquire, Deputy General Counsel, Office of General Counsel, St. Johns River Water Management District

LEGAL DESCRIPTION

MILLIKEN PROPERTY

Lots 3, 4, and 5 in fractional Section 16, Township 23 South, Range 36 East, according to map surveyed and made by Walter Overstreet, and recorded in Plat Book 1, Page 19, of the Public Records of Brevard County, Florida; excepting therefrom the North 211 feet on a perpendicular measurement. Said property being also the same described as 3 and 4, less the North 211 feet thereof, and all of Lot 5, Joseph Odea and Dan'l Mcinnis Subdivision according to said plat thereof as recorded in Plat Book 1, Page 19, on the Public Records of Brevard County, Florida.

Transcript of the Second Amendment (2000) to the Participation and Interim Management Agreement

SECOND AMENDMENT TO THE PARTICIPATION AND INTERIM MANAGEMENT AGREEMENT BETWEEN BREYARD COUNTY, FLORIDA AND THE ST. JOHNS RIVER WATER MANAGEMENT DISTRICT PINE ISLAND PROPERTY, MERRITT ISLAND, FLORIDA

This Second Amendment to the Participation and Interim Management Agreement was entered into this 12 day of January, 2000, by Brevard County, a political subdivision of the State of Florida (County) and the St. Johns River Water Management District (District).

WHEREAS, the Participation and Interim Management Agreement provided for additional properties to be included in the Agreement; and

WHEREAS, the District has acquired a mitigation parcel to be included in the original Participation and Interim Management Agreement; and

WHEREAS, the County and the District desire to add this new District-owned parcel to the descriptions of the Pine Island Property for management.

NOW THEREFORE, IN CONSIDERATION OF THE PREMISES AND THE

MUTUAL COVENANTS HEREIN CONTAINED, the parties hereto do warrant and agree as follows:

The 11.36-acre property described in Exhibit "A" and known as the River Point Offsite Mitigation Area shall be included as Pine Island property under the terms of the November 26, 1996 Participation and Interim Management Agreement executed by the parties.

All terms and provisions of the Participation and Interim Management Agreement shall remain in full force and effect and shall be construed to include the property described in Exhibit "A."

All other terms of the Participation and Interim Management Agreement shall remain in full force and effect and this property hall be included in a management agreement between parties at a subsequent date.

IN WITNESS WHEREOF, the parties hereto have duly executed this Agreement to be effective as of the date and year first written above.

Truman G. Scarborough, Jr., Chairman, Board of County Commissioners, Brevard County, Florida

William W. Kerr, Chairman, Governing Board, St. Johns River Water Management District

John W. Williams, Deputy General Counsel, St. Johns River Water Management District

EXHIBIT A

Warranty Deed made on 31st day of August, 1998, between Willian E. Gunn, Julie E. Gunn, the William E. Gunn Trust, Grantors, and the St. Johns River Water Management District, Grantee.

Clerk of Courts, Brevard County, FL, Book/Page: 3893/1415, September 4, 1998. The following described land, situate, lying and being in Brevard County, Florida; to wit: The North 211 feet, on a perpendicular measurement, of Lots 3 and 4 in fractional Section 16, Township 23 South, Range 36 East, according to the map surveyed and made by Walter Overstreet recorded in Plat Book 1, at Page 19 of the Public Records of Brevard County, Florida.

Transcription of Memorandum Accepting Donation of Land from The Nature Conservancy

August 21, 2013 MEMORANDUM

TO: Jack Masson, Parks and Recreation Director, Attn: Mike Knight

RE: Item 111.B.2., Accept Donation of Land from The Nature Conservation Land Acquisitions

The Board of County Commissioners, in regular session on August 20, 2013, accepted the donation of property previously referred to as the St. Lucie Consulting tract, from The Nature Conservancy (TNC).

Your continued cooperation is always appreciated.

Sincerely yours,

Tammy Etheridge, Deputy Clerk, BOARD OF COUNTY COMMISSIONERS, SCOTT ELLIS, CLERK

Cc: Asset Management, Finance, Budget

Legal Description

Warranty Deed made on December 10, 2013 by The Nature Conservancy, Grantor, to Brevard County, Grantee.

Clerk of Courts, Brevard County, FL, Book 7031, Page 2291, December 16, 2013. All that certain land situate in Brevard County, Florida, viz: “Government Lot 2 in Section 22, Township 23 South, Range 36 East, Brevard County Florida, less and except the lands described in Official Records Book 616, Page 203 Official Records Book 2256, Page 2711, and road right of way.

APPENDIX B

Regulatory Letters

The following original documents are presented here as they were received from their respective agencies. To access these documents in a Section 508 compliant format please request them through Brevard County's Public Request Process. Contact the Public Records Request Coordinator at (321) 633-2071, or by emailing your request to PublicRecordsRequest@BrevardFL.gov.

Chicone, Ron

Subject: FW: Pine Island Conservation Area Management Plan

Hi Ron,
Thanks for incorporating the goal of working on the management agreement. I read the public meeting minutes in Appendix J. Nice to see you had a few people attend. It doesn't look like there was anything too dramatic or Earth shattering. Assuming the rest of the document has remained unchanged, I will give the plan a green light from District staff.

Typically management plans for areas that include District ownership, including cooperator properties such as Pine Island, go to our Governing Board for approval. Please let me know what the County Commission approval calendar looks like so I can schedule accordingly to get this to our Board.

Cheers,
Brent

Brent Bachelder
St. Johns River Water Management District
Phone: 386-643-1973

From: Chicone, Ron <Ron.Chicone@brevardfl.gov>
Sent: Tuesday, July 19, 2022 2:42 PM
To: Brent Bachelder <BBachelder@sjrwmd.com>
Cc: DEMEYER, DAVID <david.demeyer@brevardfl.gov>
Subject: FW: Pine Island Conservation Area Management Plan

Brent,
The Pine Island Management Plan has gone through our public comment period with no changes requested. I am attaching the pdf version of the final draft for your review. This addresses all the changes previously requested by SJRWMD. With your approval, this final draft will go to Board of County Commissioners. I can also send you the Word version of the final draft and the version with your previous comments. They are big files so didn't want to attach everything if you don't need it.
Thanks,

Ron Chicone, Jr.
Brevard County Environmentally Endangered Lands (EEL) Program
Central Region Land Management Specialist

6195 North Tropical Trail
Merritt Island 32953
Office: 321-449-4720
Cell: 321-946-6352
Fax: 321-449-4736

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BOARD OF COUNTY COMMISSIONERS

Planning & Development
2725 Judge Fran Jamieson Way
Building A, Room 114
Viera, Florida 32940

Inter-Office Memo

DATE: **November 18, 2021**

TO: **Ron Chicone Jr., Brevard County Environmentally Endangered Lands Program Central Region Land Management Specialist**

FROM: **Jeffrey Ball, AICP, Planning & Zoning Manager, Brevard County Planning & Development Department**

RE: **Pine Island Conservation Area**

All of the properties within the referenced Pine Island Conservation Area are entirely situated within the unincorporated area of Brevard County. The approximately 28 parcels within the area retain one of the following zoning classifications listed with applicable Section of the Zoning Regulations: Government Managed Lands (Parks and Conservation), (GML(P); General Use (GU); and Agricultural Residential (AU). Each of these zoning classifications states that parks and public recreational facilities are permitted uses.

Each of the approximately 27 parcels within this area are designated Public Conservation (PUB-CONS) on Future Land Use Map. The PUB-CONS Future Land Use designation is consistent with the use of an environmentally sensitive sanctuary. One property is designated as Residential 1 (Res 1) and is consistent with the Agricultural Residential (AU) zoning designation. However Res 1, it is not consistent with the use of an environmentally sensitive area.

If you have any questions do not hesitate to contact me.

enclosure

Phone (321) 633-2070 • Fax (321) 633-2087
Website: www.brevardfl.gov/planningdev/home

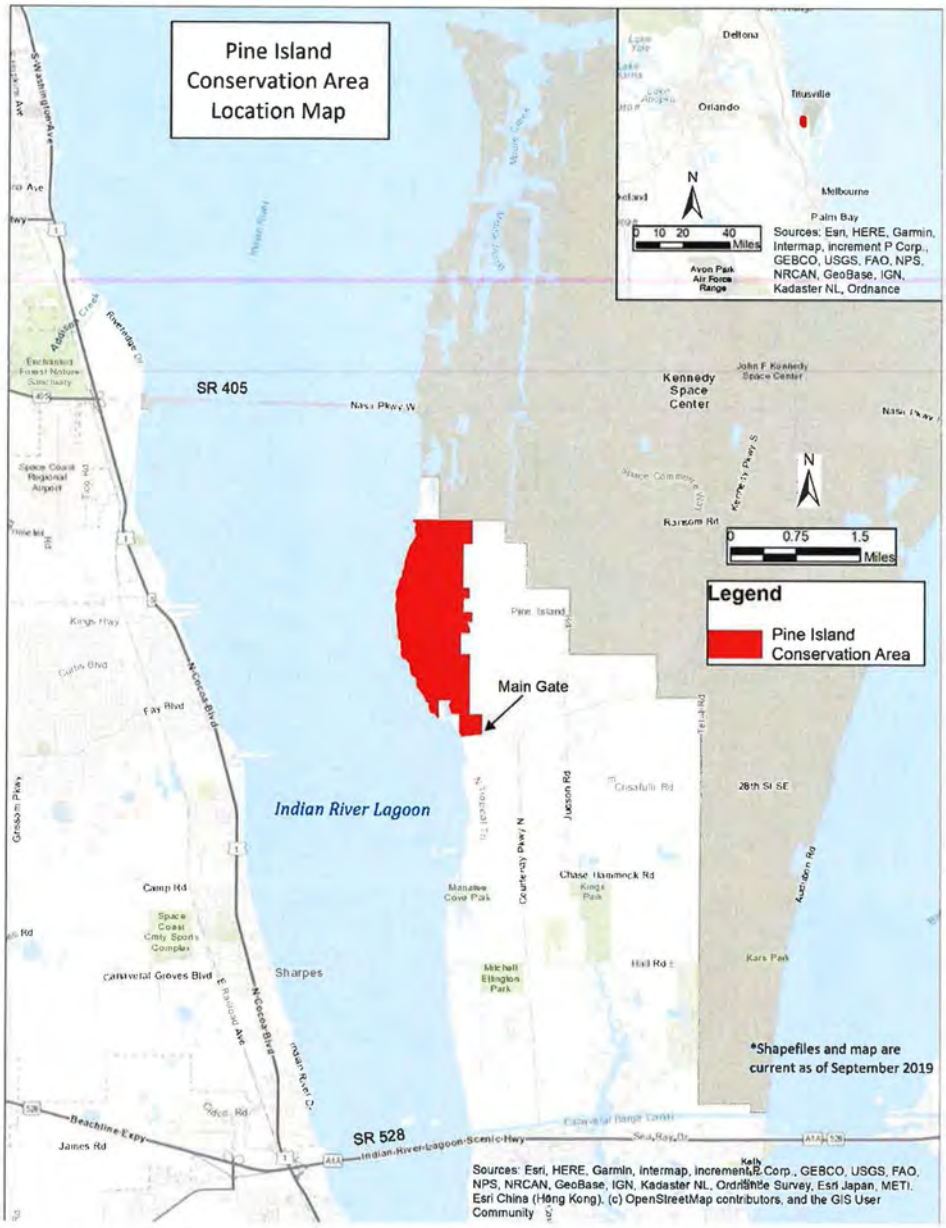

Figure 1. Location Map for Pine Island Conservation Area

Florida Department of Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Rick Scott
Governor

Carlos Lopez-Cantera
Lt. Governor

Noah Valenstein
Secretary

January 7, 2019

Mr. David DeMeyr
Brevard County Environmentally Endangered Lands (EEL) Program
Central Region Land Manager
6195 North Tropical Trail
Merritt Island FL, 32953

RE: Land Management Plans for Brevard County

Dear Mr. DeMeyer:

Thank you for your inquiry regarding the surface water quality classifications on and near the land parcels in the Pine Island Conservation Area and three additional areas listed in the Sykes Creek Management Plan.

