Coconut Point Sanctuary Management Plan

July 2000

Brevard County Board of County Commissioners
Environmentally Endangered Lands Program

COCONUT POINT SANCTUARY
MANAGEMENT PLAN

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I. EXECUTIVE SUMMARY

The Coconut Point Sanctuary is part of the sanctuary network established by the Environmentally Endangered Lands (EEL) Program in Brevard County. The intent 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 EEL Program, Sanctuary Management Manual, 1995). The program also establishes a network of public land to provide passive recreation and environmental education programs to Brevard County residents and visitors.

The Coconut Point Sanctuary encompasses approximately 55 acres, located 5 and 3/4 miles south of the Melbourne Causeway (US 192) on State Road A1A and south of the City of Melbourne Beach, Florida. Of the 55 acres, approximately 2 acres of coastal dune habitat are located east of A1A on the northeast corner of the property. The remainder of the property is located west of A1A and consists of coastal strand, scrub and tidal swamp. The site is enhanced by being bordered on all sides by the Atlantic Ocean, Indian River Lagoon or other private or publicly held conservation lands. Though portions of the site have been heavily degraded in the past, it offers relatively undisturbed sections of coastal strand and scrub.

The Coconut Point Sanctuary is the northernmost of the EEL managed properties located on the South Beaches Regional Management Area of Brevard County. The Coconut Point Sanctuary, along with the other EEL properties in the South Beaches Regional Management Area will be served by an EEL Center for Regional Management at the Barrier Island Ecosystem Center (BIEC), located 8 miles south of the sanctuary. As described in the Sanctuary Management Manual, the Coconut Point Sanctuary is a Category 2 or intermediate use site meaning that the site will receive minimal capital development that may include trails, kiosks, etc.

The primary goals of the site include the conservation and restoration of ecosystem function, natural communities and native species' habitat. The collection and documentation of natural and cultural resource data are also important management goals. Other management goals include provisions for public access and environmental education and the preservation of natural landscape/topographic features.

The Coconut Point Sanctuary will provide outstanding opportunities for nature-based outdoor recreation, environmental education, field research, and guided or self-guided interpretive tours highlighting the sanctuary's unique ecology and geology. Due to the sensitive nature of the resources, access will be limited to passive recreation activities such as hiking, nature study, picnicking, and environmental education. Onsite facilities will be limited to informational kiosks and trail signage.

The proposed recreation and educational opportunities will serve both regional residents and tourists to Brevard County. An emphasis will be placed on providing education to Brevard County schools to promote the understanding and appreciation of the unique and valuable resources available in Brevard County and thereby promote the long-term preservation.

II. INTRODUCTION

In a 1990 referendum, Brevard County voters approved the Environmentally Endangered Lands (EEL) Program. The Program Vision Statement is as follows:

"The Environmentally Endangered Lands (EEL) 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. The EEL protects the rich biological diversity of Brevard County for future generations through acquisition and management. The EEL Program provides passive recreation and environmental education opportunities to Brevard's citizens and visitors without detracting from the primary conservation goals of the program. The EEL Program encourages active citizen participation and community involvement."

The program established a conceptual framework and funding mechanism to implement an EEL sanctuary network in Brevard County. The EEL Program sanctuary network represents a collection of protected natural areas that form a regional conservation effort focused upon protection of biological diversity. Within the countywide EEL 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 for the EEL Program are listed:

I. Barrier Island Ecosystem Center
Regional Management Center for South Beaches

II. The Enchanted Forest Sanctuary
Regional Management Center for North Mainland

III. Malabar Scrub Sanctuary
Regional Management Center for South Mainland

IV. Helen and Allan Cruickshank Sanctuary
Regional Management Center for Central Mainland

These centers provide strategically located hubs for implementing the countywide conservation, passive recreation and environmental education goals of the EEL Program.

As outlined in the Sanctuary Management Manual (SMM), the EEL Program will adopt and implement 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:

1. 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.

2. 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.

3. 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 combine to form the foundation of an effective ecosystem management strategy.

The Sanctuary Management Manual of the Environmentally Endangered Lands Program establishes a general framework for management of specific sites and establishes ten Principles of Conservation summarized, to achieve the following:

1. Maintain all sites in a natural state and/or restore sites to enhance natural resource values;

2. Protect natural resource values by maintaining biological diversity and using conservation as a primary goal for decision making;

3. Balance human use with the protection of natural resources;

4. Apply the most accurate scientific principles to strategies for conservation;

5. Collect and use the most accurate data available for developing site management plans;

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

7. Promote effective communication that is interactive, reciprocal, and continuous with the public;

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;

9. Promote the integration of natural resource conservation into discussions of economic development and quality of life in Brevard County; and

10. Provide a responsible financial strategy to implement actions to achieve long-term conservation and stewardship goals.

In addition to the conservation principles, this management plan provides specific goals, strategies and actions to guide management of the Coconut Point Sanctuary in terms of the objectives of the Environmentally Endangered Lands Program. The plan is divided into the listed 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 EEL 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.

VII. *Projected Timetable for Implementation* prioritizes activities and provides a timeframe for management plan implementation.

VIII. *Financial Considerations* discusses funding mechanisms and projected management costs.

IX. *Bibliography* cites original research and publications used to develop the Management Plan.

X. *Appendices* include supplemental information.

III. SITE DESCRIPTION AND LOCATION

The Coconut Point Sanctuary is located within the Archie Carr National Wildlife Refuge (the Refuge). The United States Fish and Wildlife Service (USFWS) established the Refuge in 1989 under the Department of the Interior to "protect sea turtle populations and their nesting habitat along the central Atlantic coastline of Florida".

The Refuge was named after the late Dr. Archie Carr, a pioneer in Florida ecology and sea turtle biology. The 20.5 miles of coastline within the refuge host the largest concentration of loggerhead and green sea turtles in the United States. Green turtles nest within the refuge but not in globally significant numbers. The beaches of the Refuge in Brevard County represent the northern extent of leatherback turtle nesting areas in the United States (Brevard County EEL Program, 1995a).

The Coconut Point Sanctuary is 55 acres, located 5 and 3/4 miles south of the Melbourne Causeway (US 192) and south of the town of Melbourne Beach, Florida (Section 33/34, Township 28, Range 38 East), as shown in Figure 1. The sanctuary is comprised of several parcels whose legal descriptions are 28-38-33-00-1, -2, -2.1, -3, -4, -4.4, -5, -7 and –9. The Coconut Point Sanctuary was acquired under the CARL project Maritime Hammock Initiative with the State holding 100% title interest. Access to the site by vehicle is from SR A1A, which separates a 2-acre portion of the site, located on the northeast corner, from the bulk of the property.

Figure 2 outlines the Coconut Point Sanctuary and adjacent properties. The portion of the sanctuary located east of A1A is bounded by the Atlantic Ocean to the east, SR A1A to the West, a Save Our Coast (SOC) site to the south and conservation lands held by the Richard King Mellon Foundation to the North. The remainder of the property is bounded by A1A to the east, the Indian River Lagoon to the west, an SOC site to the south and additional Mellon Foundation properties to the north. An out parcel, also owned by the Mellon Foundation, is located within the property on the western edge of the property.

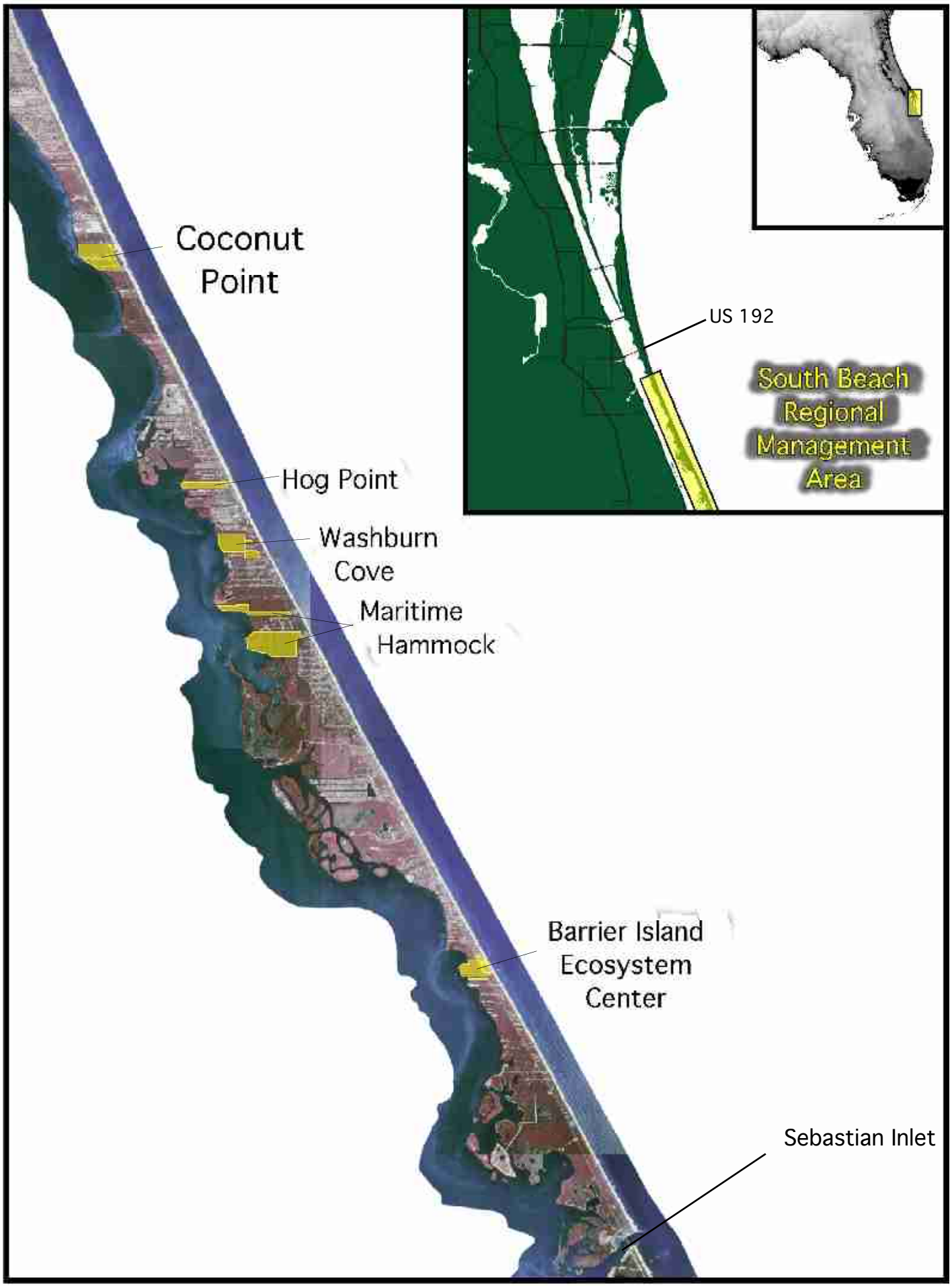

Figure 1. Location of the Coconut Point Sanctuary and other managed EEL properties

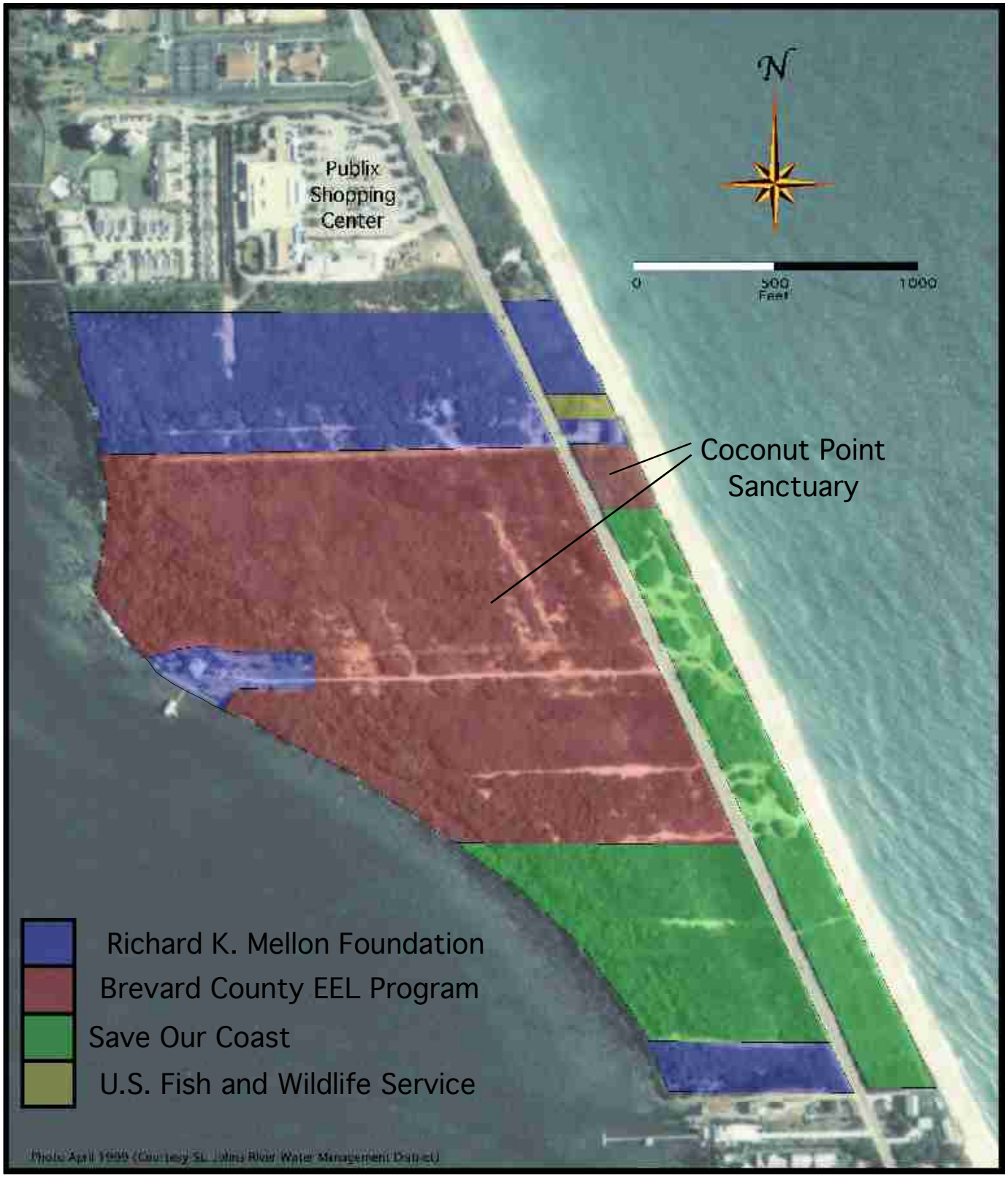

Figure 2. Coconut Point Sanctuary and Adjacent Properties

IV. NATURAL RESOURCE DESCRIPTIONS

This section provides descriptions of natural resources, including physical resources (climate, geology, topography, soils and hydrology), biological resources (ecosystem function, flora, fauna, special concern species and biological diversity) and cultural resource information (archeological, historical, land-use history and public interest).

A. PHYSICAL RESOURCES

1. Climate

The Coconut Point Sanctuary is located in east central Florida, an isothermal area at the junction of the temperate and sub-tropical climatic zones. Temperature data from representative locations in Brevard County indicate an average annual temperature of approximately 74° F. August is typically the warmest month, averaging 82° F, whereas January is the coolest month, averaging about 62° F (Schmocker, et. al., 1990). 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. The most recent "hard" freeze occurred in the winter of 1989/1990 resulting in the die back of many plants including many red mangroves (Rhizophora mangle) and the exotic Australian Pine (Casuarina equisetifolia). Long-term rainfall data for the area indicate an average of 50 to 52 inches per year in southernmost Brevard County (Schmocker et. al., 1990). Wet and dry seasons are typically well defined, with the wet season occurring between May and October, the dry season between November and April. Annual and seasonal rainfall is subject to large variation in both amount and distribution.

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). Climatic change, seasonal variability, and disturbance contribute to species distribution and community composition.

2. Geology

The ecosystems of the barrier island are largely a result of the fluid geology of the region, which is constantly being sculpted and continually changed. The following relevant geological information, provided by the EEL Program in the Characterization Report for the Archie Carr National Wildlife Refuge (Brevard County EEL Program, 1995a), is summarized below.

Formation of most North American barrier islands occurred about 7,000 years ago. At the end of the Holocene ice age, 18,000 years before present (YBP), sea level was about 130 meters below its present level. At this time, glacier melting released water to the oceans creating a rise in sea level. The rise in sea level created flooding and formation of barrier islands along the North American coastline (Parkinson, 1995).

The barrier island in the vicinity of the Coconut Point Sanctuary is believed to be perched on a rise in the underlying coquina rock, or Anastasia Formation. The Anastasia Formation runs from St. Augustine, Florida (St. John's County) south to Boca Raton, Florida (Palm Beach County). This formation is thought to be composed of late Pleistocene sediments that were deposited to the east of the Atlantic Coastal Ridge and lithified in places to form beach rock (Johnson and Barbour, 1990). The Brevard County portion of the barrier island has a ridge and swale topography with some ridge elevations in excess of 30 feet (Parkinson, 1995; Parkinson and White, 1994). Maximum elevations at the Coconut Point Sanctuary are 18 feet above mean sea level.

At present, the coastal processes that lead to the development of the geomorphology at the Coconut Point Sanctuary are unknown. Three processes are possible: 1) washover, 2) tidal inlet evolution, and 3) beach ridge progradation. Washover fans occur when waves surge over the crest of the dune, depositing sand on the backbarrier of the island. A flood-tidal delta develops when sand flushes through a tidal inlet under rising tide or storm surge conditions. Unlike washover events, inlets are transitory features that open, migrate, and close in response to the rate of sea-level rise, sediment supply, wave climate, tidal range, and frequency of storm events. Inlet dynamics, washover events and the overall landward retreat of the barrier island have significant impacts on the barrier island ecosystems. Beach ridge progradation occurs when either a large volume of sediment is introduced to the area via long-shore currents and/or sea-level elevation stabilizes or drops. Either process yields a succession of beach ridges separated by low-relief swales. The combination of these processes yields a barrier island ecosystem with a relatively straight sandy seaward shoreline and rugged backbarrier shoreline. The straight seaward shoreline is indicative of erosion and the rugged backbarrier shoreline is indicative of depositions (Parkinson, 1995; Parkinson and White, 1994).

3. Topography

The Coconut Point Sanctuary has a relatively simple topography with elevations up to 15' National Geodetic Vertical Datum (NGVD) on a ridge immediately west of SR A1A. To the east of this line the land slopes off to a 10-foot line along the dune edge. To the west the land slopes off towards the lagoon with a 5-foot line running along or immediately east of the shoreline. The sloping of land from the 15-foot ridge towards the lagoon is not linear but instead is characterized by several swales running north to south (Figure 3). Detailed elevation transects through the center of the property (Figure 4) detail the general ridge and swale topography of the site (Mayhew, unpublished).

However, the elevation on the site is not solely the result of natural processes. A review of aerial photos of the property shows that a large section was cleared to bare soil between 1951 and 1958. In addition during this time frame, a series of mosquito control ditches were installed along the western shore, parallel to the shoreline (Figure 5). Review of the 1943 aerials shows what appears to be a natural swale that may have held water, prompting ditch installation.

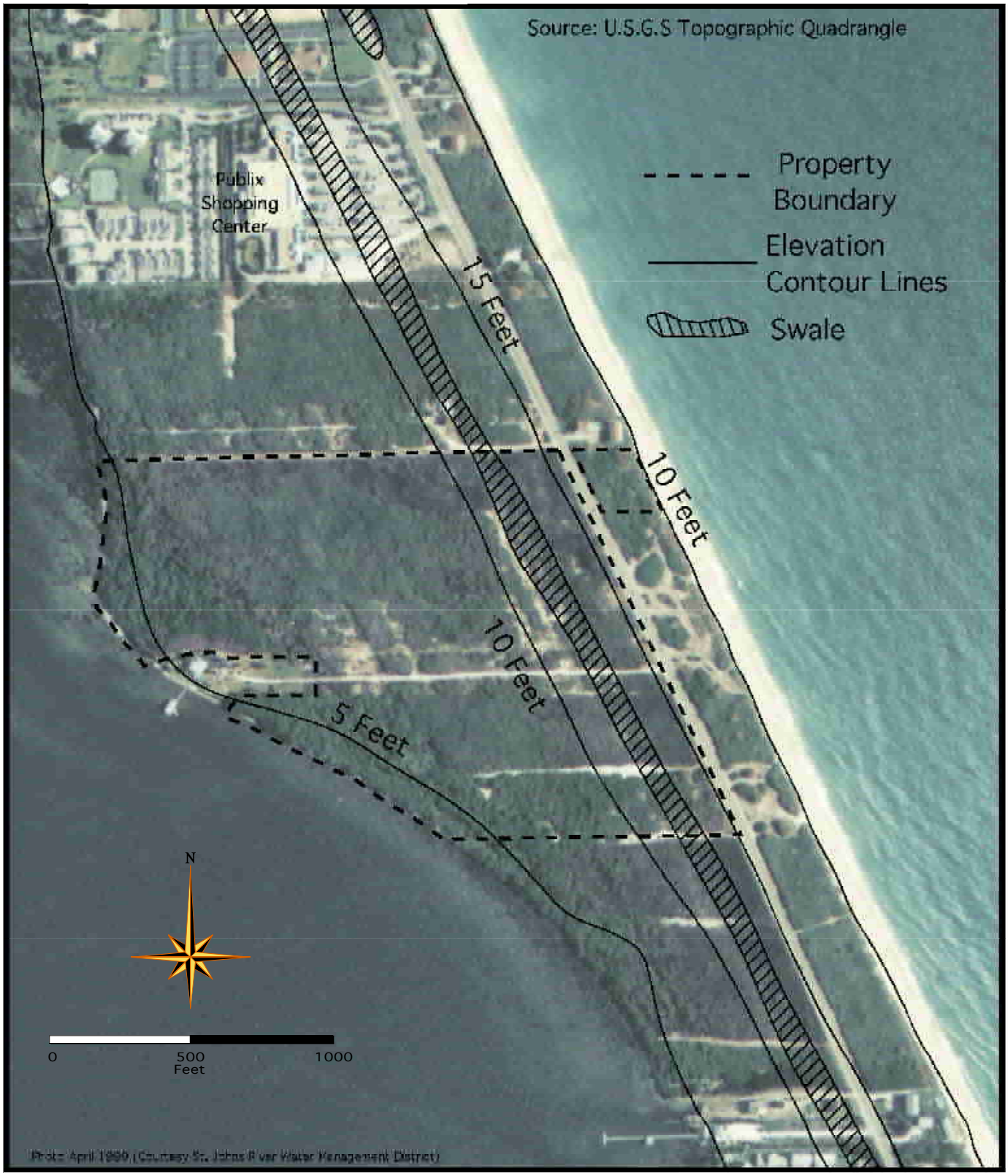

Figure 3. Coconut Point Sanctuary Topography

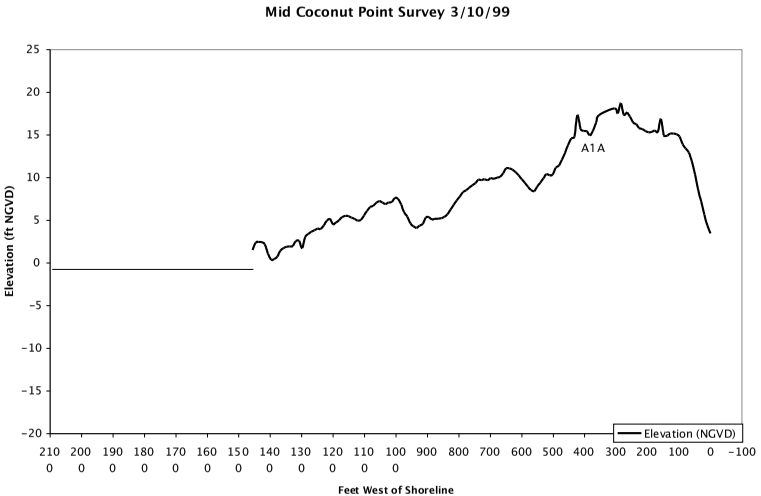

Figure 4. Elevation Transect Along Access Road

Source: Troy Mayhew, Florida Institute of Technology, unpublished data.

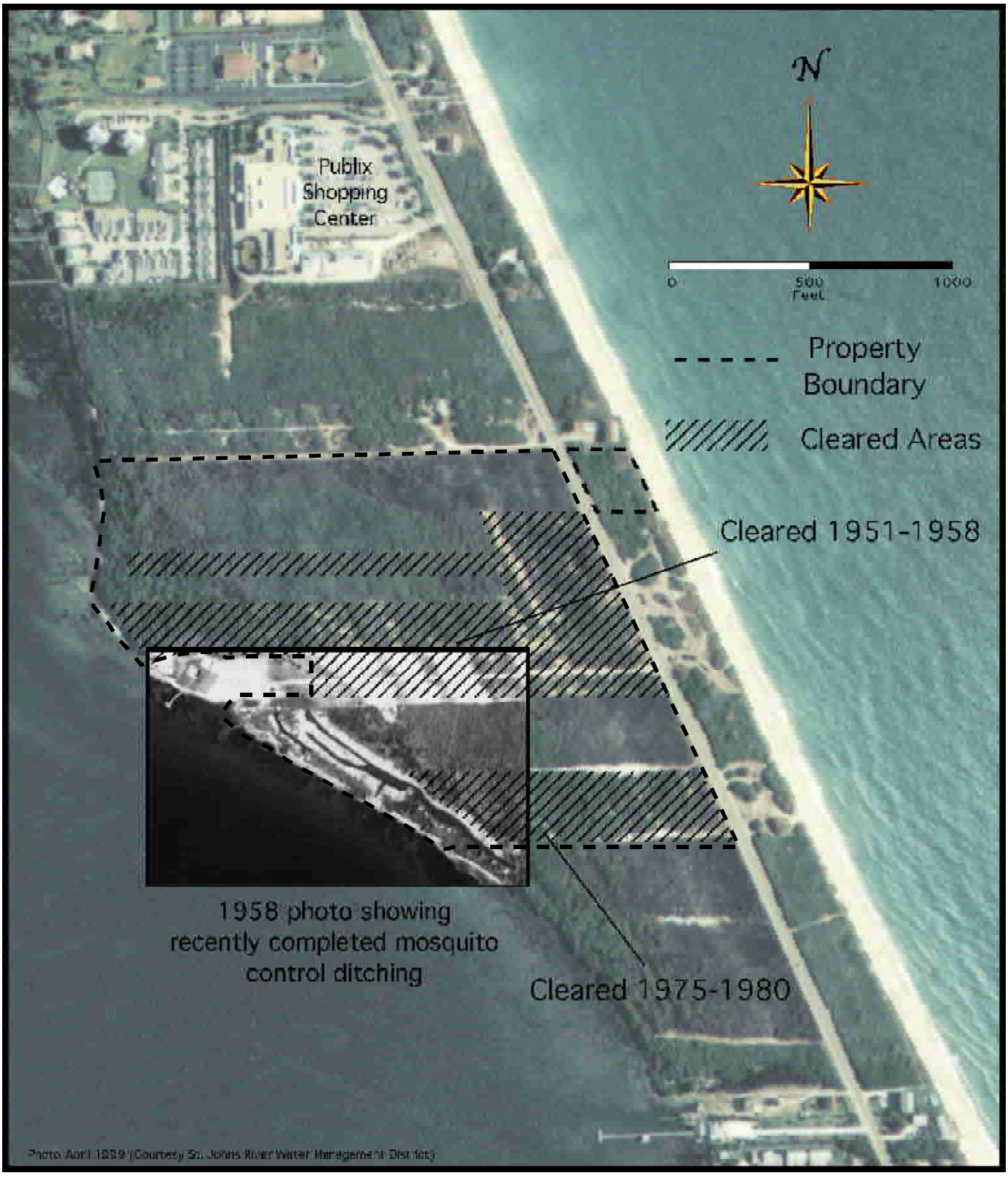

Figure 5. Coconut Point Human Impacts

4. Soils

The Natural Resource Conservation Service (formerly the Soil Conservation Service) describes the soils within the Coconut Point Sanctuary (Figure 6) as listed:

Palm Beach sand (Pb)
Welaka sand (We)
Pomello sand (Ps)
Coastal Beaches (Ck)
(Source: Soil Survey of Brevard County, Florida, 1974)

Palm Beach sand (Pb) is classified as a nearly level to gently sloping, excessively drained soil on dune-like ridges that are approximately parallel to the Atlantic Ocean. The soil is composed of mixed sand and shell fragments. Natural vegetation found on Palm Beach sand consists of saw palmetto, sand live oak, sea-grape, prickly pear cactus and sea-oats. The water table is usually at a depth of more than 9 foot due to the presence of the high dune ridge system (Bush et al., unpublished report).

Welaka sand (We) are located throughout the middle of the site. Welaka soils are extremely acidic to slightly acidic in the top layers. This series consists of nearly level, well-drained sandy soils on broad ridges interposed with long narrow sloughs. The water table is usually at a depth of 3 to 5 feet during the wet season. The soil is composed of fine, moderately well, to very well sorted marine sands with very little shell material. Quartz sand particles are coated with iron oxide especially below the surface layers. In some areas, a brownish-red, very well sorted, fine sand was found from the surface to at least 3 feet without any variation. Organic matter was <1% in composition for all samples (Bush et al., unpublished report).