The northwest corner of the Pine Island Conservation Area (PICA) is immediately adjacent to the Merritt Island National Wildlife Refuge, which was designated an Outstanding Florida Water (OFW) under subsection 62-302.700(9)(b)19, Florida Administrative Code (F.A.C.). Additionally, the western boundary of the PICA is immediately adjacent to the Indian River Lagoon, which is classified as a Class II shellfishing waters under subparagraph 62-302.400(17)(b)5, F.A.C.

Waters in and adjacent to the Johnson Property are Class III and do not include any OFWs. Similarly, surface waters in and adjacent to the Kabboord Wildlife Sanctuary and the Ulumay Wildlife Sanctuary are classified as Class III. The Banana River Aquatic Preserve OFW, under subsection 62-302.700(9)(h)3, F.A.C., runs through the Kabboord Wildlife Sanctuary is adjacent to the western boundary of Ulumay Wildlife Sanctuary. Therefore, both the Kaboord and Ulamay Wildlife Sanctuaries contain or are adjacent to an OFW.

If you have any questions or need additional information, please feel free to contact me by phone at 850-245-8414, or via E-mail at Kenneth.Weaver@dep.state.fl.us.

Sincerely,

Kenneth Weaver
Environmental Administrator
Water Quality Standards Program

FLORIDA
Natural Areas
INVENTORY

1018 Thomasville Road
Suite 200-C
Tallahassee, FL 32303
850-224-8207
fax 850-681-9364
www.fnai.org

January 8, 2019

David DeMeyer
Environmentally Endangered Lands Program
Brevard County
6195 North Tropical Trail
Merritt Island, FL 32953

Dear Mr. DeMeyer,

Thank you for requesting information from the Florida Natural Areas Inventory (FNAI). We have compiled the following information for your project area.

Project: Pine Island Conservation Area
Date Received: 01/04/19
Location: Brevard County

Element Occurrences

A search of our maps and database indicates that we currently have a few element occurrences mapped in the vicinity of the study area (see enclosed map and element occurrence table). Please be advised that a lack of element occurrences in the FNAI database is not a sufficient indication of the absence of rare or endangered species on a site.

The element occurrences data layer includes occurrences of rare species and natural communities. The map legend indicates that some element occurrences occur in the general vicinity of the label point. This may be due to lack of precision of the source data, or an element that occurs over an extended area (such as a wide ranging species or large natural community). For animals and plants, element occurrences generally refer to more than a casual sighting; they usually indicate a viable population of the species. Note that some element occurrences represent historically documented observations which may no longer be extant. Extirpated element occurrences will be marked with an 'X' following the occurrence label on the enclosed map.

Likely and Potential Rare Species

In addition to documented occurrences, other rare species and natural communities may be identified on or near the site based on habitat models and species range models (see enclosed Biodiversity Matrix Report). These species should be taken into consideration in field surveys, land management, and impact avoidance and mitigation.

FNAI habitat models indicate areas, which based on land cover type, offer suitable habitat for one or more rare species that is known to occur in the vicinity. Habitat models have been developed for approximately 300 of the rarest species tracked by the Inventory, including all federally listed species.

FNAI species range models indicate areas that are within the known or predicted range of a species, based on climate variables, soils, vegetation, and/or slope. Species range models have been developed for approximately 340 species, including all federally listed species.

The FNAI Biodiversity Matrix Geodatabase compiles Documented, Likely, and Potential species and natural communities for each square mile Matrix Unit statewide.

Florida Resources
and Environmental
Analysis Center

Institute of Science
and Public Affairs

The Florida State University

Tracking Florida's Biodiversity

Florida Scrub-jay Survey – U.S. Fish and Wildlife Service
This survey was conducted by staff and associates of the Archbold Biological Station from 1992 to 1996. An attempt was made to record all scrub-jay (*Aphelocoma coerulescens*) groups, although most federal lands were not officially surveyed. Each map point represents one or more groups.

This data layer indicates that there are potential scrub-jay populations on or very near your site. For additional information:

Fitzpatrick, J.W., B. Pranty, and B. Stith, 1994, Florida scrub jay statewide map, 1992-1993. U. S. Fish and Wildlife Service Report, Cooperative Agreement no. 14-16-004-91-950.

Managed Areas
Portions of the site appear to be located within the Pine Island Conservation Area, managed by Brevard County, and adjacent to the Merritt Island National Wildlife Refuge managed by US Dept. of the Interior, Fish and Wildlife Service.

The Managed Areas data layer shows public and privately managed conservation lands throughout the state. Federal, state, local, and privately managed conservation lands are included.

Land Acquisition Projects
This site appears to be located within the Indian River Lagoon Blueway Florida Forever BOT Project, which is part of the State of Florida's Conservation and Recreation Lands land acquisition program. For more information on this Florida Forever Project, contact the Florida Department of Environmental Protection, Division of State Lands.

Florida Forever Board of Trustees (BOT) projects are proposed and acquired through the Florida Department of Environmental Protection, Division of State Lands. The state has no specific land management authority over these lands until they are purchased.

The Inventory always recommends that professionals familiar with Florida's flora and fauna conduct a site-specific survey to determine the current presence or absence of rare, threatened, or endangered species.

Please visit www.fnai.org/trackinglist.cfm for county or statewide element occurrence distributions and links to more element information.

The database maintained by the Florida Natural Areas Inventory is the single most comprehensive source of information available on the locations of rare species and other significant ecological resources. However, the data are not always based on comprehensive or site-specific field surveys. Therefore this information should not be regarded as a final statement on the biological resources of the site being considered, nor should it be substituted for on-site surveys. Inventory data are designed for the purposes of conservation planning and scientific research, and are not intended for use as the primary criteria for regulatory decisions.

Information provided by this database may not be published without prior written notification to the Florida Natural Areas Inventory, and the Inventory must be credited as an information source in these publications. FNAI data may not be resold for profit.

This report is made available at no charge due to funding from the Florida Department of Environmental Protection, Division of State Lands.

Thank you for your use of FNAI services. If I can be of further assistance, please contact me at (850) 224-8207 or at kbrinegar@fnai.fsu.edu.

Sincerely,

Tracking Florida's Biodiversity

Kerri Brinegar

Kerri Brinegar
GIS / Data Services

Encl

This record search is for informational purposes only and does NOT constitute a project review. This search only identifies resources recorded at the Florida Master Site File and does NOT provide project approval from the Division of Historical Resources. Contact the Compliance and Review Section of the Division of Historical Resources at 850-245-6333 for project review information.

January 4, 2019

Florida Master Site File

David DeMeyer
Brevard County EEL Program
6195 North Tropical Trail
Marriott Island, FL 32953
Phone: 321.449.4720
Email: david.demeyer@brevardfl.gov

In response to your inquiry of January 4, 2019 the Florida Master Site File lists one archaeological site, eight field surveys, and one historic structure found in the following sections of Brevard County:

T 23S, R 36E, Sections 9, 10, 15, 16, & 22 with a 150 foot buffer as shown on the corresponding maps.

When interpreting the results of our search, please consider the following information:

- **This search area may contain *unrecorded* archaeological sites, historical structures or other resources even if previously surveyed for cultural resources.**
- **Because vandalism and looting are common at Florida sites, we ask that you limit the distribution of location information on archaeological sites.**
- **While many of our records document historically significant resources, the documentation of a resource at the Florida Master Site File does not necessarily mean the resource is historically significant.**
- **Federal, state and local laws require formal environmental review for most projects. This search DOES NOT constitute such a review. If your project falls under these laws, you should contact the Compliance and Review Section of the Division of Historical Resources at 850-245-6333.**

Please do not hesitate to contact us if you have any questions regarding the results of this search.

Sincerely,

Cody VanderPloeg
Archaeological Data Analyst
Florida Master Site File
Cody.VanderPloeg@dos.myflorida.com

APPENDIX C

Aerial Photos of Pine Island Conservation Area

Brevard County, FL

1943 to 2006

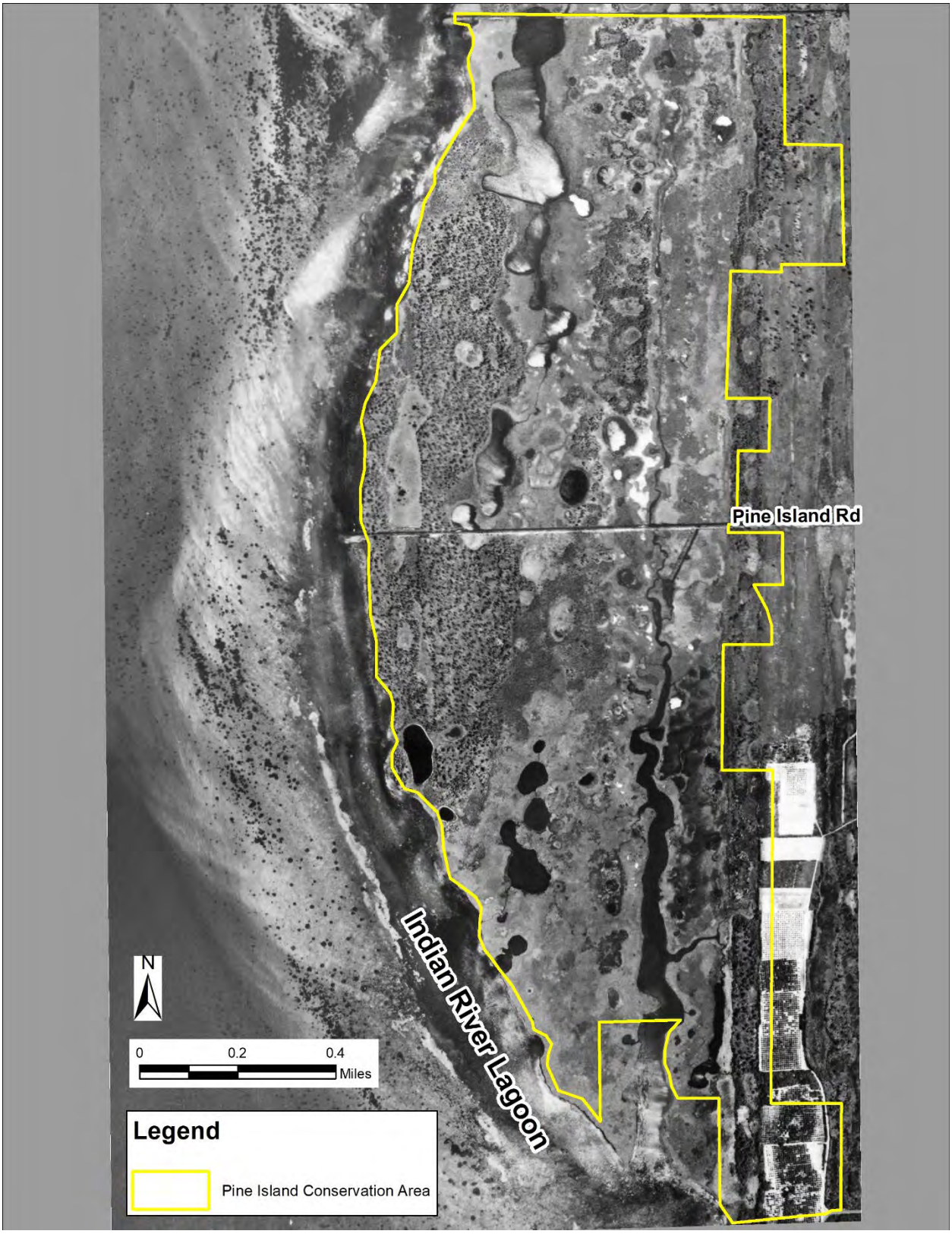

Figure 1. 1943 United States Department of Agriculture Image of Pine Island Conservation Area. The Pine Island property boundary is approximate.