Pomello sand (Ps) is located in a narrow strip along the point on the western edge of the site. Pomello soils are nearly level and are moderately well drained. The water table is about 3 feet below the surface. Pomello soils are very acidic throughout the entire profile. On this site, many large oyster and clam shells are associated with this soils in some areas. The presence of these shells may be partially attributed to the activities of local Indians who constructed middens in the area (see below). The area where this soil type is present typically had a high shrub understory providing large inputs of leaf litter that contributed to a high organic content in the sands (5-8%, Bush et al., unpublished report).

Coastal Beaches (Ck) consist of nearly level or gently sloping sand, along the Atlantic Ocean. Consisting primarily of quartz sand and shell fragments, this area is partially covered during high tides. It is subject to reworking by wave and wind action.

5. Hydrology

As previously described, surface water is between 3 and 9 feet below ground level, depending on local elevations. Ground infiltration of precipitation is the primary

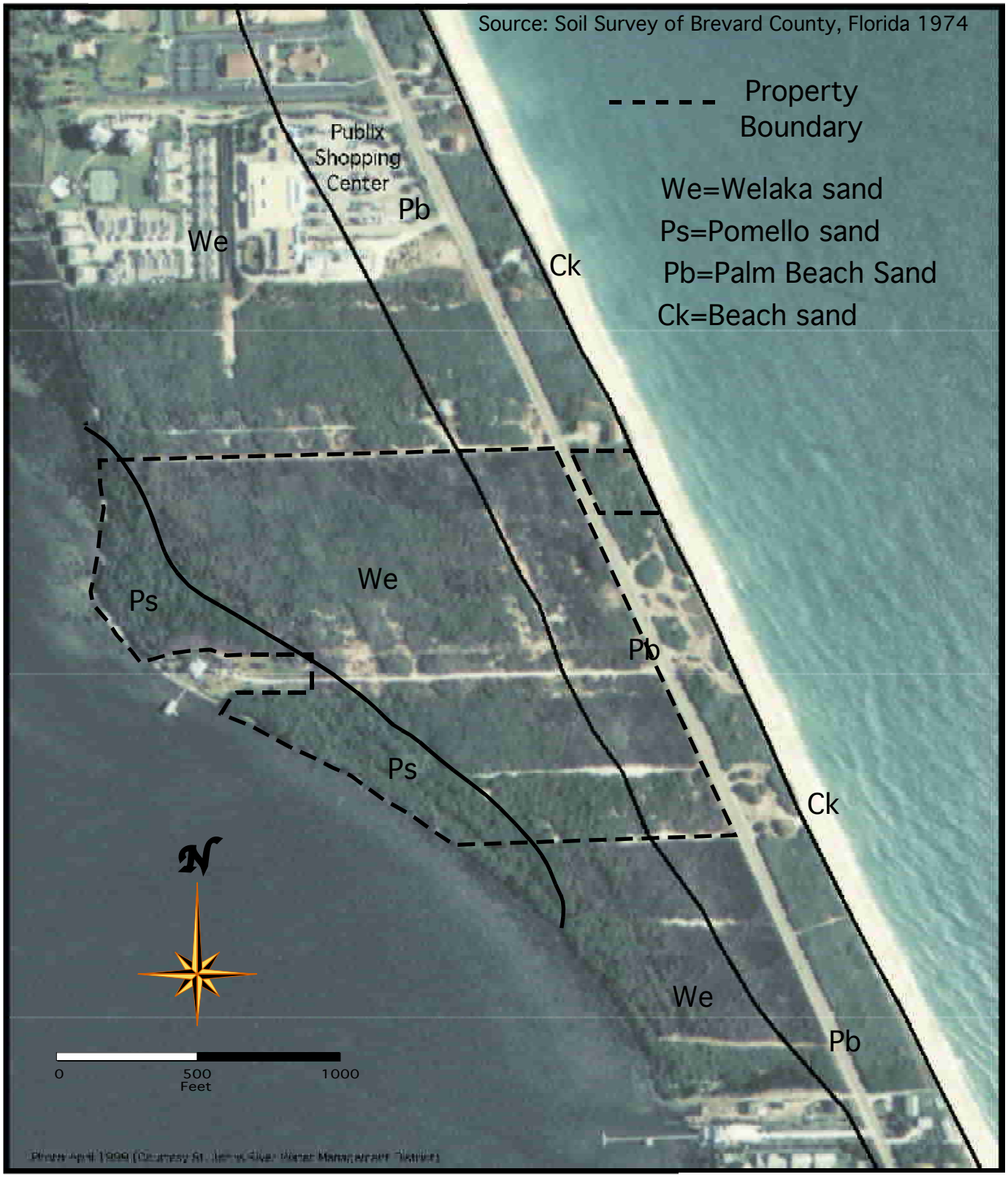

Figure 6. Coconut Point Soils

mechanism for recharge of the surficial aquifer, which is the primary source of freshwater in the south beaches, making this property valuable to the local water resources.

In addition to the hydrologic impacts due to SR A1A, the hydrology has also been altered by recent disturbances, including vegetation clearing and the mosquito control ditches on the western portion of the property. Judging by the predominance of freshwater species in these ditches (Leather Fern, etc.) it appears that seepage from the lagoon is offset by rainfall. No salinity readings have been taken from the ditches though the fact that several species of amphibian use the ditches as breeding areas suggests a relatively low salinity (Blihovde et al., in prep.).

The portion of the property east of A1A and a thin strip of the western edge of the Coconut Point Sanctuary are within the 100-year flood zone (Federal Emergency Management Agency, FEMA). The entire barrier island system of Brevard County is however expected to be inundated in the event of a Category 3 or greater hurricane event (Brevard County Planning, 1991).

B. Biological Resources

1. Ecosystem Function

The Coconut Point Sanctuary consists of a Coastal Strand community that grades westward into Coastal Scrub. This Coastal Scrub in turn grades westward into a small area of Maritime Hammock and finally Estuarine Tidal Swamp along the Indian River Lagoon. Though the site has had severe disturbance in the last 50 years, including clearing and the installation of mosquito control ditches, much of the site consists of relatively undisturbed (by human activities) habitats. The Sanctuary, along with adjacent protected parcels, is the largest remaining area of Coastal Strand/Scrub on the south barrier island of Brevard County. The property is also important as a surficial aquifer recharge area.

Aside from being a valuable remnant of Coastal Strand/Scrub on the south beaches of Brevard County, the site is important in the preservation of designated plant and animal species. The site provides a significant area, free from light pollution, for the nesting of endangered sea turtles on the properties east of A1A. Additional designated animals recorded from the site include numerous Gopher Tortoises (Gopherus polyphemus), Florida scrub-jays (Aphelocoma coerulescens) and eastern indigo snakes (Drymarchon corais couperi). Several designated plant species, including erect pricklypear (Opuntia stricta), beach creeper (Ernodea littoralis), coastal mock vervain (Glandularia maritima), coastal sandmat (Chamaesyce cumulicola), twinberry (Myrcianthes fragrans), tough bully (Sideroxylon tenax) and Curtiss' horypea (Tephrosia angustissima var. curtissii) are also found on the site.

2. Flora

In order to understand the floral communities currently on site, aerial photos from 1943 to the present were reviewed (Figure 7). In 1943, the site was nearly pristine with what is probably a small clearing on the shore of the IRL, immediately south of the current location of the house located on the outparcel. The remainder of the property appears to have been an impenetrable stretch of coastal strand and scrub. By extrapolating from the areas present on site today which have not been disturbed, the habitat west of A1A was probably covered primarily with sand live oak and saw palmetto with very little open herbaceous clearings. Interestingly, the land east of what was then A1A, was nearly bare of dune vegetation, possibly as a result storm surge (a tropical storm came ashore in the area of Brevard County in August 1939, www.nhc.noaa.gov/tracks/1939.gif) or a wildfire. Slight variations in the vegetation coincide with the gentle ridge and swale topography. An area of hammock existed at this time on the western edge of the property west of A1A. This hammock seems to be associated with a slight natural depression parallel to the shoreline. This depression and the associated standing water may have prompted the ditching of this area in the late the 1950s.

Between 1943 and 1951, a single east-west trail appears immediately south of the Coconut Point Sanctuary, leading to a small parcel of hammock along the Indian River Lagoon. This site is now known to contain an Indian Kitchen Midden (Bayview Site, 8BR112, C.A.R.L. Archaeological Survey). During this period, the Coconut Point Sanctuary remained undisturbed. By 1958, major disturbances had occurred on site (Figure 5) with nearly 20 acres of land completely cleared of vegetation. By 1974, much of the vegetation in the cleared areas had recovered. Re-growth was faster in the swale areas, presumably as a result of the relative shallowness of the surface aquifer. Between 1975 and 1980, an additional 6 acres of land were cleared. From 1980 through 1995, there appears to have been no new disturbances on site and vegetation seems to be recovering in most areas, though open sandy areas still exist to this day. The site lends itself to studies into the regeneration of coastal strand habitats since a variety of disturbances have occurred over a wide span of years.

The undisturbed portions of coastal strand still found on the site (roughly 25 acres) are nearly impenetrable, with 6-8' tall saw palmettos situated in the ridge and swale topography. Within the saw palmetto matrix are a variety of temperate and tropical species including tallowwood (Ximenia americana), fiddlewood (Citharexylum fruiticosum), Florida swampprivet (Forestiera segregata), and yellow necklacepod (Sophora tomentosa) along with other species described for this community. This community grades almost imperceptibly into a Coastal Scrub in which scattered sand live oaks (Quercus geminata), myrtle oak (Quercus myrtifolia), and scrub hickory (Carya floridana) occur mixed in the increasingly taller saw palmetto matrix. A sparse ground cover of prickly pear (Opuntia humifusa), gopher apple (Licania michauxii), pinebarren frostweed (Helianthemum corymbosum), wire weed (Lechea sessiliflora), and Elliott's milkpea (Galactia elliottii), among others scattered through the scrub, particularly in disturbed or open sandy patches (Figure 5).

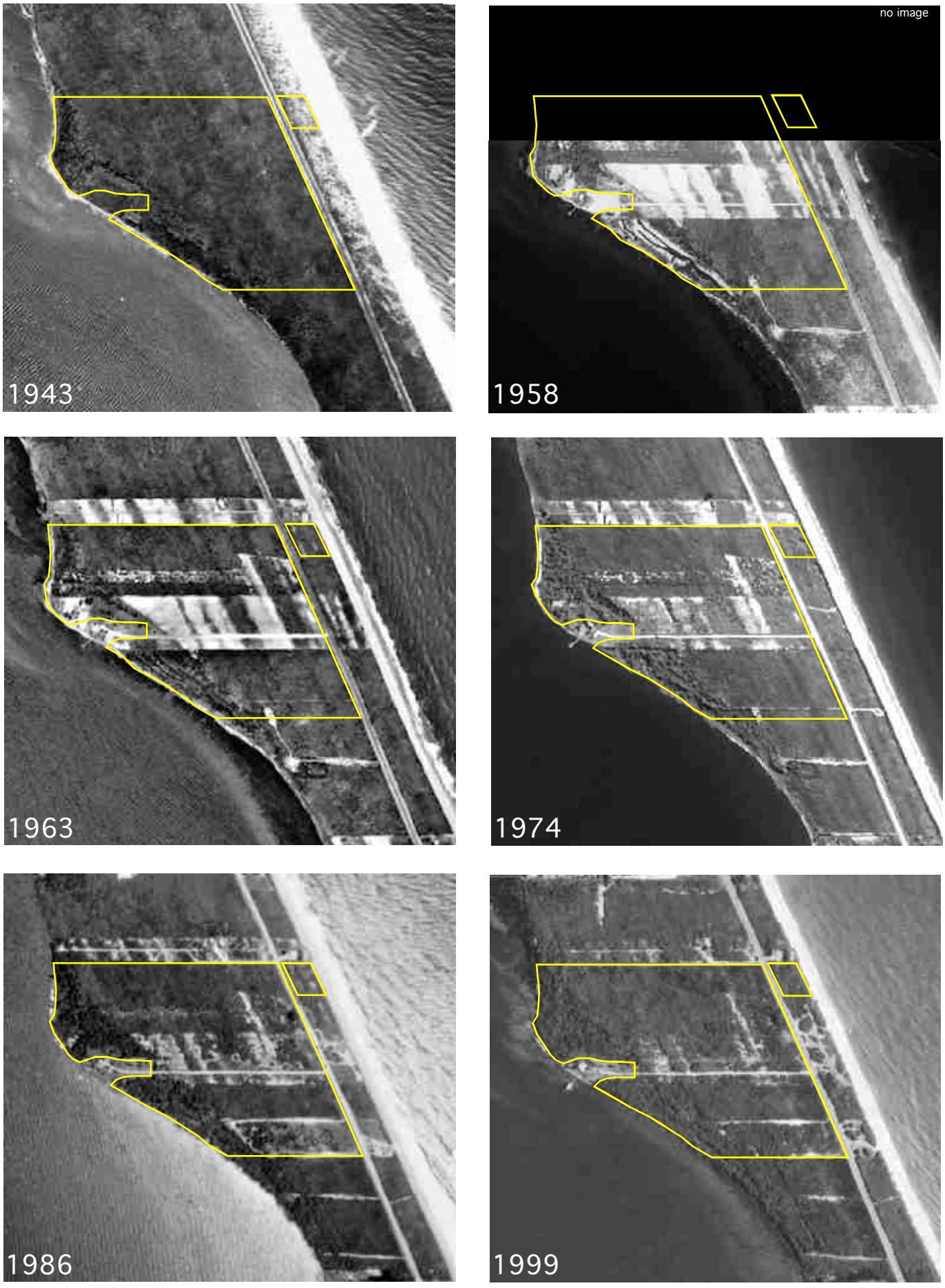

Figure 7. Coconut Point Representative Aerials

Plant surveys have been conducted at the Coconut Point Sanctuary by amateur plant biologists Margaret Hames and Travis McClendon in 1991 and 1999 respectively and by Dr. Mark Bush's students in 1997 (Bush et al., 1997). A total of 102 plant species have been identified (Appendix A). Additional sampling needs to be conducted to identify density and locations of designated species.

Fire management on the Coconut Point Sanctuary was initiated in February of 1999 at which time a prescribed fire was conducted on the western portion of the property. It was estimated that most of the site had not been burned in the last 40-60 years (Zach Prusak, EEL Program, personal communication). Of the 53 acres located west of A1A, approximately 18 acres burned intensely with an additional 4.5 acres burned in low creeping fires that did not reach into the canopy (Figure 8). This translates to approximately 42% of the Coconut Point Sanctuary having burned. The fire had trouble burning through some of the denser sections of oak scrub and the wet hammock along the western shore. Previously cleared areas acted as fire breaks, slowing or completely stopping the progress of the fire.

Fire management is important for the local environment as well as the safety of adjacent landowners. Controlled burns stimulate growth of native plants, reduce ground cover to improve habitat for gopher tortoises and maintain the habitat mosaic important to scrub-jays.

The history of land clearing and alteration on site has also led to the proliferation of exotic plant species on site. The primary invasive exotic plant on the site is the Brazilian pepper (Schinus terebinthifolius), with some Australian pine (Casuarina equisetifolia). In addition, Madagascar periwinkle (Catharanthus roseus), guinea grass (Panicum maximum), simpleleaf chastetree (Vitex trifolia), and sea hibiscus (Hibiscus tilaceus) are also found on site.

In early 1999, the EEL Program was awarded a grant for the removal of both Brazilian pepper and Australian pine from the Coconut Point Sanctuary through the Florida Department of Environmental Protection. In addition, funds were obtained to remove exotics from properties adjacent to the Coconut Point Sanctuary. Herbicide treatment using a combination of basal bark application of Garlon 4 and JLB oil (10-20% solution depending on the size of the individual plants) removed both Brazilian Pepper and Australian pine. Cut stump (cutting the stump followed by immediate chemical treatment) application of Garlon 3A (50% solution) or Rodeo (100% solution) was used to treat plants found along the shoreline of the Indian River Lagoon.

The EEL Program is dedicated to the long-term removal of invasive exotic plants from within the Coconut Point Sanctuary and will work with adjacent property managers to ensure the success of this program. Plans are currently underway to assess the extent of the other exotic plant species on site and to develop specific plans for their removal.

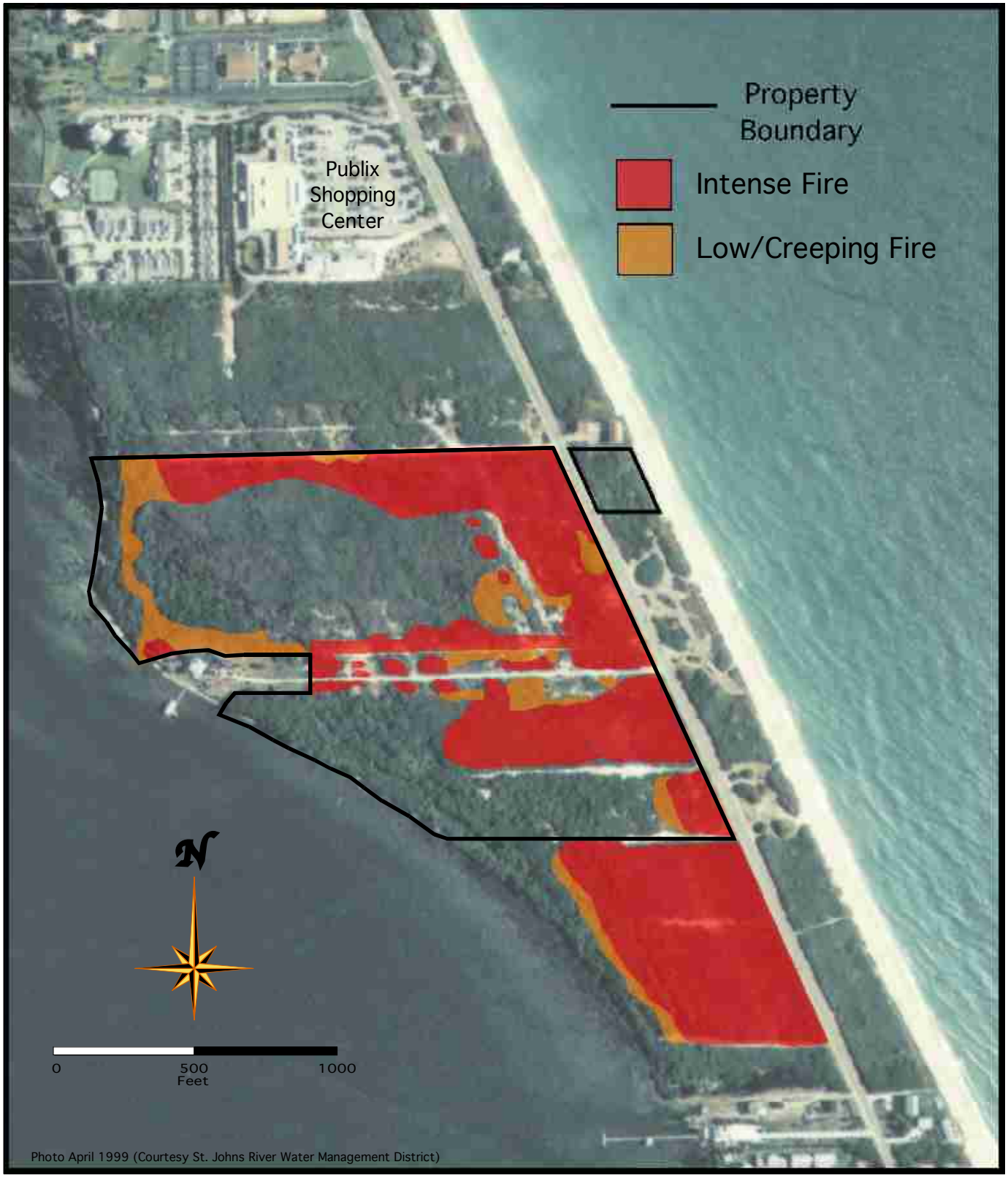

Figure 8. Coconut Point Fire, February 1999

3. Fauna

The Coconut Point Sanctuary has been fortunate to be the site of several recent faunal surveys. The site has seen the continued work of David Breininger of Dynamac (KSC) on the life history of scrub-jays (Aphelocoma coerulescens). Surveys of reptiles, amphibians and small mammals have been conducted by Dr. Llewellyn Ehrhart and his students from the University of Central Florida. Dr. Mark Bush and his students from the Florida Institute of Technology have carried out additional surveys of small mammals, birds and ants.

To better understand the site in terms of its faunal assemblage, we must consider all past land uses. For example, the installation of ditches in what was likely an ephemeral body of water on the western portion may have impacted the diversity and abundance of amphibian species on site.

The portion of the property located east of A1A is important in providing nesting sites for endangered sea turtles free from light pollution. Between 1990 and 1995, loggerhead turtles (Caretta caretta) nested at densities (per 500 meters of beach) of between 66 and 75 nests per year on the beaches adjacent to the parcel east of A1A and the Mellon Foundation properties to the North. (Zahorcak, 1996). For this same time frame, 2-2.5 green turtle (Chelonia mydas) nests per year (per 500 meters of beach) were recorded for the same area.

Insects

To date, two surveys of insects have been conducted on the Coconut Point Sanctuary. Dr. Mark Deyrup of the Archbold Biological Station conducted a survey of ant species on October 6, 1996 as part of Dr. Mark Bush's surveys. In March of 1995, George Melika and Warren Abrahamson of the Archbold Biological Station conducted a survey of oak-cynipid gallmaking insects (Appendix B).

A total of 24 species of ants were found including several exotic species including the red imported fire ant (Solenopsis invicta) and the little red fire ant (Wasmannia auropuctata). Solenopsis invicta is found around disturbed areas and will negatively impact native invertebrates and vertebrates alike (Zach Prusak, EEL Program Land Manager, personal communication). Routine treatment of the fire ant mounds with Amdro is recommended, as well as monitoring the more disturbed areas with the Coconut Point Sanctuary for the presence of these ants. The little red fire ant (Wasmannia auropuctata) has already been proven to be a serious pest in several areas around the world, but control methods for this tiny ant are unknown. Since it inhabits disturbed areas in many habitats, any natural disturbance to the habitat will allow this ant to invade community ecotones and edges. At best, annual monitoring of sites within the property is needed to document the spread. The areas around the out-parcel more than likely harbor other exotic ants (such as the crazy ant, Paratrechina longicornis), so an additional ant survey of this area is recommended (Zach Prusak, EEL Land Manager, personal communication).

A total of 13 oak gallmaking cynipids (wasps) were recorded on the Coconut Point Sanctuary by sampling galls on sand live oak (Quercus geminata) and myrtle oak (Quercus myrtifolia). The ephemeral nature of some galls may have led to an underestimation of the number of species present (Melika and Abrahamson, 1995).

Reptiles and Amphibians

Starting in 1996 Dr. Ehrhart, along with William Boyd Blihovde and Richard D. Owen, began sampling the herpetofauna on the Coconut Point Sanctuary. The goal of this sampling was to determine species richness and the relative species diversity of the site. William Blihovde will incorporate portions of this study into a Master's Thesis.

Drift fences, coverboards, minnow traps, funnel traps, pit fall traps and hand captures were used. Pit fall traps were placed adjacent to drift fences and were equipped with sponges and shade boards to reduce overheating. Traps were checked daily from May through August for 1996, 1997, 1998 and 1999.

Captured herps were measured, including snout to vent and total length, and then released. When possible, weights were also taken. Beginning in 1999, yearly cohorts were marked with a single toe clip, in order to estimate population sizes. A total of 21 species of reptiles and amphibians have been collected on the Coconut Point Sanctuary (Appendix C). Among these are two designated species: the gopher tortoise (Gopherus poylphemus) and the indigo snake (Drymarchon corais). When gopher tortoises were not considered, the narrow-mouthed toad (Gastrophryne carolinensis) made up 54% of the total abundance. The Shannon Diversity Index for the sight was a moderate 0.55 on a scale of 0 to 1(Blihovde in prep). It should be noted that the sampling methods used might have underrepresented the diversity of arboreal anurans (toads and frogs).

In addition to the herpetological sampling detailed above, Dr. Ehrhart, along with William Boyd Blihovde and Richard D. Owen, are studying gopher tortoises (Gopherus polyphemus) on the Coconut Point Sanctuary. Since 1993, 104 gopher tortoises have been marked using a small triangular file. The individual makeup of those collected so far includes 46 females, 40 males and 18 juveniles. Though analysis is in the early stages, the population appears healthy and stable, with virtually no upper respiratory disease noted and new recruits observed each summer (Blihovde et. al, unpublished). Further research into the effect of the recent control burn on populations and survivorship of juveniles is needed.

Birds

Between September 28 and December 1, 1996, Ken Snyder, a student under the direction of Dr. Mark Bush, conducted a bird census on the property. The site was visited for three hours following sunrise one day each week. Again the survey was intended as a qualitative rather than a quantitative study. Having said that, every effort was made to census all of the major vegetation types during each visit. Identification was conducted by both visual and audible means. The list generated

was primarily from the property west of A1A, as birds associated with the beaches or dunes were not specifically targeted.

A total of 33 avian species were observed on the Coconut Point Sanctuary (Appendix D). Of these two designated species observed on site, the peregrine falcon (Falco peregrinus) and the American kestrel (Falco sparverius). It should be noted that the sightings were not to the subspecies level required for a definite determination. A review of migration patterns, habitat preferences, and timing support the contention that sightings were of F. p. tundrius and F. s. sparverius. Three of the bird species encountered are known to migrate through the area to wintering grounds further south including the American redstart (Setophaga ruticilla), barn swallow (Hirundo rustica) and the black-throated warbler (Dendroica palmarum). Seven species are winter visitors including Cooper's hawk (Accipter cooperii), indigo bunting (Passerina cyanea), painted bunting (Passerina ciris), palm warbler (Dendroica palmarum), peregrine falcon (Falco peregrinus), tree swallow (Iridoprocne bicolor) and the yellow-rumped warbler (Dendroica coronata) (Terres, 1980; Peterson, 1980). The remainder of the species are year round residents. In addition, Florida scrub-jays (Aphelocoma coerulescens) have returned to the site presumably as a result of the recent prescribed fire (see section **d. Special Concern Species)**.

Small Mammals

Between October 6 and November 7, 1996, Dr. Mark Bush of the Florida Institute of Technology and several of his students conducted a small mammal trapping program on site. The students included Jen Feinstein, Tim Miller, Deborah Patterson and Julie Shepker. Trappings and observations were intended to provide a species list and not a quantitative sampling (Appendix E).

A total of 14 aluminum live traps (7.62 cm height x 6.35 cm width x 22.86 cm length) were deployed amongst the plant communities previously described. All traps were baited with sunflower seeds. Steel rods were used to stabilize the traps and to keep them in place. Traps were set for four days each week at a different site each week. Each site consisted of a distinct vegetative type. Traps were checked in the morning and the evening each day and all captures were identified and released at the point of capture.

Though sampling was not designed to answer questions about population size, some general conclusions can be drawn. A total of four species were captured using the traps including the spotted skunk (Spilogale putorius); the cotton rat (Sigmodon hispidus); the Florida mouse (Podomys floridanus) and an additional mouse species (Peromyscus sp.). In addition, racoons (Procyon lotor) were spotted on several occasions and a single red fox (Vulpes vulpes) was seen along A1A in the vicinity of the sanctuary.

This limited survey showed that a dense canopy of oak and palmetto, approximately 2 meters in height with a 0.6-meter space between the ground and the canopy base, led to the highest trapping success. This habitat type appears to provide good cover from avian predators while containing a rich ground litter for foraging. A similar site with a slightly higher canopy (2.5 meters) and a greater

percentage of oak and with less ground cover yielded low trapping success. Areas along the shore of the IRL, with tall saw palmetto (7 meters) and high infestations of Brazilian pepper, yielded low trap success primarily as a result of trap disturbance. Similarly, areas along the edges of disturbed areas yielded low trapping success though the reason is unclear. A thorough, quantitative long-term survey is needed to better understand the links between vegetation and small mammal populations.

4. Designated Species

The Coconut Point Sanctuary is home to seven designated plant species (Appendix A) and five designated animal species that reside on the property (Appendices C & D). In addition, the endangered green (Chelonia mydas) and loggerhead (Caretta caretta) sea turtles are known to nest on the beach adjacent to the portion of the sanctuary east of A1A.

Plants

Though several plant surveys have been conducted on site, these were mainly conducted to determine the presence or absence of species. The next step will require the generation of maps and a photographic series detailing the extent of coverage of the designated species followed by careful monitoring of the resources. Once a baseline has been established, additional management (e.g. replanting) can be addressed. Continued efforts to remove invasive exotic plants and the continued use of prescribed fire will allow for the natural progression of native species. The location of designated species can be considered during the creation of public access trails and during other management efforts including exotic plant removal and prescribed fires.

Terrestrial Reptiles

As stated above, the gopher tortoise population appears to be stable and in good health. The recent controlled burn has opened up the understory thereby increasing the amount of habitat open to colonization. Dr. Ehrhart plans continued studies of the gopher tortoise populations.

It is uncertain whether or not there is a stable breeding population of indigo snakes in the area. There is an indigo snake that is being tracked using a radio tag that ranges from the Publix property to the north and the developed property to the south of the area (Dave Breininger, personal communication). Each Indigo snake requires large areas that are several hundred acres in size and viable populations require large natural areas that are at least many thousands of acres in size (Tennant, 1997). Mortality from dogs and humans further reduce indigo snakes populations. The Coconut Point Sanctuary and the adjacent conservation lands probably do not come close to meeting the conditions required for a stable indigo snake population.

Sea Turtles

It has been shown that the beach east of the Coconut Point Sanctuary is an important nesting site for endangered sea turtles. Between 1990 and 1995, loggerhead turtles (Caretta caretta) nested at densities (per 500 meters of beach) of between 66 and 75 nests per year on the beaches adjacent to the parcel east of A1A and the Mellon Foundation properties to the North (Zahorcak, 1996). For this same time frame, 2-2.5 green turtle (Chelonia mydas) nests per year (per 500 meters of beach) were recorded for the same area. By providing an unlit property west of A1A we are not only making the adjacent beach attractive to nesting turtles, but also increasing the chance for survival by hatchlings.