Figure 1 Long Description.

This map displays the current site boundaries of the Pine Island Conservation Area over a 1943 United States Department of Agriculture aerial photo that has been geo-rectified using ArcGIS. The site is bordered by the Indian River Lagoon to the west, natural land to the north and northeast, Pine Island Road and agricultural land to the southeast, and North Tropical Trail to the south. This photo shows the minimal amount of human impacts to the site at that time and the natural condition of the site's flatwoods, marshes and other habitats. Pine Island Road and an adjacent ditch extending to the Lagoon is present. A vehicle bridge over the west end of this ditch is present. A side ditch extending south from Pine Island Road is present near the upper Sams Creek area. The east-west ditch connecting to the Lagoon adjacent to Ransom Road along the north site boundary is present. Agricultural groves are evident in and adjacent to the southeastern boundaries.

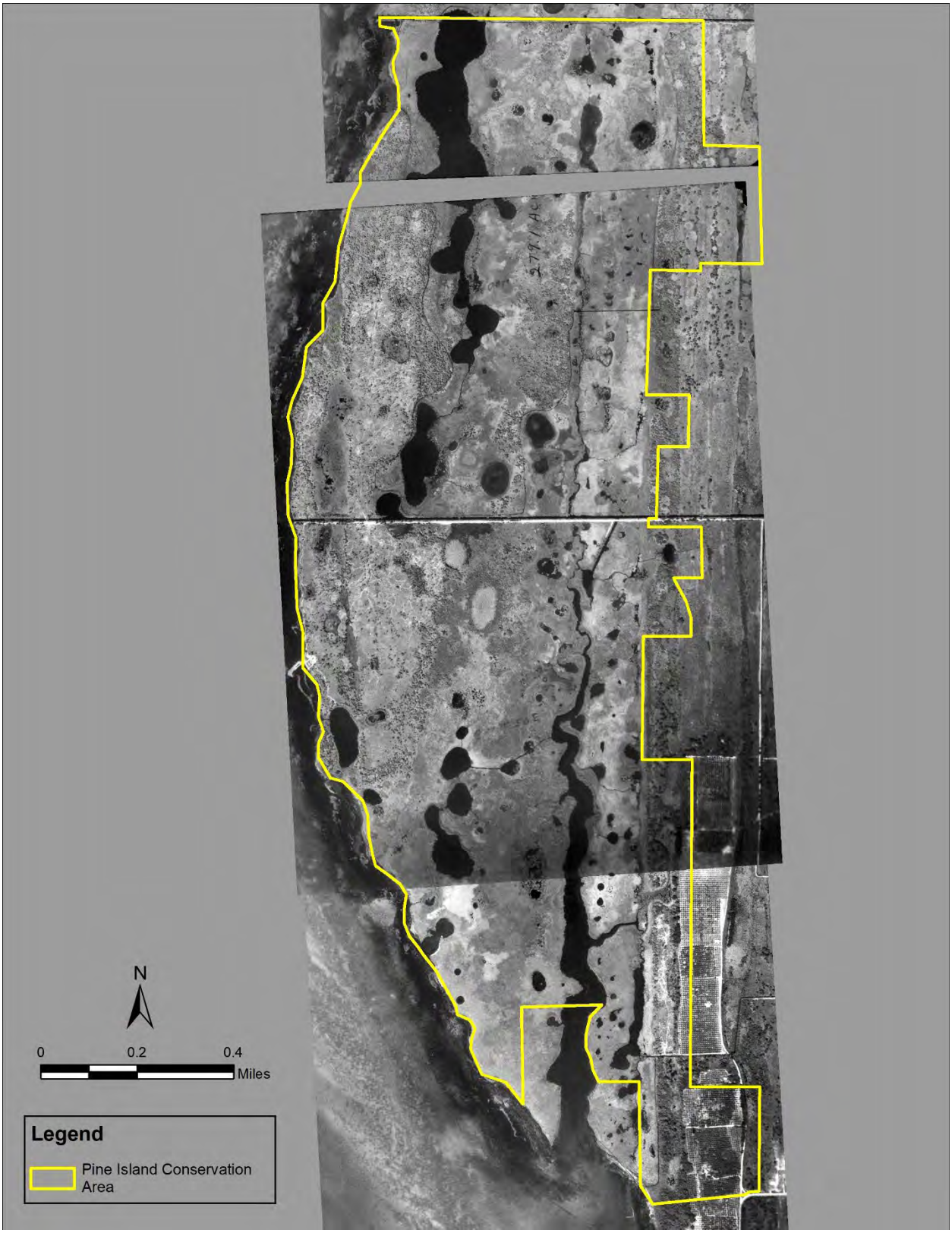

Figure 2. 1958 United States Department of Agriculture Image of Pine Island Conservation Area. The Pine Island property boundary is approximate.

Figure 2 Long Description.

This map displays the current site boundaries of the Pine Island Conservation Area over a 1958 United States Department of Agriculture aerial photo that has been geo-rectified using ArcGIS. The site is bordered by the Indian River Lagoon to the west, natural land to the north and northeast, Pine Island Road and agricultural land to the southeast, and North Tropical Trail to the south. This photo shows the minimal amount of human impacts to the site at that time and the natural condition of the site's flatwoods, marshes and other habitats. Pine Island Road and an adjacent ditch extending to the Lagoon is present. A vehicle bridge over the west end of this ditch is present. A side ditch extending south from Pine Island Road is present near the upper Sams Creek area. The east-west ditch connecting to the Lagoon adjacent to Ransom Road along the north site boundary is present. Agricultural groves are evident in and adjacent to the southeastern boundaries.

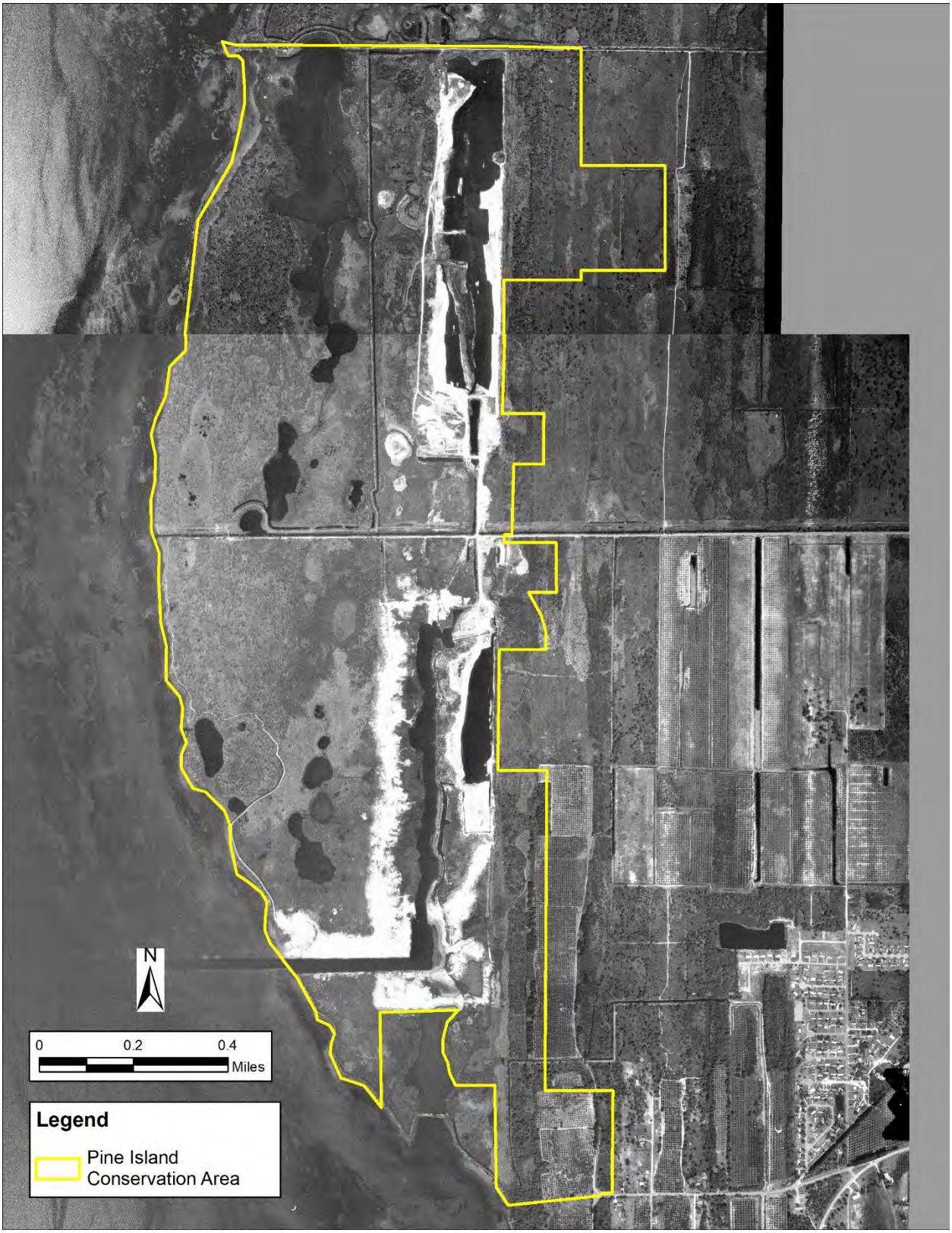

Figure 3. 1972 United States Department of Agriculture Image of Pine Island Conservation Area. The Pine Island property boundary is approximate.

Figure 3 Long Description.

This map displays the current site boundaries of the Pine Island Conservation Area over a 1972 United States Department of Agriculture aerial photo that has been geo-rectified using ArcGIS. The site is bordered by the Indian River Lagoon to the west, natural land to the north and northeast, Pine Island Road and agricultural land to the southeast, and North Tropical Trail to the south. This photo shows the drastic changes to the site from sand mining activities, dredging, berm construction human impacts to the site at that time and the natural condition of the site's flatwoods, marshes and other habitats. Pine Island Road and an adjacent ditch extending to the Lagoon is present. A vehicle bridge over the west end of this ditch is present. A side ditch extending south from Pine Island Road is present near the upper Sams Creek area. The east-west ditch connecting to the Lagoon adjacent to Ransom Road along the north site boundary is present. Agricultural groves are evident in and adjacent to the southeastern boundaries. Sams Creek has been dredged, channelized, and diverted. Spoil dirt has been piled along the sides of Sams Creek. Impoundments have been created around marshes to the north and south of Pine Island Road. Two large borrow pits are present along the northeast and east site boundaries.

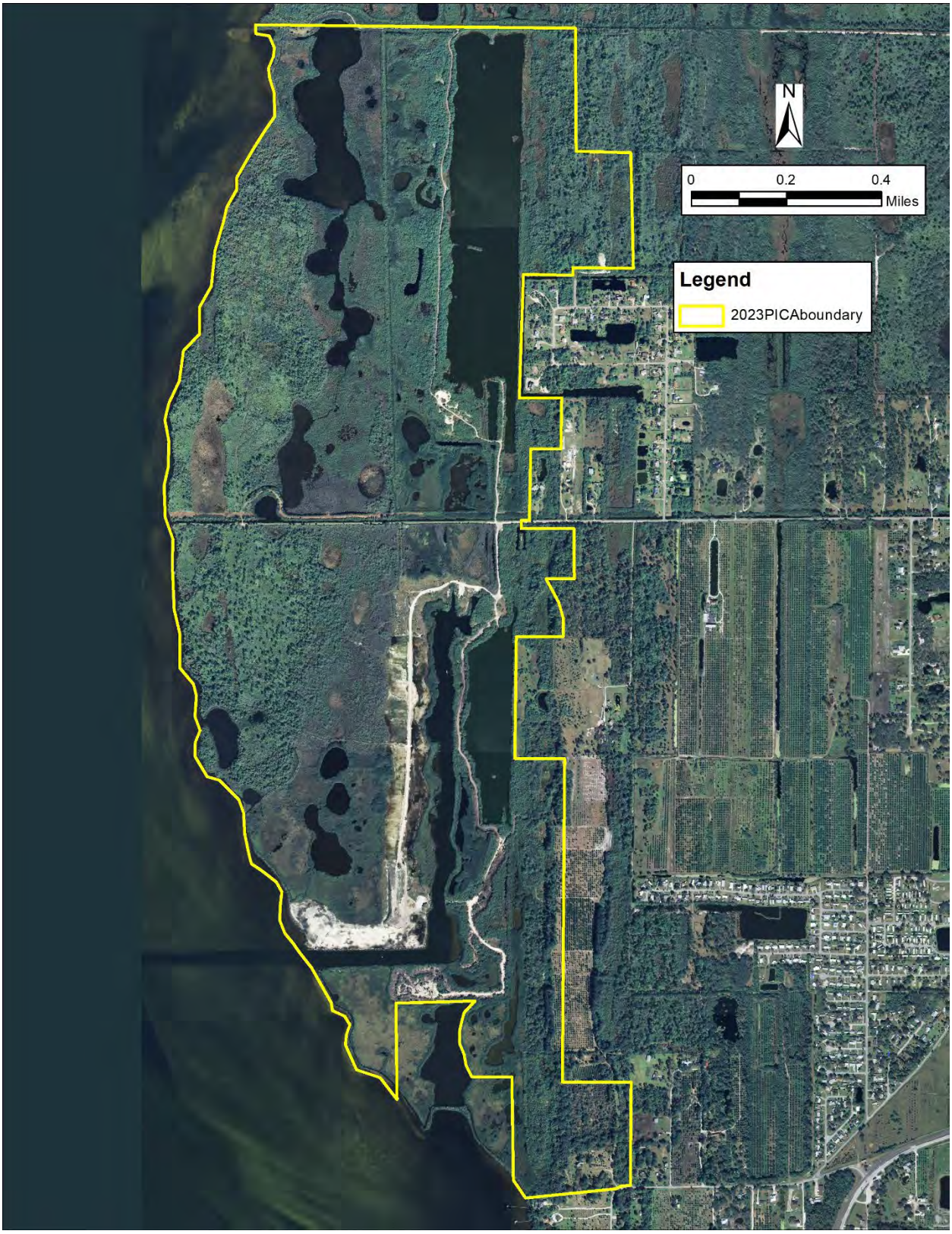

Figure 4. 1980 Florida Statewide Digital Orthophoto Program Image of Pine Island Conservation Area. The Pine Island property boundary is approximate.

Figure 4 Long Description.

This map displays the current site boundaries of the Pine Island Conservation Area over a 1980 Florida Statewide Digital Orthophoto Program aerial photo. The site is bordered by the Indian River Lagoon to the west, natural land to the north and northeast, Pine Island Road and agricultural land to the southeast, and North Tropical Trail to the south. This photo shows the drastic changes to the site from sand mining activities, dredging, berm construction human impacts to the site at that time and the natural condition of the site's flatwoods, marshes and other habitats. Pine Island Road and an adjacent ditch extending to the Lagoon is present. A vehicle bridge over the west end of this ditch is present. A side ditch extending south from Pine Island Road is present near the upper Sams Creek area. The east-west ditch connecting to the Lagoon adjacent to Ransom Road along the north site boundary is present. Agricultural groves are evident in and adjacent to the southeastern boundaries. Sams Creek has been dredged, channelized, and diverted. Spoil dirt has been piled along the sides of Sams Creek. Impoundments have been created around marshes to the north and south of Pine Island Road. Two large borrow pits are present along the northeast and east site boundaries. There is a large residential development adjacent to the east boundary north of Pine Island Road and other development along Pine Island Road east of the site. Abandonment of citrus groves in the southeast corner of the site near Sams House is apparent.

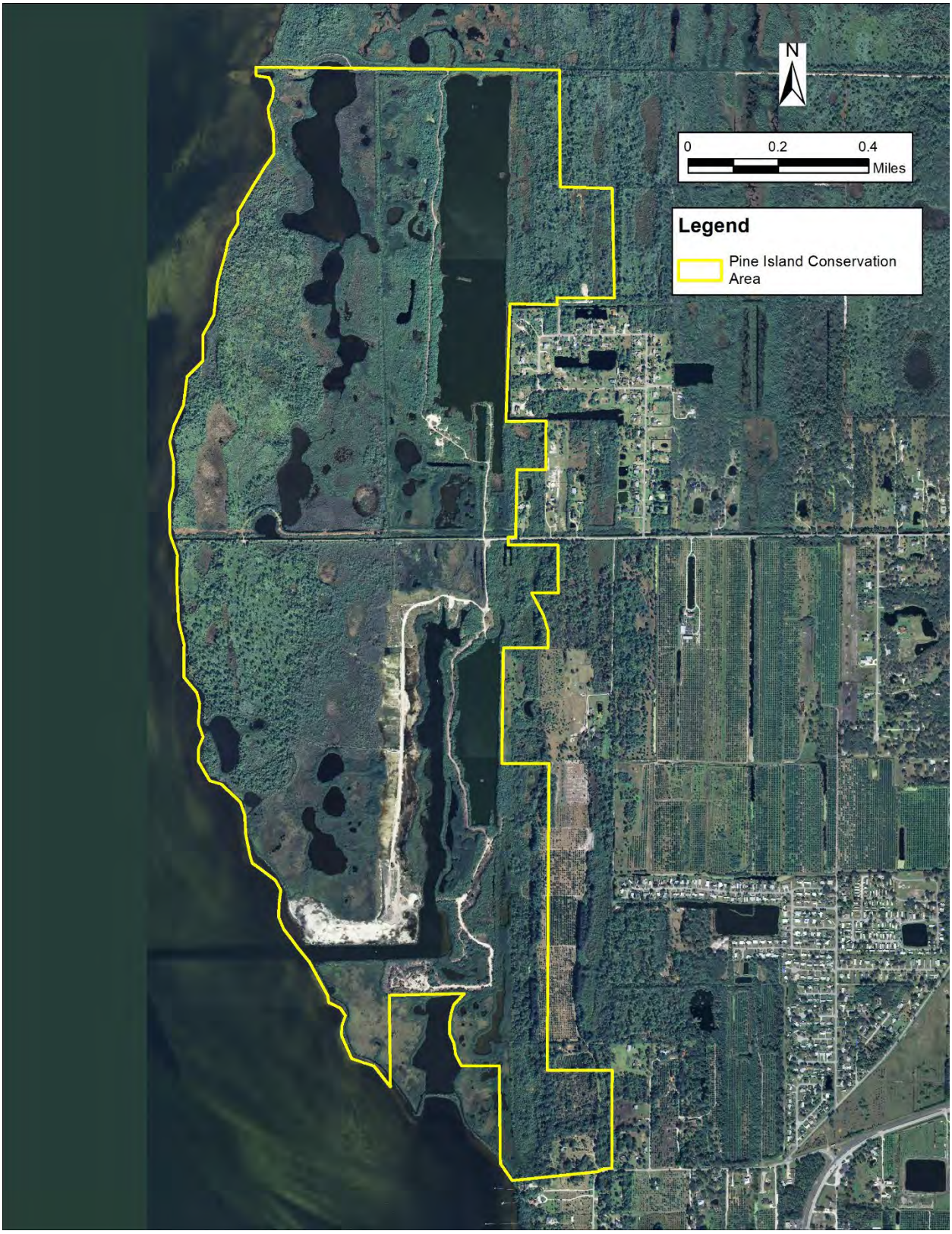

Figure 5. 2006 Florida Statewide Digital Orthophoto Program Image of Pine Island Conservation Area. The Pine Island property boundary is approximate.

Figure 5 Long Description.

This map displays the current site boundaries of the Pine Island Conservation Area over a 2006 Florida Statewide Digital Orthophoto Program aerial photo. The site is bordered by the Indian River Lagoon to the west, natural land to the north and northeast, Pine Island Road and agricultural land to the southeast, and North Tropical Trail to the south. This photo shows the drastic changes to the site from sand mining activities, dredging, berm construction human impacts to the site at that time and the natural condition of the site's flatwoods, marshes and other habitats. Pine Island Road and an adjacent ditch extending to the Lagoon is present. A vehicle bridge over the west end of this ditch is present. A side ditch extending south from Pine Island Road is present near the upper Sams Creek area. The east-west ditch connecting to the Lagoon adjacent to Ransom Road along the north site boundary is present. Agricultural groves are evident in and adjacent to the southeastern boundaries. Sams Creek has been dredged, channelized, and diverted. Spoil dirt has been piled along the sides of Sams Creek. Impoundments have been created around marshes to the north and south of Pine Island Road. Two large borrow pits are present along the northeast and east site boundaries. There is a large residential development adjacent to the east boundary north of Pine Island Road and other development along Pine Island Road east of the site. Abandonment of citrus groves in the southeast corner of the site near Sams House is apparent.

APPENDIX D

Vascular Plant Species Lists

Preliminary Floristic List for the Pine Island Conservation Area Salt marsh, salt marsh restoration, and pine flatwoods. Survey by Paul A. Schmalzer on November 28, 2006, December 2, 2006, December 8, 2007, December 6, 2008, and January 8, 2011, March 20, 2022, March 26, 2022.

FAMILY	GENUS	SPECIES	VARIETY
Pteridaceae	*Acrostichum*	*danaeifolium*	
Asteraceae	*Ambrosia*	*artemisiifolia*	
Lythraceae	*Ammannia*	*latifolia*	
Fabaceae	*Amorpha*	*fruticosa*	
Vitaceae	*Ampelopsis*	*arborea*	
Poaceae	*Andropogon*	*sp.*	
Myrsinaceae	*Ardisia*	*escallonioides*	
Avicenniaceae	*Avicennia*	*germinans*	
Asteraceae	*Baccharis*	*glomeruliflora*	
Asteraceae	*Baccharis*	*halimifolia*	
Veronicaceae	*Bacopa*	*monnieri*	
Bataceae	*Batis*	*maritima*	
Ericaceae	*Bejaria*	*racemosa*	
Asteraceae	*Bidens*	*alba*	*var. radiata*
Blechnaceae	*Blechnum*	*serrulatum*	
Amaranthaceae	*Blutaparon*	*vermiculare*	
Asteraceae	*Borrichia*	*frutescens*	
Orobanchaceae	*Buchnera*	*americana*	
Lamiaceae	*Callicarpa*	*americana*	
Fabacae	*Canavalia*	*rosea*	
Lauraceae	*Cassytha*	*filiformis*	
Poaceae	*Cenchrus*	*sp*	
Rutaceae	*Citrus*	*x aurantium*	
Cyperaceae	*Cladium*	*jamaicense*	
Lamiaceae	*Clerodendrum*	*indicum*	
Fabaceae	*Crotolaria*	*pallida*	*var. obovata*
Sapindaceae	*Cupaniopsis*	*anacardioides*	
Poaceae	*Cynadon*	*dactylon*	
Cyperaceae	*Cyperus*	*distinctus*	
Cyperaceae	*Cyperus*	*ligularis*	
Cyperaceae	*Cyperus*	*odoratus*	
Cyperaceae	*Cyperus*	*retrorsus*	
Poaceae	*Dactyloctenium*	*aegyptium*	
Fabaceae	*Dalbergia*	*ecastaphyllum*	
Poaceae	*Dichanthelium*	*commutatum*	