The property to the south of the beachfront parcel is a Save Our Coast site managed by the Brevard County Parks and Recreation Department. An unofficial parking area on the dunes has been in place since at least the 1960s and has steadily increased in size (Figure 9), destroying dune vegetation and causing repeated dune blowouts (Terry Stoms, Brevard County, Parks and Recreation, personal communication). The integrity of this sight should be addressed as it impacts the dune system directly adjacent to the Coconut Point Sanctuary.

Florida Scrub-Jay

Reviews of 1943 aerials show that most of the outer barrier island in south Brevard was comprised of a scrub community that provided habitat for Florida scrub-jays. Subsequent human development resulted in a direct loss of most habitat and fragmentation of the remaining scrub. The scrub habitat remaining grew taller and lost many of the openings that Florida scrub-jays use. These habitat changes occurred because fire suppression and habitat fragmentation resulted in a reduction in periodic fires that once sustained the habitat structure needed by Florida scrub-jay populations (Breininger et al. in press). By 1992, Florida scrub-jays were restricted to six population clusters, the southernmost of which included the Coconut Point Sanctuary (Breininger, 1999). Between 1992 and 1998, the number of breeding pairs in this cluster dropped from 3 to 1. The size of the entire south Brevard Barrier island population dropped from 29 pairs to 10 pairs between 1992 and 1998. This type of population decline was expected because most habitats remained unburned for long periods (Breininger et al., 1999). Florida scrub-jays on the barrier island are even more vulnerable to population decline because habitat fragments are small and bordered by roads so that Florida scrub-jays are vulnerable to road mortality and an abundance of house cats, fish crows, blue jays, and grackles that are relatively uncommon in optimal habitat.

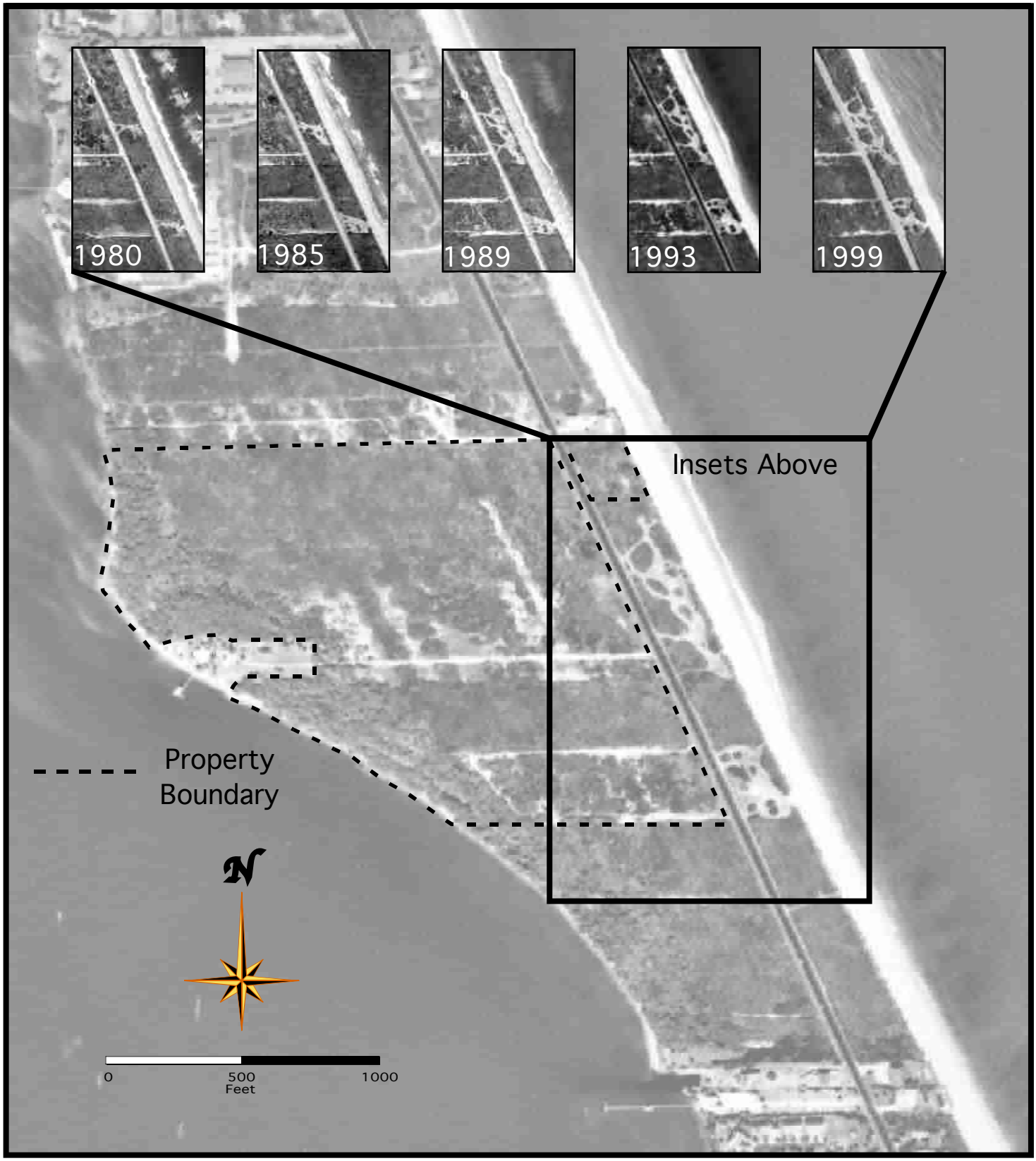

Figure 9. Unofficial Parking Area Adjacent to Coconut Point

Following the prescribed fire in February of 1999, an additional pair of scrub-jays re-colonized the site. One female came from Coconut Point Park (County) to the north and male came from Indian Harbour Beach. The long-term prognosis for the entire barrier island population is poor because the remaining habitat is fragmented and can only provide habitat for a few families in every patch (Woolfenden and Fitzpatrick 1991, Breininger et al., 1999). The Coconut Point area is the only location that in conservation ownership that can provide enough habitat for many contiguous Florida scrub-jay families on the barrier island in South Brevard. However, the Coconut Point population will always be vulnerable to extinction because of its small size and limited habitat availability especially after most of the remaining habitat in other population clusters to the north is developed.

The best chance for sustaining a small population in the Coconut Point is to restore all former scrub habitat in the Coconut Point sanctuary and adjacent conservation areas that have remained unburned for long periods. Cutting of the larger oaks and maintaining a fire frequency of 3-15 years would increase Florida scrub-jay habitat suitability (Woolfenden and Fitzpatrick, 1991; Breininger et al. 1999, in press). This presents a complicated management question; do we undertake large-scale integrated alteration of publicly held lands to maximize their value to scrub-jays in the hopes that populations may stabilize or, do we focus our efforts and resources protecting more stable populations on the mainland of Brevard County. Currently, available resources for natural resource management are limiting. Many other EELs sites that have been recently purchased need fire management and have great potential to support viable Florida scrub-jay populations, but these populations will continue their steep decline without expediting management (Breininger and Oddy 1998). Population recovery is likely to be a slow process following restoration, therefore it is important to reduce population decline quickly in areas that have good chances for long-term viability (Breininger et al. 1999). Perhaps, the best short-term strategy for managing the Coconut Point sanctuary is to continue a process of gradual habitat improvements knowing that the site might continue to be colonized by other Florida scrub-jays as they are displaced from habitats in the larger population. Other agencies should also be encouraged to begin a process of restoring habitat structure of areas in the vicinity of Coconut Point. Long-term strategies for maintaining very small Florida scrub-jay populations have not yet been developed because recovery efforts are currently focused on keeping significant representations of the species viable across all regions of its range.

5. Biological Diversity

With the exception of the herpetofaunal work conducted by Dr. Ehrhart and his students, no work has been conducted with an eye towards assessing biological diversity. Since early surveys were designed to qualitatively catalog species, additional data will need to be collected in order to assess the biological diversity (both richness and evenness) so that changes in diversity can be tracked over time. Methodologies will need to be established for all of the relevant taxonomic groups and researchers and staff tasked to address this particular need.

C. CULTURAL

1. Archaeological

A thorough review of the Coconut Point Sanctuary to determine the presence of archaeologically significant sites has not been conducted. A review of the Conservation and Recreational Lands (C.A.R.L.) Archaeological Survey records has been conducted and a known kitchen midden was identified on the property immediately to the south. This site was visited with members of the C.A.R.L. Program during an archaeological survey in June of 1999. A review of historic aerial photos shows that the public has accessed this site for at least the past 40 years. This was confirmed by the large amount of trash found at the site, which is currently well hidden.

2. Historical

The following information is summarized from the Characterization Report for the Archie Carr National Wildlife Refuge (Draft, October 1995):

Ais Indians (1000 BC – 1500 AD)

The first people to inhabit Florida arrived about 12,000 years ago, from the central and southern areas of the North American continent, at the end of the last ice age. At this time much of the North American continent was still covered by glaciers. Sea level was 200 feet below its current level and much of the earth's water was stored in glaciers (Brown, 1994).

At the time of European contact in the 16th century, the Ais ("Eyes") Indians were known to inhabit the barrier island in the Brevard County area. The Ais did not exhibit the nomadic existence of other native Americans, as the semi-tropical climate provided for their needs without having to travel great distances.

Twenty-six shell middens and four burial sites have been recorded on the Barrier Island within the Archie Carr National Wildlife Refuge. One shell midden is located immediately south of the Coconut Point Sanctuary.

Turn of the Century to Present

During the late 1800s and early 1900s, naturalists were the primary visitors to Brevard County. Notable scientists came to this species rich, semi-tropical region to collect specimens for natural history museums. These specimens included rare bird life such as the Carolina parakeet (Conuopsis carolinensis), which is now extinct. Many of these visitors stayed at Mrs. Lathams's Oak Lodge located on the barrier island in the current location of the mullet creek islands (Austin, 1967).

In the early 1900s, people came to Brevard County from around the country via the Florida East Coast Railway. There was an increase in settlement and development of towns brought about by the creation of railroads and canals. At that time, Melbourne Beach was accessible by the Melbourne Beach Improvement Company's motor train (Shofner, 1995).

The increase in population was also the result of the 1916 Drainage Acts of Florida and the establishment of Mosquito Control measures beginning in 1927. The Drainage Acts rerouted drainage patterns which permanently lowered water tables in areas where standing water naturally existed for six or more months each year. Mosquito control (pesticide spraying) lowered the mosquito population to acceptable levels (Barille, 1988).

In the 1920s, improved roads such as the Dixie Highway (U.S. 1) brought more cars and people to Brevard County. In 1921, a bridge was built over the Indian River Lagoon from Melbourne to Indialantic and hotels and casinos were established. Air conditioning was introduced, and Florida became known as the residential and tourist destination it remains today.

3. Land-use History

In 1943, the Department of Agriculture conducted the first formal aerial survey of Florida. As previously stated, the site was almost entirely undisturbed at the time, with the exception of old A1A, which appears to have been unpaved at this time. As of 1958, several parcels of land were cleared, presumably for development. Additionally, a series of mosquito control ditches were installed on the western edge of the property. By 1963, the home installed on the Mellon property was established with a stable building present to the north of the house on what is now the Coconut Point Sanctuary. Between 1975 and 1980, additional land clearing took place on the southern portion of the property. Between 1980 and 1999 very few alterations occurred on site. In 1999, a 30-foot wide firebreak was installed along the northern property line.

4. Public Interest

Public interest for the EEL Program as a whole has been enthusiastic and supportive. A public meeting held on June 8, 1998 that introduced the Master Site Plan for the Barrier Island Ecosystem Center was very well received. Additional partners in the management and maintenance of the site include the Archie Carr National Wildlife Refuge partners, Brevard County schools, and local universities. The Archie Carr National Wildlife Refuge is also served by a working group

composed of local, state, federal, citizen and private groups dedicated to the preservation and management of the Refuge's resources.

Public interest in the Coconut Point Sanctuary has been limited to issues raised by the recent prescribed burn and exotic plant removal programs. The site has also benefited from a large volunteer trash removal effort that cleared over 2 tons of trash from the site.

Fortunately, we have positive working relationships with the adjacent property owners/managers. The Save Our Coast sites located to the east and south of the Coconut Point Sanctuary are managed by the Brevard County Parks and Recreation Department and the portion west of A1A was burned during the February, 1999 prescribed burn. The R.K. Mellon Foundation, which owns properties to the north and south, in addition to the out-parcel, have worked cooperatively with the EEL Program to help advance conservation goals.

V. FACTORS INFLUENCING MANAGEMENT

A. NATURAL TRENDS

The primary variable that affects the formation and succession of Florida's barrier island communities is the ocean, including associated storms, wind, and salt. Each of the coastal plant communities is specifically adapted to its geographic and topographic position. Natural alterations are frequent, resulting from storm surges and overwash, or loss of canopy trees due to age, wind and occasionally fire. The loss of dunes due to storm surge or human activity can greatly affect the back dune, coastal strand and maritime hammock communities. Land management practices developed for the Coconut Point Sanctuary must consider the restoration and maintenance of the barrier dunes.

Another important factor controlling the communities within the Coconut Point Sanctuary is the remnant mangrove communities along the Indian River Lagoon. The installation of mosquito control ditches has altered the extent/depth and water quality of the area with impacts to both plant and animal communities. Reviews of the 1943 photos suggest that the area of hammock on the western shore may have contained a small depression marsh. It is likely that the salinity in this marsh varied with rainfall and from wash-over of sea/lagoon water. This habitat appears to be primarily freshwater based on the plant species present. Deposition of spoil from the construction of ditches has allowed the maritime hammock to expand. It is uncertain what, if any, benefits would be realized by restoring this area to it previous condition.

B. HUMAN-INDUCED TRENDS

The mild sub-tropical climate and easy access to major population centers makes the barrier island a prime resort and retirement area. Humans have altered the surrounding landscape through activities such as development, agriculture, beach armoring, the introduction of exotic plants and animals, recreation and tourism.

The major historical human influences on site have been the previous clearing of roughly 50% of the site, presumably for some unrealized development or agricultural project. The location of Route A1A has obvious influences on the survivorship of designated species such as gopher tortoises, indigo snakes and Florida scrub-jays.

C. EXTERNAL INFLUENCES

There are no known encroachments from adjoining property owners on the Coconut Point Sanctuary. Currently the illegal parking area adjacent to the property has not encroached into the section east of A1A.

The Archie Carr National Wildlife Refuge draws people during sea turtle nesting season (May-September). Local interest groups such as the Sea Turtle Preservation Society hold guided "turtle walks" during the season. These walks are held after sunset and follow well-known nesting areas. The guides are trained and follow standard guidelines for sea turtle nesting observation.