FAMILY	GENUS	SPECIES	VARIETY
Poaceae	*Dichanthelium*	*sp.*	
Ebenaceae	*Diospyros*	*virginiana*	
Poaceae	*Distichlis*	*spicata*	
Asteraceae	*Emilia*	*fosbergii*	
Poaceae	*Eragrostis*	*atrovirens*	
Asteraceae	*Erechtites*	*hieraciifolius*	
Fabaceae	*Erythrina*	*herbacea*	
Myrtaceae	*Eugenia*	*axillaris*	
Asteraceae	*Eupatorium*	*capillifolium*	
Poaceae	*Eustachys*	*petrae*	
Gentianaceae	*Eustoma*	*exaltatum*	
Asteraceae	*Euthamia*	*caroliniana*	
Moraceae	*Ficus*	*aurea*	
Cyperaceae	*Fimbristylis*	*cymosa*	
Fabaceae	*Galactia*	*elliottii*	
Orchidaceae	*Habenaria*	*floribunda*	
Asteraceae	*Heterotheca*	*subaxillaris*	
Malvaceae	*Hibiscus*	*grandiflorus*	
Clusiaceae	*Hypericum*	*cistifolium*	
Clusiaceae	*Hypericum*	*tetrapetalum*	
Aquifoliaceae	*Ilex*	*cassine*	
Aquifoliaceae	*Ilex*	*glabra*	
Poaceae	*Imperata*	*cylindrica*	
Fabaceae	*Indigofera*	*hirsuta*	
Asteraceae	*Iva*	*frutescens*	
Juncaceae	*Juncus*	*roemerianus*	
Cupressaceae	*Juniperus*	*virginiana*	
Combretaceae	*Laguncularia*	*racemosa*	
Verbenaceae	*Lantana*	*camara*	
Cistaceae	*Lechea*	*sp.*	
Poaceae	*Leptochloa*	*fusca*	*subsp. fascicularis*
Onagraceae	*Ludwigia*	*sp.*	
Solanaceae	*Lycium*	*carolinianum*	
Ericaceae	*Lyonia*	*fruticosa*	
Ericaceae	*Lyonia*	*lucida*	
Magnoliaceae	*Magnolia*	*grandiflora*	
Anacardiaceae	*Mangifera*	*indica*	
Asteraceae	*Mikania*	*scandens*	
Myricaceae	*Myrica*	*cerifera*	
Nephrolepidaceae	*Nephrolepis*	*sp.*	

FAMILY	GENUS	SPECIES	VARIETY
Osmundaceae	*Osmunda*	*cinnamomea*	
Osmundaceae	*Osmunda*	*regalis*	*var. spectabilis*
Oxalidaceae	*Oxalis*	*corniculata*	
Poaceae	*Panicum*	*maximum*	
Poaceae	*Panicum*	*repens*	
Vitaceae	*Parthenocissus*	*quinquefolia*	
Poaceae	*Paspalum*	*vaginatum*	
Passifloraceae	*Passiflora*	*suberosa*	
Polypodiaceae	*Phlebodium*	*aureum*	
Phytolaccaceae	*Phytolacca*	*americana*	
Pinaceae	*Pinus*	*elliottii*	*var. densa*
Polypodiaceae	*Pluchea*	*sp.*	
Asteraceae	*Pluchea*	*sp.*	
Polygalaceae	*Polygala*	*rugelii*	
Rosaceae	*Prunus*	*caroliniana*	
Rubiaceae	*Psychotria*	*sulzneri*	
Dennstaedtiaceae	*Pteridium*	*aquilinum*	
Fagaceae	*Quercus*	*Laurifolia*	
Fagaceae	*Quercus*	*virginiana*	
Myrsinaceae	*Rapanea*	*punctata*	
Rhizophoraceae	*Rhizophora*	*mangle*	
Anacardiaceae	*Rhus*	*copallinum*	
Poaceae	*Rhynchelytrum*	*repens*	
Rubiaceae	*Richardia*	*grandiflora*	
Arecaceae	*Sabal*	*palmetto*	
Amaranthaceae	*Salicornia*	*ambigua*	
Amaranthaceae	*Salicornia*	*bigelovii*	
Salicaceae	*Salix*	*caroliniana*	
Adoxaceae	*Sambucus*	*nigra*	*subsp. canadensis*
Amaranthaceae	*Sarcocornia*	*perennis*	
Anacardiaceae	*Schinus*	*terebinthifolius*	
Cyperaceae	*Scirpus*	*robustus*	
Fabaceae	*Sesbania*	*herbacea*	
Aizoaceae	*Sesuvium*	*portulacastrum*	
Poaceae	*Setaria*	*parviflora*	
Malvaceae	*Sida*	*sp.*	
Smilacaceae	*Smilax*	*auriculata*	
Asteraceae	*Solidago*	*sp.*	
Poaceae	*Spartina*	*alterniflora*	
Poaceae	*Spartina*	*bakeri*	

FAMILY	GENUS	SPECIES	VARIETY
Asteraceae	*Sphagneticola*	*triloba*	
Poaceae	*Sporobolus*	*indicus*	
Poaceae	*Sporobolus*	*virginicus*	
Amaranthaceae	*Suaeda*	*linearis*	
Asteraceae	*Symphyotrichum*	*carolinianum*	
Asteraceae	*Symphyotrichum*	*subulatum*	
Thelpyteridaceae	*Thelypteris*	*sp.*	
Acanthaceae	*Thunbergia*	*alata*	
Bromeliaceae	*Tillandsia*	*faxciculata*	
Bromeliaceae	*Tillandsia*	*recurvata*	
Bromeliaceae	*Tillandsia*	*usneoides*	
Bromeliaceae	*Tillandsia*	*utriculata*	
Anacardiaceae	*Toxicodendron*	*radicansa*	
Commelinaceae	*Tradescantia*	*ohiensis*	
Poaceae	*Tripsacum*	*dactyloides*	
Typhaceae	*Typha*	*domingensis*	
Malvaceae	*Urena*	*lobata*	
Ericaceae	*Vaccinium*	*myrsinites*	
Asteraceae	*Verbesina*	*virginica*	
Fabaceae	*Vigna*	*lutea*	
Vitaceae	*Vitis*	*rotundifolia*	
Vittariaceae	*Vittaria*	*lineata*	
Blechnaceae	*Woodwardia*	*virginica*	
Asteraceae	*Youngia*	*japonica*	
Zamiaceae	*Zamia*	*integrifolia*	

2016 Bioblitz Plant List for Pine Island Conservation Area. This Bioblitz was conducted on October 15 and 16, 2016 with a combined team of 30 Scientists, Volunteers, Students, and Staff. Support for plant species was provided by Dr. Jay Barnhart, Jim Stahl and Megan Wilkinson.

Scientific Name	Common Name
Acrostichum daneifolium	Leather Fern
Amorpha fruiticosa	False Indigo Bush
Ampelopsis arborea	Pepper Vine
Andropogon glomeratus	Bushy Bluestem
Asclepias incarnata	Swamp Milkweed
Aster spp.	Aster spp.
Baccharis halimifolia	Salt Bush
Belchnum serrulatum	Swamp Fern
Bidens alba	Spanish Needles
Boehmeria cylindrica	False Nettle
Callicarpa americana	American Beautyberry
Carex lupuliformis	Carex spp.
Carya glabra	Hickory Tree
Celtis laevigata	Hackberry
Chamaecrista fasciculata	Partridge Pea
Chrysobalanus icaco	Coco Plum
Citrus spp.	Citrus spp.
Clerodendrum indicum	Turk's Turban
Cocoloba uvifera	Seagrape
Commelina erecta	Virginia Day Flower
Commelina virginica	Virginia Day Flower
Conoclinium coelestinum	Mist Flower
Cyperus ligularis?	Cyperus spp.
Desmodium spp.	Trefoil
Diospyros virginiana	Common Persimmon

Scientific Name	Common Name
Erythrina herbacea	Coral Bean
Euphatorium capilifolium	Dog Fennel
Euphorbia heterophylla	Fiddlers Spurge
Ficus aurea	Strangler Fig
Gaillardia pulchella	Indian Blanket Flower
Gonolobus spp.	Angel Pod Vine
Guava spp	Guava seedling
Hamelia patens	Firebush
Hypericum hypericoides	St. Andrew's Cross
Juniperus virginiana	Southern Red Cedar
Laguncularia racemosa	White Mangrove
Lantana involucrata	Lantana
Licania michauxii	Gopher Apple
Ludwigia spp.	Primrose Willow
Madder spp.	Madder
Mangifera spp.	Mango Tree
Melinis repen	Rose Natal Grass
Melothria pendula	Creeping Cucumber
Mikania scandens	Climbing Hemp Weed
Mikania scandens	Southern Hemp
Mimosa strigillosa	Sunshine Mimosa
Mimosa strigillosa	Sunshine Mimosa
Opuntia spp Probably O. humifusa	Prickly Pear
Osmunda cinnamomea	Cinnamon Fern
Panicum spp	Panicum spp
Parthenocissus quinquefolia	Virginia Creeper
Passiflora suberosa	Corkey Passion Vine
Phlebodium aureum	Golden Foot Polypody

Scientific Name	Common Name
Phoradendron serotinum	Mistletoe
Phyla nodiflora	Frog Fruit
Physalis angustifolia	Ground Cherry
Phytolacca americana	Poke Weed
Pleopeltis polypodioides	Resurrection Fern
Pluchea odorata	Salt Marsh Fleabane, Camphorweed
Polypodium polypodioides	Resurrection Fern
Prunus caroliniana	Carolina Laurelcherry
Psychoteria sulzneri	Short Leaf Wild Coffee
Psychotria nervosa	Wild Coffee
Quercus laurifolia	Laurel Oak
Quercus virginiana	Live Oak
Rapanea punctata	Myrsine
Rhus copallina	Winged Sumac
Richardia grandiflora	Largeflower Mexican Clover
Ruellia caroliniensis	Wild Petunia
Salvia coccinea	Red Salvia, Tropical Sage
Sambucus nigra subsp canadensis	Elderberry
Saururus cernuus	Lizrad's Tail
Senna ligustrina	Privet Cassia
Sida rhombifolia	Cuban Jute
Sida spp.	Sida
Sisyrinchium angustifolium	Blue-Eyed Grass
Smilax reticulata	Smilax
Solidago fistulosa	Goldenrod
Sophora tomentosa	Necklace Pod
Sorghum halepense	Johnson Grass
Spurge spp	Spurge spp

Scientific Name	Common Name
Stachytarpheta jamaicensis	Porter Weed
Symphyotrichum carolinianum	Climbing Aster
Tillandsia recurvata	Ball Moss
Tillandsiana usneoides	Spanish Moss
Toxicodendron radicans	Poison Ivy
Tradescantia ohiensis	Spiderwort
Viburnum obavatum	Walter's Viburnum
Vicia floridana	Florida Vetch
Viola spp	Violet
Vittaria lineata	Shoestring Fern
Vitus rotundifolia	Common Grape
Yucca filamentosa	Adams Needle
Zamia floridana	Coontie

APPENDIX E

Insect Species Lists

2016 Bioblitz Butterfly and Moth Species List for Pine Island Conservation Area. This Bioblitz was conducted on October 15 and 16, 2016 with a combined team of 30 Scientists, Volunteers, Students, and Staff.

Common Name	**Scientific Name**
Scarlet Bodied Wasp Moth	*Cosmosoma myrodora*
Silver Spotted Skipper	*Epargyreus clarus*
Florida Duskywing	*Ephyriades brunneus*
Horace's Duskywing	*Erynnis horatius*
Fiery Skipper	*Hylephila phyleus*
Clouded Skipper	*Lerema accius*
Ocola Skipper	*Panoquina ocola*
Long Tail Skipper	*Urbanus proteus*
Great Purple Hairstreak	*Atlides halesus*
Eastern Pygmy Blue	*Brephidium isophthalma*
Red Banded Hairstreak	*Calycopis cecrops*
Cassius Blue	*Leptotes cassius*
Gulf Frittilary	*Agraulis vanilae*
White Peacock	*Anartia jatrophae*
Hackberry Emporer	*Asterocampa celtis*
Tawny Emperor	*Asterocampa clyton*
Queen	*Danaus gilippus*
Monarch	*Danaus plexippus*
Julia	*Dryas iulia*
Zebra Longwing	*Heliconius charitonius*
Carolina Satyr	*Hermeuptychia sosybius*
Common Buckeye	*Junonia coenia*
Mangrove Buckeye	*Junonia evarete*
Viceroy	*Limenitis archippus*
Little Wood Satyr	*Megisto cymela*
Painted Lady	*Vanessa cardui*
Red Admiral	*Vanessa atalanta*
Pipevine Swallowtail	*Battus philenor*
Polydamas Swallowtail	*Battus polydamas*
Zebra Swallowtail	*Eurytides marcellus*
Giant Swallowtail	*Papilio cresphontes*
Black Swallowtail	*Papilio polyxenes*
Eastern Tiger Swallowtail	*Papilio glaucus*
Palamedes Swallowtail	*Papilio palamedes*
Spicebush Swallowtail	*Papilio troilus*
Great Southern White	*Ascia monuste*
Southern Dogface	*Colias cesonia*
Dainty Sulphur	*Nathalis iole*

Common Name	**Scientific Name**
Orange-Barred Sulphur	*Phoebis philea*
Cloudless Sulphur	*Phoebis sennae*
Cabbage White	*Pieris rapae*
Luna Moth	*Actias luna*
a species of Grass Veneer moth	*Crambus sp.*
American Lady	
Apis mellifora	
Assembly Moth	*Samea ecclesialis*
Broad-patch carolella moth	*Eugnosta Sartana*
Ceranus Blue	
Common Checkered Skipper	
Crowned Slug Moth	*Isa textula*
Dusky Herpetogramma moth	*Herpetogramma*
Gray Hairstreak	
Little Sulphur	
NO COMMON NAME	*Heliades Mulleolella*
Olive Arta moth	*Arta olivalis*
Phaon Crescent	
So. Skipperling	
Two Banded Petrophila moth	*Petrophila bifascialis*
Velvetbean Caterpillar moth	*Anticarsia gemmatalis*
Yellow Sulphur	
Dun Skipper	
UNKNOWN Hesperidae	

2016 Bioblitz Arthropod Species List for Pine Island Conservation Area. This Bioblitz was conducted on October 15 and 16, 2016 with a combined team of 30 Scientists, Volunteers, Students, and Staff.

Common Name	Scientific Name
Twostriped Walkingstick	*Anisomorpha buprestoides*
Black & Yellow Garden Spider	*Argiope aurantia*
Carpenter Ants	*Camponotus floridanus*
Green June Beetle	*Cotinus nitida*
Hercules Beetle	*Dynastes tityus*
Palmetto Bug	*Eurycotis floridana*
Spinybacked Orb Weaver	*Gasteracantha cancriformis*
Black Widow	*Latrodectus mactans*
Silverfish	*Lepisma saccharina*
Orchard Spider	*Leucauge venusta*
Golden Silk Orb Weaver	*Nephila clavipes*
Patent Leather Beetle	*Odontotaenius disjunctus*
Blue Dasher Dragonfly	*Pachydiplax longipennis*
Love Bugs	*Plecia nearctica*
Harvester Ants	*Pogonomyrmex badius*
Lubber Grasshopper	*Romalea microptera*
Wolf Spider	
Daddy Longlegs	
Huntsman Spider	
Psuedoscorpion	
Millipede	
Jumping Bristletail	
Ladybug	
Hister Beetle	
Lightening Bugs	
Stag Beetle	
Rhinoceros Beetle	
Dung Beetle	
Ground Boring Dung Beetle	
Mosquitoes	
Hoverfly	
Horse Fly	
Crane Fly	
Cicada	
Stink Bug	
Assassin Bug	
Spittlebug	
Carpenter Bee	

Common Name	Scientific Name
Cicada Killer	
Leafcutter Ants	
Red Velvet Ant	
Spider Wasp	
Paper Wasp	
Mud Dauber	
Praying Mantis	
Antlion	
Phantom Darner Dragonfly	
Saddlebag Dragonfly	
Damselfly	
Tree Cricket	
Leaf Bug	
Roly Poly/Pill Bug	

Species List of Butterflies and Skippers observed on Pine Island Conservation Area by butterfly expert and director of the Indian River Chapter of the Florida Trail Association, Jim Escoffier. Survey visits averaged eight times throughout each year from 2004 to 2021.

Common Name	**Scientific Name**
Pipevine Swallowtail	*Battus philenor*
Black Swallowtail	*Papilio polyxenes*
Giant Swallowtail	*Papilio cresphontes*
Palamedes Swallowtail	*Papilio palamedes*
Great Southern White	*Ascia monuste*
Orange Sulphur	*Colias eurytheme*
Cloudless Sulphur	*Phoebis sennae*
Barred Yellow	*Eurema daira*
Little Yellow	*Eurema lisa*
Mimosa Yellow	*Eurema nise*
Dainty Sulphur	*Nathalis iole*
'Southern' Oak Hairstreak	*Satyrium favonius favonius*
Gray Hairstreak	*Strymon melinus*
Red-banded Hairstreak	*Calycopis cecrops*
Eastern Pygmy-Blue	*Brephidium isophthalma*
Ceraunus Blue	*Hemiargus ceraunus*
Gulf Fritillary	*Agraulis vanillae*
Zebra Heliconian	*Heliconius charithonia*
Phaon Crescent	*Phyciodes phaon*
Common Buckeye	*Junonia coenia*
Mangrove Buckeye	*Junonia evarete*
White Peacock	*Anartia jatrophae*
Viceroy	*Limenitis archippus*
Monarch	*Danaus plexippus*
Queen	*Danaus gilippus*
Soldier	*Danaus eresimus*
Long-tailed Skipper	*Urbanus proteus*
Dorantes Longtail	*Urbanus dorantes*
Florida Duskywing	*Ephyriades brunneus*
Horace's Duskywing	

APPENDIX F

Avian Species Lists

2016 Bioblitz Avian Species List for Pine Island Conservation Area. This Bioblitz was conducted on October 15 and 16, 2016 with a combined team of 30 Scientists, Volunteers, Students, and Staff.

Common Name	Scientific Name
Cooper's Hawk	*Accipiter cooperii*
Sharp-Shinned Hawk	*Accipiter striatus*
Red-Tailed Hawk	*Buteo jamaicensis*
Red-Shouldered Hawk	*Buteo lineatus*
Northern Harrier	*Circus cyaneus*
Swallow-Tailed Kite	*Elanoides forficatus*
Bald Eagle	*Haliaeetus leucocephalus*
Belted Kingfisher	*Megaceryle alcyon*
Mottled Duck	*Anas fulvigula*
Wood Duck	*Aix sponsa*
Black-Bellied Whistling Duck	*Dendrocygna autumnalis*
Anhinga	*Anhinga anhinga*
Chimney Swift	*Chaetura pelagica*
Cattle Egret	*Bulbucus ibis*
Great Egret	*Ardea alba*
Green Heron	*Ardea herodias*
Little Blue Heron	*Butorides virescens*
Reddish Egret	*Egretta rufescens*
Snowy Egret	*Egretta thula*
Tricolor Heron	*Egretta tricolor*
Cedar Waxwing	*Bombycilla cedrorum*
Chuck Will's Widow	*Caprimulgus carolinensis*
Northern Cardinal	*Cardinalis cardinalis*
Blue Grosbeak	*Passerina caerulea*
Painted Bunting	*Passerina ciris*
Indigo Bunting	*Passerina cyanea*
Rose-Breasted Grosbeak	*Pheucticus ludovicianus*
Scarlet Tanager	*Piranga olivacea*
Summer Tanager	*Piranga rubra*
Turkey Vulture	*Cathartes aura*
Black Vulture	*Coragyps atratus*

Common Name	Scientific Name
Wood Stork	*Mycteria americana*
Rock Pigeon	*Columba livia*
Common Ground Dove	*Columbina passerina*
Mourning Dove	*Zenaida macroura*
Florida Scrub Jay	*Aphelocoma coerulescens*
American Crow	*Corvus brachyrhynchos*
Fish Crow	*Corvus ossifragus*
Blue Jay	*Cyanocitta cristata*
Yellow Billed Cuckoo	*Coccyzus americanus*
Eastern Towhee	*Pipilio erythrophthalmus*
Chipping Sparrow	*Spizella passerina*
Peregrine Falcon	*Falco peregrinus*
American Kestrel	*Falco sparverius*
American Goldfinch	*Carduelis tristis*
Sandhill Crane	*Grus canadensis pratensis*
Barn Swallow	*Hirundo rustica*
Purple Martin	*Progne subis*
Tree Swallow	*Tachycineta bicolor*
Red-Winged Blackbird	*Agelaius phoeniceus*
Baltimore Oriole	*Icterus galbula*
Brown-Headed Cowbird	*Molothrus ater*
Boat Tailed Grackle	
Common Grackle	*Quiscalus quiscala*
Ring-Billed Gull	*Larus delawarensis*
Laughing Gull	*Leucophaeus atricilla*
Least Tern	*Sternula antillarum*
Forsters tern	*Sterna forsteri*
Royal Tern	*Thalasseus maximus*
Gray Catbird	*Dumetella carolinensis*
Northern Mockingbird	*Mimus polyglottos*
Brown Thrasher	*Toxostoma rufum*
Osprey	*Pandion haliaetus*
Tufted Titmouse	*Parus bicolor*
Yellow-Rumped Warbler	*Dendroica coronata*

Common Name	Scientific Name
Yellow-Throated Warbler	*Dendroica dominica*
Pine Warbler	*Dendroica pinus*
Common Yellowthroat	*Geothlypsis trichas*
Worm-Eating Warbler	*Helmitheros vermivorum*
Black-and-White Warbler	*Mniotilta varia*
Bluewing warbler	*vermivora cyanoptera*
Tennessee Warbler	*Oreothlypis peregrina*
Ovenbird	*Seiurus aurocapilla*
Louisiana Waterthrush	*Seiurus motacilla*
Northern Parula	*Setophaga american*
Black-Throated Blue Warbler	*Setophaga caerulescens*
Hooded Warbler	*Setophaga citrina*
Myrtle Warblerr	*Setophaga coronata coronata*
Prairie Warbler	*Setophaga discolor*
Magnolia Warbler	*Setophaga magnolia*
Palm Warbler	*Setophaga palmarum*
Prairie Warbler	*Setophaga discolor*
Yellow Warbler	*Setophaga petechia*
Blackpoll Warbler	*Setophaga striata*
Cape May Warbler	*Setophaga tigrina*
Black-Throated Green Warbler	*Setophaga virens*
American Redstart	*Setopharga ruticilla*
Orange-Crowned Warbler	*Vermivora celata*
Double-crested Commorant	*Phalcrocorax auritus*
Northern Bobwhite	*Colinus virginianus*
Wild Turkey	*Meleagris gallopavo*
Northern Flicker	*Colaptes auratus*
Pileated Woodpecker	*Drycopus pileatus*
Red-Bellied Woodpecker	*Melanerpes carolinus*
Red-Headed Woodpecker	*Melanerpes erythrocephalus*
Downy Woodpecker	*Picoides pubescens*
Hairy Woodpecker	*Picoides villosus*
Yellow-Bellied Sapsucker	*Sphyrapicus varius*
Blue-Gray Gnatcatcher	*Polioptila caerulea*

Common Name	Scientific Name
Ruby-Crowned Kinglet	*Regulus calendula*
Golden-Crowned Kinglet	*Regulus satrapa*
Greater Yellowlegs	*Tringa melanoleuca*
Great Horned Owl	*Bubo virginianus*
Eastern Screech Owl	*Otus asio*
Barred Owl	*Strix varia*
European Starling	*Sturnus vulgaris*
Glossy Ibis	*Plegadis falcinellus*
White Ibis	*Eudocimus albus*
Ruby-Throated Hummingbird	*Archilochus colubris*
House Wren	*Toroglodytes aedon*
Carolina Wren	*Thryothorus ludovicianus*
Hermit Thrush	*Catharus guttatus*
Wood Thrush	*Hylocichla mustelina*
Eastern Bluebird	*Sialia sialis*
American Robin	*Turdus migratorius*
Great-Crested Flycatcher	*Myiarchus crinitus*
Eastern Phoebe	*Sayornis phoebe*
Eastern Kingbird	*Tyrannus tyrannus*
White-Eyed Vireo	*Vireo griseus*
Red-Eyed Vireo	*Vireo olivaceus*
Blue-Eyed Vireo	*Vireo solitarius*

A list of common names of all bird species observed by Union University students and faculty during their surveys which were conducted in January of 2014, 2016, 2018, 2019, and 2020 on the Pine Island Conservation Area.