D. LEGAL OBLIGATIONS AND CONSTRAINTS

The following is a list of possible legal constraints to management and public access on site.

St. John's River Water Management District

The proposed hiking trail on site will be primarily restricted to previously disturbed roads and paths. An opportunity to create a new path through the area currently bisected by the mosquito control ditches may be desirable and could end in an overlook of the Indian River Lagoon. The St. John's River Water Management District (SJRWMD) regulates impacts to wetlands pursuant to Part IV, Chapter 373 of the Florida Statutes and in accordance with Chapters 40C-400 of the Florida Administrative Code (F.A.C.). The SJRWMD typically requires an Environmental Resource Permit (ERP) to impact wetlands. Since the construction of a simple bridge over the mosquito ditch would impact less than 0.5 acres, no mitigation would be required.

Prior to submitting an application for dredging or filling within waters of the State, it is recommended that the areas proposed for impact be delineated in accordance with the Unified Wetland Delineation Methodology for the State of Florida dated 1 July, 1994 and then reviewed by SJRWMD staff.

U.S. Army Corps of Engineers

The installation of a simple bridge and an overlook, and the associated impact to wetlands, will require an additional permit through the U.S. Army Corps of Engineers (USACE). USACE regulates wetlands connected to "Waters of the United States" and isolated wetlands pursuant to Section 404 of the Clean Water Act. Mitigation may not be required if impacts are minimal or to degraded systems. Since the area that will be traversed has undergone severe human alteration it is unlikely that mitigation will be required.

Division of Forestry

The Florida Division of Forestry (DOF) issues permits for prescribed burns for land management to land managers with certified burn numbers. Certification is provided by DOF.

E. MANAGEMENT CONSTRAINTS

1. Exotic Plant Species

Invasive, exotic, and/or nuisance plants have the potential to displace native species and to significantly alter natural ecosystem function. Exotic species are a major concern within the Coconut Point Sanctuary, particularly along roads and the shore of the Indian River Lagoon. The primary species of concern, Brazilian pepper (Schinus terebinthifolius) and Australian pine (Casuarina equisetifolia), are currently being targeted through a grant under the Florida Department of Environmental Protection's Invasive Plant Management Program. The complete treatment of the above mentioned species should be completed by the end of 1999. The members of the Marine Resources Council are planting red mangrove seedlings along the shore of the Indian River Lagoon to stabilize the shoreline and to prevent recolonization by Brazilian pepper.

A thorough survey of the extent of the Madagascar periwhinkle (Catharanthus roseus), guinea grass (Panicum maximum), and simpleleaf chastetree (Vitex trifolia) needs to be conducted. Once determined, these species can be treated and monitored. The EEL Program is currently developing a comprehensive treatment and monitoring program to ensure the long-term removal of these species from the Coconut Point Sanctuary and other EEL managed properties.

2. Exotic Animal Species

The list of non-indigenous animal species noted with the Coconut Point Sanctuary include the Cuban tree frog (Osteopilus septentrionalisu), the brown anole (Anolis sagrei), and several other herpetile species as well as several ant species. Further investigation into the levels and impacts of these species will be conducted prior to the establishment of a control strategy.

F. PUBLIC ACCESS AND PASSIVE RECREATION

The EEL Program is committed to providing a range of public use opportunities that are consistent with the conservation and protection goals of the voter approved referendum. It has been determined that passive recreational activities best support the EEL Program goals. The EEL Program *Sanctuary Management Manual* (SMM) defines passive recreation as:

> "recreational types of uses, level of uses and combination of uses that do not, individually or collectively, degrade the resource values, biological diversity, and aesthetic or environmental qualities of a site."

The Coconut Point Sanctuary is a Category II site, which means that minimal capital improvements are planned. The size, location and habitats of the Coconut Point Sanctuary will dictate the types of activities that will be compatible with the overriding conservation mandate. These activities include hiking and nature observation. The proposed trails (Figure 10) will guide visitors through the coastal strand habitat as it grades into the hammock along the mosquito control

ditches. If feasible, a bridge over the ditch will be constructed with an overlook located within the mangrove fringe along the Indian River Lagoon.

The proposed trail is roughly 3,100 feet in length. Educational opportunities afforded by this trail include discussions of current research being conducted on the site, scrub-jays, gopher tortoises, prescribed fire and the history of the site. Parking for bicycles and several automobiles will be established at the northern terminus of the trail, on a parcel which has recently been cleared of Australian pines. Hikers can return to the parking area along an existing bicycle/pedestrian trail on the west side of A1A.

An additional positive use of the site is as a research and educational resource. The undisturbed areas interspersed with areas that have been disturbed by human use can be used to illustrate the ways in which habitats recover the use of these habitats by native species. Whenever possible, research and restoration conducted on site will be used to guide educational programs.

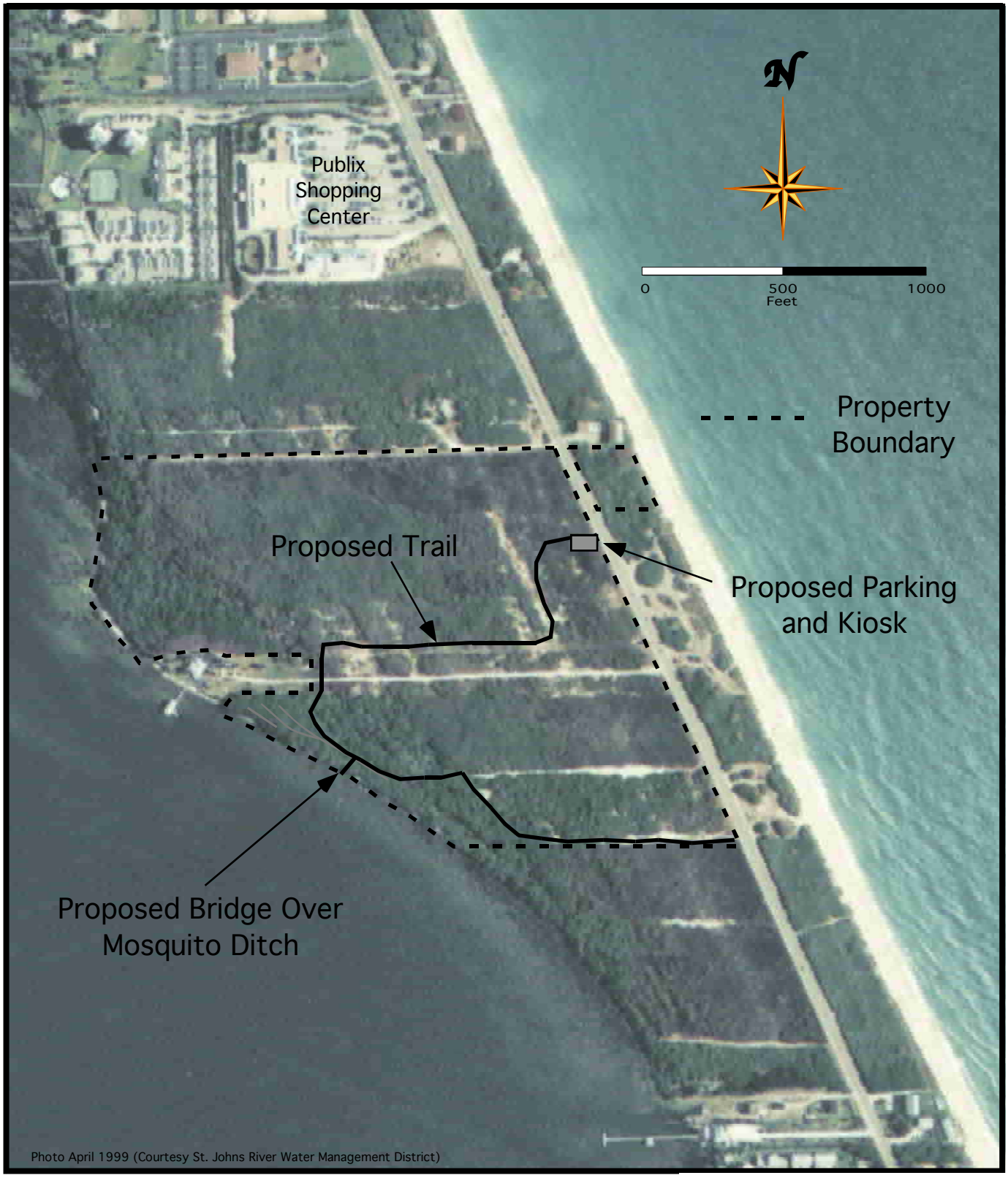

Figure 10. Coconut Point Proposed Trail

VI. MANAGEMENT ACTION PLANS

The following is a comprehensive outline of the goals, strategies and actions necessary to manage the Coconut Point Sanctuary.

A. GOALS

The *Sanctuary Management Manual* of the EEL Program provides the following management goals for the Coconut Point Sanctuary.

- Documentation of historic public use
- Conservation of ecosystem function
- Conservation of natural (native) communities
- Conservation of species (including endemic, rare, threatened and endangered species)
- Documentation of significant archeological and historical sites
- Provision of public access for responsible public use
- Assessment of carrying capacity of natural resources with public use
- Provision of environmental education programs
- Provision of opportunities for compatible uses
- Assurance of general upkeep and security of the property

B. STRATEGIES AND ACTIONS

The following is an outline of the specific management strategies and actions that are needed to meet the management goals for the Coconut Point Sanctuary.

GOAL: DOCUMENTATION OF HISTORIC PUBLIC USE

Strategy 1: Document historic public use

Actions:
- Collect historic information regarding the types of activities that have occurred on-site
- Evaluate how historic public use impacted the site's natural resources
- Consider historic public use patterns in planning future public uses

GOAL: CONSERVATION OF ECOSYSTEM FUNCTION

Strategy 2: Protect, maintain, and restore native diversity, ecological patterns, and the processes that maintain diversity.

Actions:
- Research and monitor baseline conditions of natural systems
- Research the connection of on-site natural resources with adjacent resources
- Research hydrologic patterns on and off-site
- Research native species' movement patterns on and off-site
- Focus natural community restoration efforts on enhancing native diversity
- Investigate the historic hydroperiod and restore natural hydrologic patterns

GOAL: CONSERVATION OF NATURAL (NATIVE) COMMUNITIES

Strategy 3: Restore degraded, disturbed, or altered uplands within the Coconut Point Sanctuary

Actions:

- Conduct monitoring to establish baseline conditions within the upland communities
- Collect historic information regarding prior wetland communities that may have occurred on-site
- Consult local experts and current literature regarding best scientific methods for wetland restoration
- Prioritize the upland communities in need of restoration
- Identify appropriate restoration activities
- Assess possible impacts of proposed restoration on adjacent communities and off-site properties
- Implement the selected restoration activities
- Monitor the effects of the restoration activities, evaluate the success of the restoration projects, and revise the restoration plan as necessary

Strategy 4: Design and implement a "natural" fire management program

Actions:

- Identify natural communities that require prescribed fire management
- Identify and evaluate individual proposed burn management units
- Identify the goal of the application of fire to each proposed burn unit
- Document listed species within each burn unit
- Identify and plan perimeter and internal fire breaks
- Develop and implement public education campaign including programs and literature regarding the need for periodic controlled burns
- Secure the necessary permits from the State Division of Forestry
- Begin prescribed fire management program
- Monitor the effects of the fire management activities, evaluate the success of the program, and revise the program strategies as needed

GOAL: CONSERVATION OF SPECIES (INCLUDING ENDEMIC, RARE, THREATENED AND ENDANGERED)

Strategy 5: Protect on-site populations of endemic, rare, threatened and endangered species through the utilization of existing habitat management and species recovery plans.

Actions:
- Develop a methodology and work plan to accomplish the identification of designated plant and animal species
- Survey for, and identify, designated plant and animal species
- 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
- Periodically update these baseline survey data to determine possible changes in designated species distribution or density
- Review management plans for consistency with USFWS and FGFWFC guidance concerning listed species
- Implement habitat restoration activities for listed species (i.e. removal of exotic/nuisance species, restoration of ecosystem function)
- Establish periodic monitoring of habitat suitability (where indices are available for a given species), species population levels, diversity levels, and exotic/nuisance species, as a means of evaluating the success of management strategies

GOAL: DOCUMENTATION OF SIGNIFICANT ARCHAEOLOGICAL AND HISTORIC SITES

Strategy 6: Survey for archaeological and historical sites within the Coconut Point Sanctuary.

Actions:
- Contact the State Division of Historic Resources to conduct a Phase I survey of the site
- Review available maps and historic records for indications of past usage of the site
- Map all archaeological and historic sites for future reference

GOAL: PROVISION FOR PUBLIC ACCESS AND RESPONSIBLE PUBLIC USE

Strategy 7: Establish and enforce specific policies and management techniques governing public access and responsible public use.

Actions:
- Plan appropriate public facilities by examining the site's natural and cultural resources and reviewing public input
- Evaluate proposed public facilities for consistency with ADA guidelines

- Establish social and environmental carrying capacities for proposed public facilities
- Use daily or seasonal quotas, restricted access or limited parking to enforce established carrying capacities
- Coordinate recreational use with the ecological burning strategies of the EEL Program
- Minimize unauthorized trail expansion by educating the users, providing on-site public info, establishing sufficient trails, constructing handrails, and developing written guidelines
- Construct hiking trails in accordance with the USDA Forest Service "Standard Specifications for the Construction of Trails"
- Construct terraces for erosion control

GOAL: ASSESSMENT OF CARRYING CAPACITY OF NATURAL RESOURCES WITH PUBLIC USE

Strategy 8: Establish a monitoring program to assess effects of public usage on natural resources.

Actions:
- Establish baseline vegetation monitoring transects to provide data regarding existing conditions
- Establish a methodology and record keeping system to document public use
- Conduct regular monitoring to assess impacts of public use on natural habitats
- Conduct regular walk-throughs" on frequently used sites to assess the need for changes in routing/user types or user intensity
- Re-route users from sensitive areas or popular sites on a regular or as-needed basis
- Re-align public use to avoid areas which observations or data indicate are too sensitive for the level of use originally planned

GOAL: PROVISION OF ENVIRONMENTAL EDUCATION PROGRAMS

Strategy 9: Develop a plan to provide on-going environmental education programs to Brevard County residents and visitors.

Actions:
- Determine target audiences and types of programming best suited to those groups
- Design and develop indoor and outdoor exhibits, signs and printed materials
- Include educators, friends groups and other organizations in the design, development and delivery of programs
- Develop and coordinate a docent program to assist in program delivery
- Develop and provide training and site specific informational materials for use by docents and other educators
- Develop a marketing and promotions plan for educational programs
- Develop criteria and process of evaluation for program review and refinement
- Provide a "special collection" of books and other materials specifically related to the environmental and cultural character of the Sanctuary

GOAL: PROVISION OF OPPORTUNITIES FOR COMPATIBLE USES

Strategy 10: Provide opportunities for multiple use and compatibility when practical.