· Mottled Duck	· White Ibis	· Palm Warbler
· Gadwall	· Roseate Spoonbill	· Eastern Towhee
· Greater Scaup	· Turkey Vulture	· Field Sparrow
· Lesser Scaup	· Black Vulture	· Song Sparrow
· Hooded Merganser	· Osprey	· Swamp Sparrow
· Red-breasted Merganser	· Bald Eagle	· Fox Sparrow
· Wild Turkey	· Sharp-shinned Hawk	· Dark-eyed Junco
· Pied-billed Grebe	· Cooper's Hawk	· Northern Cardinal

· Horned Grebe	· Red-shouldered Hawk	· Painted Bunting
· Eurasian Collared-dove	· Red-tailed Hawk	· Red-winged Blackbird
· Common Ground-dove	· Great Horned Owl	· Boat-tailed Grackle
· Mourning Dove	· Barred Owl	·
· Clapper Rail	· Belted Kingfisher	·
· Common Gallinule	· Red-bellied Woodpecker	·
· American Coot	· Yellow-bellied Sapsucker	·
· Sandhill Crane	· Downy Woodpecker	·
· Killdeer	· Northern Flicker	·
· Wilson's Plover	· Pileated Woodpecker	·
· Semipalmated Plover	· American Kestrel	·
· Sanderling	· Least Flycatcher	·
· Greater Yellowlegs	· Eastern Phoebe	·
· Bonaparte's Gull	· White-eyed Vireo	·
· Laughing Gull	· Blue Jay	·
· Ring-billed Gull	· Fish Crow	·
· Herring Gull	· American Crow	·
· Forster's Tern	· Tree Swallow	·
· Royal Tern	· Tufted Titmouse	·
· Caspian Tern	· Carolina Chickadee	·
· Black Skimmer	· House Wren	·
· Common Loon	· Carolina Wren	·
· Wood Stork	· Sedge Wren	·
· Double-crested Cormorant	· Blue-gray Gnatcatcher	·
· Anhinga	· Ruby-crowned Kinglet	·
· American White Pelican	· Hermit Thrush	·
· Brown Pelican	· American Robin	·
· Great Blue Heron	· Gray Catbird	·
· Cattle Egret	· Northern Mockingbird	·
· Snowy Egret	· European Starling	·
· Great Egret	· Cedar Waxwing	·

· Tricolored Heron	· Black-and-white Warbler	·
· Little Blue Heron	· Common Yellowthroat	·
· Reddish Egret	· Yellow-rumped Warbler	·
· Green Heron	· Black-throated Green Warbler	·
· Black-crowned Night-heron	· Pine Warbler	·
· Glossy Ibis	· Prairie Warbler	·

APPENDIX G

Reptile and Amphibian Species List

2016 Bioblitz Amphibian Species List for Pine Island Conservation Area. This Bioblitz was conducted on October 15 and 16, 2016 with a combined team of 30 Scientists, Volunteers, Students, and Staff.

Common Name	Scientific Name
Bufonidae	
Oak Toad	*Anaxyrus quercicus*
Southern Toad	*Anaxyrus terrestris*
Eleutherodactylidae	
Greenhouse Frog	*Eleutherodactylus planirostris planirostris*
Hylidae	
Southern Cricket Frog	*Acris gryllus gryllus*
Green Treefrog	*Hyla cinerea*
Pinewoods Treefrog	*Hyla femoralis*
Squirrel Treefrog	*Hyla squirella*
Cuban Treefrog	*Osteopilus septentrionalis*
Michrohylidae	
Greenhouse Frog	*Gastrophryne carolinensis carolin- ensis*
Ranidae	
Southern Leopard Frog	*Lithobates sphenocephalus*
Florida Gopher Frog	*Lithobates capito*
Scaphiopodidae	
Eastern Spadefoot Toad	*Scaphiopus holbrooki holbrooki*
Other Species	
Pig Frog	*Lithobates grylio*
Eastern Narrowmouth Toad	*Gastrophryne carolinensis*
Southern Toad	*Anaxyrus terrestris*

2016 Bioblitz Reptile Species List for Pine Island Conservation Area. This Bioblitz was conducted on October 15 and 16, 2016 with a combined team of 30 Scientists, Volunteers, Students, and Staff.

Alligatoridae	
American Alligator	*Alligator mississippiensis*
Anguidae	
Eastern Glass Lizard	*Ophisaurus ventralis*
Chelydridae	
Florida Snapping Turtle	*Chelydra serpentina osceola*
Colubridae	
Southern Black Racer	*Coluber constrictor priapus*
Southern Ringneck Snake	*Diadophis punctatus punctatus*
Eastern Indigo Snake	*Drymarchon couperi*
Rough Green Snake	*Opheodrys aestivus*
Yellow Rat Snake	*Pantherophis alleghaniensis*
Red Rat Snake (Corn Snake)	*Pantherophis guttatus*
Gray Rat Snake	*Pantherophis spiloides*
Pinewoods Snake	*Rhadinaea flavilata*
Peninsula Ribbon Snake	*Thamnophis sauritus sackenii*
Eastern Garter Snake	*Thamnophis sirtalis sirtalis*
Elapidae	
Eastern Coral Snake	*Micrurus fulvius*
Emydidae	
Florida Box Turtle	*Terrapene carolina bauri*
Kinosternidae	
Eastern Mud Turtle	*Kinosternon subrubrum subrubrum*
Phrynosomatidae	
Florida Scrub Lizard	*Kinosternon subrubrum subrubrum*
Polychrotidae	
Green Anole	*Anolis carolinensis*
Cuban Brown Anole	*Anolis sagrei*
Scincidae	
Southeastern Five-Lined Skink	*Plestiodon inexpectatus*
Broad-Head Skink	*Plestiodon laticeps*
Ground Skink	*Scincella lateralis*
Teiidae	
Six-Lined Racerunner	*Aspidoscelis sexlineata*
Testudinidae	

Gopher Tortoise	*Gopherus Polyphemus*
Viperidae	
Eastern Diamond Back Rattlesnake	*Crotalus adamanteus*
Other Species	
Order: Squamata	
Black Racer	
Yellow Rat Saake	
Red Rat Snake (Corn Snake	
Green Anole	
Cuban Brown Anole	
Indo-Pacific House Gecko	
Penninsular Cooter	

The following table lists snake species documented during a survey conducted by Mr. Frank Robb from April through July of 2017.

COMMON NAME	SCIENTIFIC NAMES
Ribbon Snake	*Thamnophis*
King Snake	*Getula*
Pinewood Snake	*Rhadinaea*
BWS/Saltmarsh	*Norodia*
Ringnecks	*Diadophis*
Yellow Rats	*Elaphae Obsoleta*
Red Rats	*Pantherophis*
Crawfish Snake	*Regina*
Garder Snake	*Thamnophis*
Black Racer	*Coluber Constrictor*
Diamond Back	*Crotalus*
Coral Snake	*Micrusus*
Pygmies	*Sistrusus miliarius*
Cottonmouth	*Agkistrodon*
Rough Green	*Opheodrys*

APPENDIX H

Mammalian Species Lists

Common Name	*Scientific Name*
Canidae	
Coyote	*Canis latrans*
Gray Fox	*Urocyon cinereoargenteus*
Cervidae	
White-tailed Deer	*Odocoileus virginianus*
Dasypodidae	
Nine-banded Armadillo	*Dasypus novemcinctus*
Didelphimorphia	
Virginia Opossum	*Didelphis virginiana*
Felidae	
Bobcat	*Lynx rufus*
Raccoon	*Procyin lotor*
Leporidae	
Eastern Cottontail Rabbit	*Sylvilagus floridanus*
Marsh Rabbit	*Sylvilagus palustris*
Mephitidae	
Striped Skunk	*Mephitis mephitis*
Sciuridae	
Eastern Gray Squirrel	*Sciurus carolinensis*
Southern Flying Squirrel	*Glaucomys volans*
Suidae	
Feral Hog	*Sus scrofa*
Other Species	
Feral cat	*Feline spp.*

2016 Bioblitz mamal species list for Pine Island Conservation Area. This Bioblitz was conducted on October 15 and 16, 2016 with a combined team of 30 Scientists, Volunteers, Students, and Staff.

APPENDIX I

Fish Species Lists

To access a copies of the following document in its original format please request it through Brevard County's Public Request Process. Contact the Public Records Request Coordinator at (321) 633-2071, or by emailing your request to PublicRecordsRequest@BrevardFL.gov.

Transcription of email regarding site visit and assessment of Pine Island retention lakes by Dustin Everitt of Floirda Fish and Wildlife Conservation Commission

From: Everitt, Dustin
To: DEMEYER, DAVID
Cc: Chicone, Ron; Kramer, Steve; Hamm, Ryan
Subject: PICA fisheries observations
Date: Tuesday, September 11, 2018 9:58:43 PM

Hi David,

…another FWC Biologist (Steve Kramer) and myself were at Pine Island this morning to check out both the north and south ponds. I sincerely apologize if I created any confusion that led to your absence. Unfortunately, the salinity and specific conductivity of the water in both ponds were too high for our electrofishing equipment to be effective. I am not sure how much you know about electrofishing, but I will try to give you the short version of why it didn't work for us. Electrofishing is possible when energy produced by a generator is harnessed, amplified and directed into the water creating an electrical field between the anode (droppers) and the cathode (the boat). The energy within that electrical field will seek out most conducive substance to pass through/interact with. When the conductivity of fish (the concentration of ions in their blood) is greater than that of the water, the electrical charge seeks out the fish and passes through them, temporarily rendering them immobile and susceptible to netting. If the conductivity of the fish is less than that of the water (less ions in the blood of the fish than the surrounding water), the electrical field passes *around* the fish, leaving the fish unharmed. To summarize, the conductivity of the PICA ponds was so high that the electricity simply passed around the fish as they swam by the boat (and laughed).

That said, today's outing wasn't a loss. We were able to launch our boat in both ponds and check water quality, depth contours, fish habitat presence and visually make fish observations from the deck of the boat. I was going to call you this afternoon to give you an update, but wanted to collect my thoughts and record them in an email to make sure I didn't forget anything. Forgive me for the length of this email, but I wanted to be thorough with my observations and opinions.

Here is what we observed:

Given the current salinity levels, saltwater fish species or euryhaline freshwater species (that can tolerate a wide range of salinities) are probably best suited for the ponds. We saw what appeared to be Tilapia, Bluegill, Atlantic Needlefish, Striped Mullet and several schools of Tarpon. We also observed and couldn't identify some smaller baitfish species. There are probably many more species that we didn't see or couldn't identify. Overall fish habitat in the pond was good and different from many of the waterways we typically sample. Water quality was adequate in both ponds. Dissolved Oxygen was acceptable at 4.9mg/L, temperature was 86 deg F (30 deg C), pH was 8.2 and specific conductivities ranged from 6000-8000µS.