Actions:
- Use fire breaks as multi-use recreation trails when not needed for resource management
- Include multiple benefits of natural community restoration efforts in education program

GOAL: ASSURANCE OF GENERAL UPKEEP AND SECURITY OF THE PROPERTY

Strategy 11: Secure and maintain the Sanctuary to the highest degree possible using EEL staff. Parks and Recreation staff, contract employees and volunteers.

Actions:
- Employ a land manager to oversee maintenance and security activities
- Contract with Brevard County, Parks and Recreation for maintenance of parking areas, fire breaks, trails, boardwalks, bridges, benches etc.
- Coordinate daily maintenance tasks using staff and volunteers

VII. PROJECTED TIMETABLE FOR IMPLEMENTATION

The implementation of the management plan is outlined in a recommended timeline. This timeline includes immediate, short-term and long-term time frames. Immediate time frame is defined as within one year of the adoption of this management plan, short term is 1 to 5 years, and long-term is more than 5 years. Some actions are also defined as on-going, if the activity is required for the on-going maintenance of the Coconut Point Sanctuary.

ACTION	TIMELINE
Strategy 1: Document historic public use	
Collect historic information regarding the types of activities that have occurred on-site	Complete
Evaluate how historic public use impacted the site's natural resources	Complete
Consider historic public use patterns in planning future public uses	Complete
Strategy 2: Protect, maintain, and restore native diversity, ecological patterns, and the processes that maintain diversity	
Research and monitor baseline conditions of natural systems	Immediate
Research the connection of on-site natural resources with adjacent resources	Immediate
Research hydrologic patterns on and off-site	Immediate
Research native species' movement patterns on and off-site	Immediate
Focus natural community restoration efforts on enhancing native diversity	Short-Term
Investigate the historic hydroperiod and restore natural hydrologic patterns	Long-Term
Strategy 3: Restore degraded, disturbed, or altered uplands with the Coconut Point Sanctuary	
Conduct monitoring to establish baseline conditions within the upland communities	Immediate
Collect historic information regarding prior wetland communities that may have occurred on-site	Immediate
Consult local experts and current literature regarding best scientific methods for wetland restoration	On-Going
Prioritize the upland communities in need of restoration	On-Going
Identify appropriate restoration activities	On-Going
Assess possible impacts of proposed restoration on adjacent communities and off-site properties	On-Going
Implement the selected restoration activities	Short-Term
Monitor the effects of the restoration activities, evaluate the success of the restoration projects, and revise the restoration plan as necessary	Long-Term

Strategy 4: Design and implement a "natural" fire management program

Identify natural communities that require prescribed fire management	Complete
Identify and evaluate individual proposed burn management units	Complete
Identify the goal of the application of fire to each proposed burn unit	Complete
Document listed species within each burn unit	Complete
Identify and plan perimeter and internal fire breaks	Complete
Develop and implement public education campaign including programs and literature regarding the need for periodic controlled burns	Complete
Secure the necessary permits from the State Division of Forestry	Complete
Begin prescribed fire management program	Complete
Monitor the effects of the fire management activities, evaluate the success of the program, and revise the program strategies as needed	On-Going

Strategy 5: Protect on-site populations of endemic, rare, threatened and endangered species through the utilization of existing habitat management and species recovery plans

Develop a methodology and work plan to accomplish the identification of designated plant and animal species	On-Going
Survey for, and identify, designated plant and animal species	On-Going
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	Immediate
Periodically update these baseline survey data to determine possible changes in designated species distribution or density	Short-Term & On-Going
Review management plans for consistency with USFWS and FGFWFC guidance concerning listed species	Immediate
Implement habitat restoration activities for listed species	Short-Term
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	On-Going

Strategy 6: Survey for archaeological and historic sites within the Coconut Point Sanctuary.

Contact the State Division of Historic Resources to conduct a Phase I survey of the site	Complete
Review available maps and historic records for indications of past usage of the site	Complete
Map all archaeological and historic sites for future reference	Short-Term

Strategy 7: Establish and enforce specific policies and management techniques for public access and responsible public use

Plan appropriate public facilities by examining the site's natural and cultural resources and reviewing public input	Immediate

Evaluate design and proposed public facilities for consistency with ADA guidelines	Immediate
Establish social and environmental carrying capacities for proposed public facilities	Short-Term
Use daily or seasonal quotas, restricted access or limited parking to enforce established carrying capacities	Short-Term
Coordinate recreational use with the ecological burning strategies of the EEL Program	Short-Term
Minimize unauthorized trail expansion by establishing sufficient trails, constructing handrails, and the development of written guidelines	Short-Term
Construct hiking trails in accordance with the USDA Forest Service "Standard Specifications for the Construction of Trails"	Short-Term
Construct terraces for erosion control	Short-Term

Strategy 8: Establish a monitoring program to assess effects of public usage on natural resources

Establish baseline vegetation monitoring transects to provide data regarding existing conditions prior to development	Immediate
Establish a methodology and record keeping system to document public use	Short-Term
Conduct regular monitoring to assess impacts of public use on natural habitats	On-Going
Conduct regular walk-throughs over frequently used sites to assess the need for changes in routing/user types, or user intensity	On-Going
Re-route users from sensitive areas or popular sites on a regular or as-needed basis	On-Going
Re-align public use to avoid areas which observations or data indicate are too sensitive for the level of use originally planned	On-Going

Strategy 9: Develop a plan to provide on-going environmental education programs to Brevard County residents and visitors

Determine target audiences and types of programming best suited to those groups	Short-Term
Design and develop indoor and outdoor exhibits, signs and printed materials;	Short-Term
Include educators, friends groups and other organizations in the design, development and delivery of programs	Short-Term
Develop and coordinate a docent program to assist in program delivery	Short-Term
Develop and provide training and site specific informational materials for use by docents and other educators	Short-Term
Develop a marketing and promotions plan for educational programs	Short-Term
Develop criteria and process of evaluation for program review and refinement	Short-Term
Provide a "special collection" of books and other materials specifically related to the environmental and cultural character of	Short-Term

the Sanctuary	

Strategy 10: Provide opportunities for multiple use and compatibility when practical

Use fire breaks for multi-use recreation trails when not needed for resource management	Short-Term
Include multiple benefits of natural community restoration efforts in education program	Immediate & On-Going

Strategy 11: Secure and maintain the Sanctuary to the highest degree possible using EEL staff. Parks and Recreation staff, contract employees and volunteers

Employ a land manager to oversee maintenance and security activities	Complete
Contract with Brevard County, Parks and Recreation for maintenance of parking areas, fire breaks, trails, boardwalks, bridges, benches etc	Short-Term
Coordinate daily maintenance tasks using staff and volunteers	On-Going

VIII. FINANCIAL CONSIDERATIONS

The following is a breakdown of the general costs estimated for capital improvement and annual management of the Coconut Point Sanctuary:

Capital Improvement	
Property Boundary Fencing (FY 2000/2001)	$25,156.00
Property Boundary Signs (FY 2000/2001)	$ 840.00
Directional Trail Signs (FY 2000/2001)	$ 600.00
Footbridge to Indian River Lagoon (FY 2000/2001)	$ 1,500.00
Lagoon Overlook (FY 2001/2002)	$ 3,000.00
Interpretive Trail Signs (FY 2001/2002)	$ 3,000.00
Kiosks (FY 2000/2001, FDCA, Coastal Management Program Grant)	$ 1,400.00
Initial Treatment of Brazilian pepper (FY 1999/2000, FDEP, Bureau of Invasive Plant Management Grant)	$45,000.00
Annual Management	
Follow-up treatment of Brazilian Pepper	$ 1,375.00
Treatment for other invasive plants species	$ 220.00
Mechanical treatment of vegetation to facilitate prescribed fire	$ 666.00
Upkeep of fences, raised boardwalks, trails and kiosks	$ 2,310.00

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X. APPENDICES

The appendices include the following additional or supplemental information important to the management plan.

Appendix A. Coconut Point Sanctuary Observed Plant Species

Appendix B. Coconut Point Sanctuary Observed Insect Species

Appendix C. Coconut Point Sanctuary Observed Reptile and Amphibian Species

Appendix D. Coconut Point Sanctuary Observed Bird Species

Appendix E. Coconut Point Sanctuary Observed Mammal Species

Appendix F. Florida Natural Areas Inventory Description of Resources

Appendix G. Compliance Letter from Brevard County Planning and Zoning Office

Appendix A. Coconut Point Sanctuary Observed Plant Species

Note: Surveyors: H=Margaret Hames, S= Dr. Paul Schmalzer, M=Travis McClendon

SCIENTIFIC NAME	COMMON NAME	Exotic	Surveyor	FFWCC Status
Acrostichum danaeifolium	Giant Leather Fern		H	
Ambrosia artemisiifolia	Common Ragweed		H	
Ammannia latifolia	Toothcups		H	
Andropogon longiberbis	Hairy Bluestem		S	
Baccharis glomeruliflora	Silverlining		H	
Baccharis halimifolia	Groundsel Tree, Sea Myrtle		S	
Bacopa monnieri	Herb-of-Grace		S	
Blechnum serrulatum	Swamp Fern		S	
Boehmeria cylindrica	False Nettle		H	
Caesalpinia bonduc	Gray Nicker		S	
Canavalia rosea	Bay Bean		S	
Carya floridana	Scrub Hickory		S	
Cassytha filiformis	Love Vine		S	
Catharanthus roseus	Madagascar Periwhinkle	X	H	
Chamaecrista fasciculata	Partridge Pea		M	
Chamaesyce cordifolia	Heartleaf Sandmat		M	
Chamaesyce cumulicola	Coastal Sandmat		H	E
Citharexylum fruiticosum	Fiddlewood		H	
Cladium jamaicensis	Jamaica Swamp Sawgrass		H	
Cnidoscolus stimulosus	Tread Softly		S	
Coccoloba uvifera	Seagrape		S	
Commelina erecta	Whitemouth Dayflower		S	
Conocarpus erectus	Buttonwood		H	
Conyza canadensis var. *pusilla*	Canadian Horseweed		S	
Crotalaria pumila	Low Rattlebox		M	
Croton glandulosus var. *glandulosus*	Vente Conmigo		H	
Cyperus ligularis	Swamp Flatsedge		H	
Dalbergia ecastophyllum	Coinvine		H	
Dalea feayi	Feay's Prarieclover		H	
Distichlis spicata	Saltgrass		H	
Ernodea littoralis	Beach Creeper		M	T
Erythrina herbacea	Coral Bean		S	
Euphorbia sp.	Spurge		S	
Eustachys petraea	Pinewoods Fingergrass		S	
Flaveria linearis	Narrowleaf Yellowtop		H	
Forestiera segregata	Florida Swampprivet		H	
Gaillardia pulchella	Firewheel		S	
Galactia elliottii	Elliott's Milkpea		H	
Galactia volubilis	Downy Milkpea		S	
Glandularia maritima	Coastal Mock-Vervain		M	E
Helianthemum corymbosum	Pinebarren Frostweed		H	
Helianthus debilis	Dune Sunflower		S	
Heterotheca subaxillaris	Camphorweed		S	
Hypericum hypericoides	St. Andrew's Cross		H	
Hypericum tetrapetalum	Fourpetal St. John's Wort		S	
Ilex glabra	Inkberry, Gallberry		M	
Ipomoea pes-caprae	Railroad Vine		M	
Iva imbricata	Seacoast Marshelder		M	
Kosteletzkya virginica	Virginia Saltmarsh Mallow		H	
Laguncularia racemosa	White Mangrove		H	
Lechea sessiliflora	Pineland Pineweed		H	
Lepidium virginicum	Virgina Pepperweed		H	

Licania michauxii	Gopher Apple		S	
Mikania cordifolia	Florida Keys Hempvine		H	
Myrcianthes fragrans	Twinberry		S	T
Myrica cerifera	Wax Myrtle		S	
Oenothera humifusa	Seabeach Evening Primrose		S	
Opuntia humifua	Pricklypear		M	
Opuntia stricta	Erect Pricklypear		S	T
Panicum maximum	Guinea Grass	X	S	
Paspalum sp.	Paspalum Grass		S	
Persea borbonia	Red Bay		S	
Phlebodium aureum	Golden Polypody		M	
Phyla nodiflora	Turkey Tangle Fogfruit		S	
Phyllanthus abnormis	Drummond's Leafflower		S	
Physalis walteri	Walter's Groundcherry		M	
Phytolacca americana	American Pokeweed		H	
Pluchea camphorata	Camphorweed		H	
Polygala grandiflora	Showy Milkwort		H	
Portulaca pilosa	Pink Purslane		H	
Psychotria nervosa	Wild Coffee		S	
Quercus geminata	Sand Live Oak		H	
Quercus myrtifolia	Myrtle Oak		S	
Quercus pumila	Running Oak		H	
Quercus virginiana	Virginia Live Oak		S	
Randia aculeata	White Indigoberry		S	
Rapanea punctata	Myrsine		S	
Rhizophora mangle	Red Mangrove		S	
Rhus copallinum	Winged Sumac		S	
Rhynchosia minima	Least Snoutbean		S	
Sabal palmetto	Cabbage Palm		S	
Schinus terebenthifolius	Brazilian Pepper	X	S	
Scleria triglomerata	Tall Nutgrass		H	
Seronea repens	Saw Palmetto		S	
Sideroxylon tenax	Tough Bully		S	E
Sisyrinchium xerophyllum	Jeweled Blueeyed Grass		H	
Smilax sp.	Bamboo Vine		S	
Solidago odora var.*chapmanii*	Chapman's Goldenrod		H	
Solidago sempervirens	Seaside Goldenrod		H	
Sophora tomentosa	Yellow Necklace Pod		S	
Stylosanthes hamata	Cheesytoes		S	
Tephrosia angustissima var. *curtissii*	Curtiss' Hoarypea		H	E
Tribulus cistoides	Burrnut		M	
Trichostema dichotomum	Forked Bluecurls		S	
Triplasis purpurea	Purple Sand Grass		S	
Vaccinium stamineum	Deerberry		S	
Verbesina virginica	Frostweed		S	
Vitex trifolia	Simpleleaf Chastetree	X	S	
Vitis shuttleworthii	Calloose Grape		H	
Vitus rotundifolia	Muscadine		S	
Ximenia americana	Tallow Wood		S	
Zanthoxylum clava-herculis	Hercules' Club		S	

FFWCC=Florida Fish and Wildlife Conservation Commision
E=Endangered
T=Threatened
C=Common

Appendix B. Coconut Point Sanctuary Observed Insect Species

Ant Species

Note: Surveyor Dr. Mark Deyrup, Archbold Biological Station

		Exotic
Camponotus decipiens		
Camponotus floridanus	Florida bull (=carpenter) ant	
Camponotus tortuganus	Tortugas bull ant	
Crematogaster ashmeadi		
Cyphomyrmex minutus		
Cyphomyrmex rimosus		X
Eurhopalthrix floridana		X
Forelius pruinosus		
Hypoponera opacior		
Odontomachus brunneus	Snap-jaw ant	
Pheidole floridanus		
Pheidole moerens		X
Pogonomyrmex badius	Florida harvester ant	
Pseudomyrmex ejectus		
Solenopsis abdita		
Solenopsis geminata	Fire ant	
Solenopsis invicta	Red imported fire ant	X
Solenopsis nickersoni		
Solenopsis picta		
Solenopsis tennesseensis		
Strumigenys eggersi		X
Strumigenys louisianae		
Trachymyrmex septentrionalis		
Wasmannia auropunctata	Little red fire ant	X