Bottom substrate was solid throughout the ponds and consisted of rock, sand, clay and shell.

We observed almost no submerged, floating or emergent vegetation throughout most of the ponds. In fact, the only "cover" habitat we observed was from overhanging trees and grasses on the edge of the

shoreline. In some locations there were emergent cattails very close to the shore, but they offered little value in actual fish habitat. What the ponds lacked in “cover” habitat, they made up for with “structure” which included islands, drop-offs, ledges, rocks and other features of bottom contour we observed from the boat and the depth finder. Depth ranged from 2 to 15 ft in both ponds, but the northern pond seemed to have a deeper average depth with much of the off-shore area being a steady 14-15ft.

What we recommend doing in the future regarding the fisheries at PICA is completely dependent on your management goals for the area. I was happy to see anglers utilizing the ponds, and even spoke with couple enthusiastic fly fishing anglers who fish PICA often. In our initial discussion over the phone, it sounded like the ponds at PICA were dominated by freshwater fish species when it was electrofished a decade ago. Given the fact that these ponds/lakes have been re-engineered to increase storm surge capacity, saltwater inundation from storm surge and/or high water appears to have shifted the predominate fish communities to saltwater species, and will probably prohibit native freshwater fish species from ever dominating these areas again.

…I would make the following suggestions:

1. Embrace and encourage the presence and potential of the saltwater fish species living there. Tarpon are a wonderful sport fish, and we saw a bunch of them.

2. Promote and encourage anglers and the general public to utilize PICA for fishing. Continue mowing trails around the pond for bank access, and potentially look at adding some fishing piers or platforms to the areas of the pond most accessible from the road.

3. Look at placing one or more diffusers/aerators in each pond. This will help create areas of oxygen refuge for the fish and help avoid stress/fish kills during low dissolved oxygen events.

4. Add one or more fish attractors made of natural or synthetic brush in each pond, especially in the deep flats where little structure or cover is present. Baitfish will be attracted to these areas, and sport fish will follow them.

5. If creating a unique fishery is desired, stocking hybrid striped bass in either of the ponds should be successful. They can tolerate a wide range of salinity from the purest spring to the saltiest ocean. Given the average depth of each pond and the fact that hybrid stripers are generally pelagic, they would probably be successful there.

6. Conduct a thorough examination of the fish species present through hook and line surveys, gill nets, trawls, fyke nets and creel surveys.

Please let me know if you would like to get together sometime and discuss some potential management actions, or if there is any way I could be of assistance to you in your management of PICA (or any other county/public access locations in the county for that matter).

Sincerely,

Dustin W. Everitt, Fisheries Biologist III, Florida Fish and Wildlife Conservation Commission, Division of Freshwater Fisheries Management, Kissimmee Field Office, 1601 Scottys Rd, Kissimmee, FL 34744

APPENDIX J

Meeting Minutes

Meeting minutes pertaining to this management plan can also be accessed at the Advisory Committee section of the Environmentally Endangered Lands Program website (https://www.brevardfl.gov/EELProgram/ Advisory Committee) or contact the Public Records Request Coordinator at (321) 633-2071, or by emailing your request to PublicRecordsRequest@BrevardFL.gov.

APPENDIX K

Long Descriptions

Figure 1 Long Description:

This location map of Pine Island Conservation Area displays the site boundaries of the property in relation to surrounding roads and geographic features. The boundary is overlaid on a Geographic Information Systems street map. The site is bordered by the Indian River Lagoon to the west, the Merritt Island National Wildlife Refuge to the north, Pine Island Road and private property to the east, and North Tropical Trail to the south.

The map shows the location of Pine Island Conservation Area to be approximately five miles north of State Road 528, 1 mile south of State Road 407, and 3 miles west of State Road 3 in Township 23 South, Range 36 East, Sections 9, 10, 15, 16, and 22. It lies along the eastern shore of the Indian River Lagoon, and is contiguous with the southern border of the Merritt Island National Wildlife Refuge.

Figure 2 Long Description:

This site map of Pine Island Conservation Area displays the locations of the site boundaries, natural vegetation, lakes and other features. These features are overlaid on a 2018 aerial photograph. The site is bordered by the Indian River Lagoon to the west, the Merritt Island National Wildlife Refuge to the north, Pine Island Road and private property to the east, and North Tropical Trail and private residential property to the south.

Figure 3 Long Description:

This optimal boundaries map of Pine Island Conservation Area displays the site boundaries of the property in relation to parcel boundaries of surrounding properties the could be considered for inclusion within the Pine Island Conservation Area. These boundaries are overlaid on a Geographic Information Systems street map. The site is bordered by several private parcels to the north, several private and public parcels to the east, two properties to the south (at the historic mouth of Sams Creek), and three out parcels near the center on the site.

Figure 4 Long Description:

This public access map of Pine Island Conservation Area displays the locations of the site boundaries, hiking trails, multi-use trails, kayak trails, kiosks, parking areas, Sams House Education Center/restrooms, Sams House trails, and overlooks. These features are overlaid on a 2018 aerial image photograph. The site is bordered by the Indian River Lagoon to the west, the Merritt Island National Wildlife Refuge to the north, Pine Island Road and private property to the east, and North Tropical Trail to the south.

Hiking trails represented are: Wildlife Blind Trail (0.1 miles) in the central portion of the site, Shoreline Trail (0.4 miles) in the west-central portion of the site, and the Garnet Trail (1.5 miles) in the east-central portion of the site connecting to Sams House trails in the south-central portion of the site.

Multi-Use trails represented are: Flatwoods Loop (1.1 miles) in the west-central portion of the site, Equestrian Loop (3.4 miles) in the central and northeast portions of the site, Little Inlet trail (0.3 miles) to the south of the Flatwoods Loop, and the Maintenance Trail (not yet complete) in the southeast portion of the site.

Kayak trails represented are: Pine Island Creek trail (2 miles) in the central and north portions of the site, and Sams Creek trail (1 mile) in the south-central portion of the site.

A parking area, kiosk and kayak launch is represented at the west end of Pine Island Road. A parking area and a boat launch is represented north of the west end of Pine Island Road A parking area, manatee overlook, and kayak launch is represented south of the west end of Pine Island Road. A parking area, Sams House Education Center and restrooms are represented off of North Tropical Trail at the south end of the site.

Figure 5 Long Description

This topographic map of Pine Island Conservation Area displays elevations above sea level as contour lines in and around the site. The majority of the natural topography of the Pine Island Conservation Area lies at 0’ to 5’ above sea level. A significant portion of the southeast corner of the site and a small area in the northeast contain elevations from 5’ to 10’ above sea level.

Figure 6 Long Description

Within the Pine Island Conservation Area, mapped soil types vary from excessively drained to very poorly drained. Extensive disruption of natural soil characteristics has occurred in areas of previous sand mining and dredging operations in and around the two retention lakes. The soils within Pine Island were obtained from Soil Survey Geographic Database (Natural Resource Conservation Service, 2019).

Anclote sand is mapped on approximately 2% of the site. This soil series consist of a nearly level, very poorly drained sandy soil in marshy depressions in the flatwoods, in broad areas on

flood plains, and in poorly defined drainage ways. These soils were formed in sandy marine sediments.

Basinger sand is mapped on approximately 2% of the site. This soil series is a nearly level, poorly drained, sandy soil in sloughs of poorly defined drainageways and depressions in the flatwoods. These soils formed in sandy marine sediments.

Bessie muck is mapped on approximately 5% of the site. This soil series consists of very deep, very poorly drained, slow or very slow permeable organic soils in coastal mangrove swamps that are subject to daily or periodic flooding by high tides. They formed in marine deposits of organic materials over clayey and sandy sediments.

Candler fine sand is mapped on approximately 2% of the site. This soil series consists of very deep, excessively drained, very rapidly to rapidly permeable soils on uplands of Atlantic Coast Flatwoods. They formed in thick beds of eolian or sandy marine deposits.

Canaveral-Anclote Complex is mapped on approximately 11% of the site. This soil series consists of very deep, somewhat poorly to moderately well drained, very rapidly permeable soils on side slopes of dune-like ridges bordering depressions and sloughs along the coast in peninsular Florida. They formed in thick marine deposits of sand and shell fragments. Anclote…soils are on lower positions [within this complex] and are very poorly drained.

Immokalee sand is mapped on approximately 7% of the site. This soil series consists of very deep, very poorly drained soils that formed in sandy marine sediments. They are on flatwoods and low broad flats on marine terraces.

Myakka sand is mapped on approximately 4% of the site. This soil series consists of nearly level, poorly drained sandy soils in broad areas in the flatwoods, in depressions, and in area between sand ridges and ponds and sloughs. These soils formed in beds of marine sands.

Pomello sand is mapped on approximately 0.2% of the site. This soil series consists of very deep, moderately well to somewhat poorly drained soils that formed in sandy marine sediments. These soils are on ridges, hills, and knolls in the flatwoods on marine terraces.

Quartzipsamments, smoothed is mapped on approximately 6% of the site. These are nearly level to steep sandy soils that have been reworked and shaped by earthmoving equipment. Many areas are former sloughs, marshes, or shallow ponds that have been filled with various soil material to surrounding ground level or above natural ground level.

St. Johns sand is mapped on approximately 9% of the site. This soil series consists of nearly level, poorly drained sandy soils on broad low ridges, in sloughs, in poorly defined drainageways, and in shallow intermittent ponds in the flatwoods. These soils formed in marine sands.

Turnbull and Riomar soils are mapped on approximately 26% of the site. These soil series consist of very deep, very poorly drained, very slowly permeable soils near sea level and are

flooded periodically by tidal overwash. They formed in clayey and sandy estuarine deposits. Riomar soils [a Competing Series] are moderately deep to limestone bedrock.

Water is mapped on approximately 14% of the site. This is open water within the site that is not contiguous with the IRL (includes borrow/stormwater lakes and interior bays).

Waters of the Atlantic Ocean is mapped on approximately 12% of the site. This is open water within Sams Creek/Rinker Canal.

Figure 7 Long Description

This Natural Communities Map of Pine Island Conservation Area is based on the Florida Natural Areas Inventory Guide to the Natural Communities of Florida (FL Natural Areas Inventory, 2010). Natural community types occurring on Pine Island are: mesic flatwoods, mesic hammock, hydric hammock, depression marsh, basin marsh, salt marsh, mangrove swamp, estuarine unconsolidated substrate and tidal creek. Other habitats or land cover types on Pine Island are the result of significant anthropogenic alteration. They are stormwater lakes, berms and powerlines, ruderal woodland, scrub restoration (abandoned citrus groves), gardens and landscaped areas.

Figure 8 Long Description

The Pine Island Conservation Area has been divided into Burn Units that allow staff to safely conduct prescribed fires. A map of the burn units is provided in Figure 8. Unit 1 contains all the managed habitats north of Pine Island Road, Unit 2 contains the habitats between Pine Island Road and Sams Creek. These two units contain large portions of natural flatwoods habitat and are the main focus of prescribed fire management activities on the Sanctuary.

Units 5, 6, and 7 are small two-acre units and are the focus of a habitat restoration project to convert abandoned citrus groves back to natural scrubby flatwoods. According to the Fire Management Manual, natural fires burn through these habitats in Brevard County on an interval of 2-20 years. Without these stand replacing fires, oak shrub height and biomass will increase, open spaces will decrease, and eventually, they will develop into xeric hammock habitat (White, 2000).

Units 3 and 4 are not actively burned due to the hydric nature of the habitats there and do not have any firebreaks other than natural water bodies. However, portions of these areas may benefit from prescribed fire and staff will assess the potential to conduct burns in certain portions of these units in the future. Units 5, 6, and 7 have been burned once and more prescribed fire is planned as part of the restoration process.