Oak Cynipid Gallmaking Insects

Note: Surveyors George Melika and Warren G. Abrahamson, Archbold Biological Field Station

	Notes
Neuroterus quercusminutissimus	Agamic generation is known on underside of leaves of Q. mytifolia
Neuroterus sp.	Integral galls, underside of the leaves of Q. mytifolia
Amphibolips murata	Agamic generation only is known, bud galls on Q. myrtifolia
Amphibolips quercuscitriformis	Agamic generation only is known, bud galls on Q. myrtifolia
Andricus quercusfoliatus	Agamic generation only is known, bud galls on Q. geminata
Disholcaspis quercussuccinipes	Agamic generation only is known, stem galls on Q. geminata
Disholcaspis quercusvirens	Agamic generation only is known, stem galls on Q. geminata
Belonocnema quercusvirens	Agamic generation only is known, leaf galls on Q. geminata
Callirhytis difficilis	Agamic generation only is known, stem galls on Q. myrtifolia
Callirhytis myrtifolia	Bisexual generation only is known, catkin galls on Q. myrtifolia
Callirhytis quercusbatatoides	Agamic generation only is known, stem galls on Q. geminata
Callirhytis quercusclavigera	Agamic generation only is known, stem galls on Q. myrtifolia
Callirhytis quercusmedullae	Agamic generation only is known, stem galls on Q. myrtifolia

Appendix C . Coconut Point Sanctuary Observed Reptile and Amphibian Species

Note: Surveyors Dr. Llew Ehrhart, William Blihovde, Richard Owen, University of Central Florida

Order/Suborder	SCIENTIFIC NAME	COMMON NAME	FFWCC	FWS
Anura	*Rana utriculria*	Southern Leopard Frog		
	Gastrophryne carolinensis	E. Narrow-mouthed Frog		
	Osteopilus septentrionalis	Cuban Treefrog		
	Eleutherodactylus planirostris	Greenhouse Frog		
Squamata/Lacertia	*Hemidactylus garnoti*	Indo-Pacific Gecko		
	Anolis carolinensis	Green Anole		
	Anolis sagrei	Brown Anole		
	Ophisaurus ventralis	Eastern Glass Lizard		
	Cnemidophorus sexilineatus	Six-lined Racerunner		
	Eumeces egregius	Peninsula Mole Skink		
	Eumeces inexpectatus	Southeastern Five-lined Skink		
Squamata/Serpentes	*Cemophora coccinea*	Florida Scarlet Snake		
	Coluber constrictor	Southern Black Racer		
	Drymarchon corais	Eastern Indigo Snake	T	T
	Elaphe guttata	Corn Snake		
	Elaphe obsoleta	Yellow Rat Snake		
	Diadophis punctatus	Southern Ringneck Snake		
	Opheodrys aestivus	Rough Green Snake		
	Thamnophis sauritus	Eastern Ribbon Snake		
Testudines	*Gopherus polyphemus*	Gopher Tortoise	SSC	
	Kinosternon baurii	Striped Mud Turtle		

FFWCC=Florida Fish and Wildlife Conservation Commision
FWS=US Fish and Wildlife Service
SSC=Species of Special Concern
T=Threatened

Appendix D. Coconut Point Sanctuary Observed Bird Species

Note: Surveyor Ken Snyder, Florida Institute of Technology

SCIENTIFIC NAME	COMMON NAME	FFWCC	FWS
Accipter cooperii	Cooper's hawk		
Aphelocoma coerulescens	Florida scrub-jay	T	T
Ardea herodias	Great blue heron		
Butorides striatus	Green-backed heron		
Cardinalis cardinalis	Northern cardinal		
Cathartes aura	Turkey vulture		
Colaptes auratus	Common flicker		
Columbina passerina	Ground dove		
Coragyps atratus	Black vulture		
Corvus ossifragus	Fish crow		
Cyanocitta cristata	Blue jay		
Dendroica caerulescens	Black-throated blue warbler		
Dendroica coronata	Yellow-rumped warbler		
Dendroica palmarum	Palm warbler		
Dumetella carolinensis	Gray catbird		
Falco peregrinus	Peregrine falcon	E*	
Falco sparverius	American kestrel	T*	
Geothylpis trichas	Common yellowthroat		
Hirundo rustica	Barn swallow		
Iridoprocne bicolor	Tree swallow		
Lanius ludovicianus	Loggerhead shrike		
Melanerpes carolinus	Red-bellied woodpecker		
Mimus polyglottos	Northern mockingbird		
Pandion haliaetus	Osprey		
Passerina ciris	Painted bunting		
Passerina cyanea	Indigo bunting		
Quiscalus major	Boat-tailed grackle		
Quiscalus quiscula	Common grackle		
Setophaga ruticilla	American redstart		
Thryothorus ludovicianus	Carolina wren		
Toxostoma rufum	Brown thrasher		
Vireo griseus	White-eyed vireo		
Zenaida macroura	Mourning dove		

FFWCC=Florida Fish and Wildlife Conservation Commision
FWS=US Fish and Wildlife Service
E=Endangered
T=Threatened

*subspecies not confirmed

Appendix E. Coconut Point Sanctuary Observed Mammal Species

Note: Surveyors; Jen Feinstein, Tim Miller, Deborah Patterson and Julie Shepker, Florida Institute of Technology

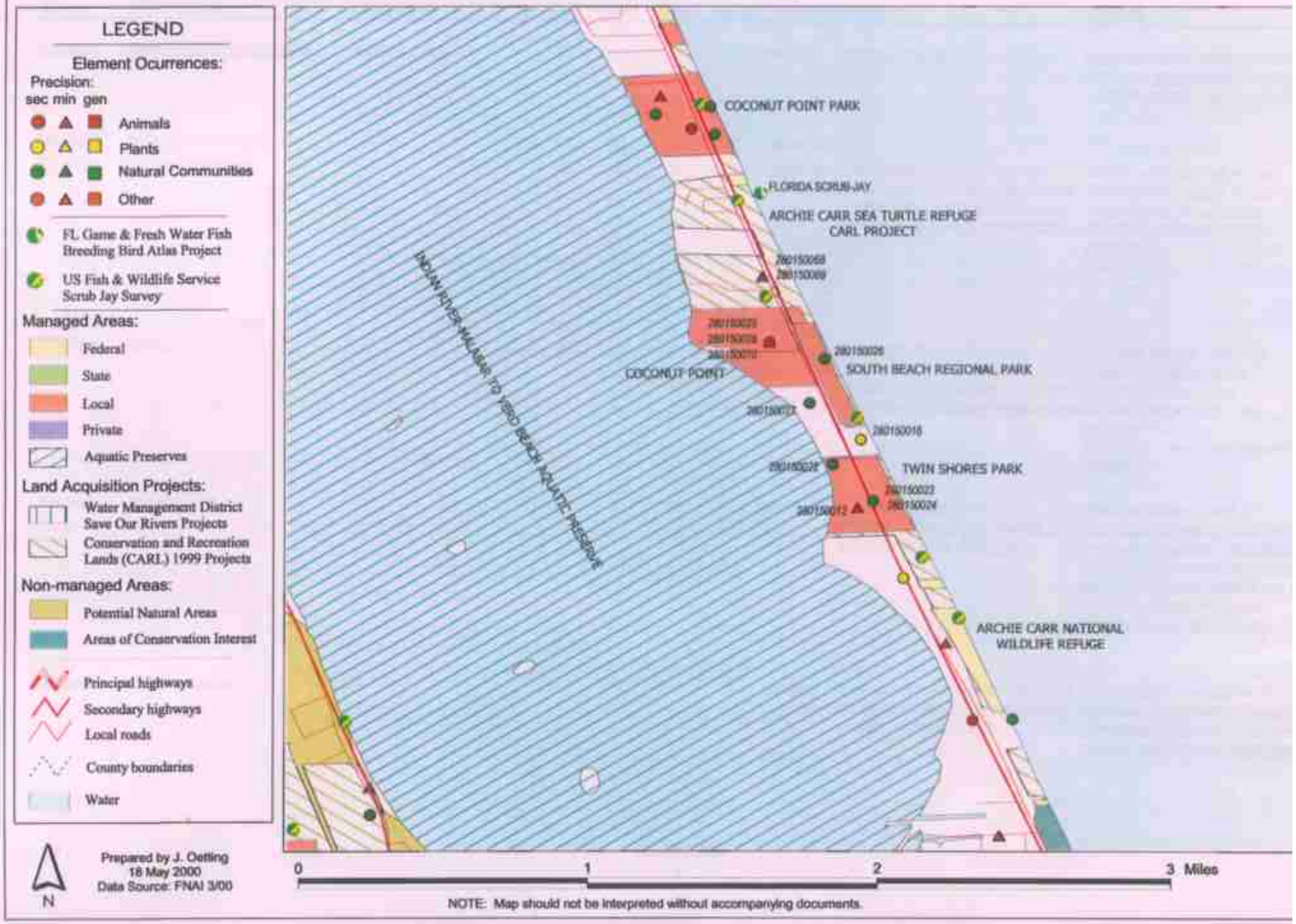
SCIENTIFIC NAME	COMMON NAME
Spilogale putorius	Spotted skunk
Sigmodon hispidus	Cotton rat
Podomys floridanus	Florida mouse
Peromyscus sp.	
Procyon lotor	Racoon
Vulpes vulpes	Red Fox

FNAI

Florida Natural Areas Inventory

1018 Thomasville Road, Suite 2
Tallahassee, FL 32303
(850) 224-8207

Coconut Point Sanctuary, Brevard County



FNAI ELEMENT OCCURRENCE RECORDS ON OR NEAR SITE

GIS ID	SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS	DATE OBSERVED	DESCRIPTION	COMMENTS
280150012	APHELOCOMA COERULESCENS	FLORIDA SCRUB-JAY	G3	S3	LT	LT	1986-	COASTAL STRAND	RESIDENT SCRUB JAYS HAVE BEEN OBSERVED ON THE DISNEY MIDDLE TRACT FROM 1972-1986 BY HARDEN.
280150016	DATA SENSITIVE PLANT		G2Q	S2	N	LE	1988-04-09		
280150022	MARITIME HAMMOCK		G4	S2	N	N	1990-02-18	LOW HAMMOCK (15-20' CANOPY) OF REDBAY, LIVE OAK AND CABBAGE PALM. UNDERSTORY OF MYRSINE AND WILD COFFEE. SURROUNDED BY BRAZILIAN PEPPER.	CANOPY: QUERCUS VIRGINIANA, PERSEA HUMILIS, SABAL PALMETTO UNDERSTORY: MYRCIANTHES FRAGRANS, SERENOA REPENS, ZANTHOXYLUM CLAVA-HERCULIS, SMILAX AURICULATA, PSILOTUM NUDUM.
280150023	DATA SENSITIVE PLANT		G2Q	S2	N	LE	1990-02-18		
280150024	SCRUB		G2	S2	N	N	1990-02-18	DISTURBED SCRUB WITH MUCH DUMPING. HEAVY CASSYTHA INFESTATION TO N OF SAND RD. SCRUB GRADES INTO BRAZILIAN PEPPER STAND NEAR LAGOON.	DOMINANT SHRUBS: QUERCUS GEMINATA, BUMELIA TENAX, FORESTIERA SEGREGATA, SERENOA REPENS AND PARASITIC VINE, CASSYTHA FILIFORMIS (DEAD FROM FREEZE DEC. 1989). BRAZILIAN PEPPER FREQUENT.
280150025	SCRUB		G2	S2	N	N	1990-02-21	SCRAPED SCRUB THAT IS REGENERATING - MANY OPENINGS. CA. 3RD DUNE RIDGE W OF BEACH.	QUERCUS GEMINATA AND Q. MYRTIFOLIA RESPROUTING. IN SANDY OPEN AREAS: XIMENIA AMERICANA, HETEROTHECA SUBAXILLARIS, LICANIA MICHAUXII, OPUNTIA STRICTA, RHUS COPALLINA, ANDROPOGON SP., RHYNCHOSPORA MEGALOCARPA.
280150026	COASTAL STRAND		G3?	S2	N	N	1990-02-21	PURE SAW PALMETTO BOTH E AND W OF A1A. SERENOA GRADUALLY REPLACED BY OAKS FURTHER INLAND.	DOMINATED BY LOW SAW PALMETTO (SERENOA REPENS) WITH SCATTERED LOW SHRUBS OF QUERCUS VIRGINIANA, BUMELIA TENAX, PERSEA BORBONIA.

FNAI ELEMENT OCCURRENCE RECORDS ON OR NEAR SITE

GIS ID	SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS	DATE OBSERVED	DESCRIPTION	COMMENTS
280150027	SCRUB		G2	S2	N	N	1990-02-21	DENSE OAK SCRUB ON OLDER DUNE RIDGES ABOUT 1/4 MILE INLAND FROM COAST.	DOMINANT SHRUBS: QUERCUS GEMINATA, PERSEA BORBONIA, SERENOA REPENS, BUMELIA TENAX, QUERCUS MYRTIFOLIA, CATBRIAR (SMILAX AURICULATA). LESS COMMON SPP: ZANTHOXYLUM CLAVA-HERCULIS, SCHINUS TEREBINTHIFOLIUS, ERYTHRINA HERBACEA.
280150028	APHELOCOMA COERULESCENS	FLORIDA SCRUB-JAY	G3	S3	LT	LT	1993	SCRAPED SCRUB THAT IS REGENERATING-MANY OPENINGS GA. 3RD DUNE RIDGE W OF BEACH.	1993: SPECIES REPORTED AS ON-SITE BY U93COA01FLUS; ADDITIONAL DATA NEEDED. 1991(?): SPECIES PRESENT IN COASTAL STRAND/SCRUB. 1990: 2 PAIRS OF SCRUB JAYS SEEN ENGAGING IN TERRITORIAL DISPLAY (I.E., LOOPING FLIGHT ALONG BOUNDARY LINE; CALLING).
280150068	APHELOCOMA COERULESCENS	FLORIDA SCRUB-JAY	G3	S3	LT	LT	1993	No data given in U93COA01FLUS.	Species reported as on-site by U93COA01FLUS; additional data needed.
280150069	GOPHERUS POLYPHEMUS	GOPHER TORTOISE	G3	S3	N	LS	1993	No data given in U93COA01FLUS.	Species reported as on-site by U93COA01FLUS; additional data needed.
280150070	GOPHERUS POLYPHEMUS	GOPHER TORTOISE	G3	S3	N	LS	1993	Scraped scrub	Species reported as on-site by U93COA01FLUS; additional data needed.