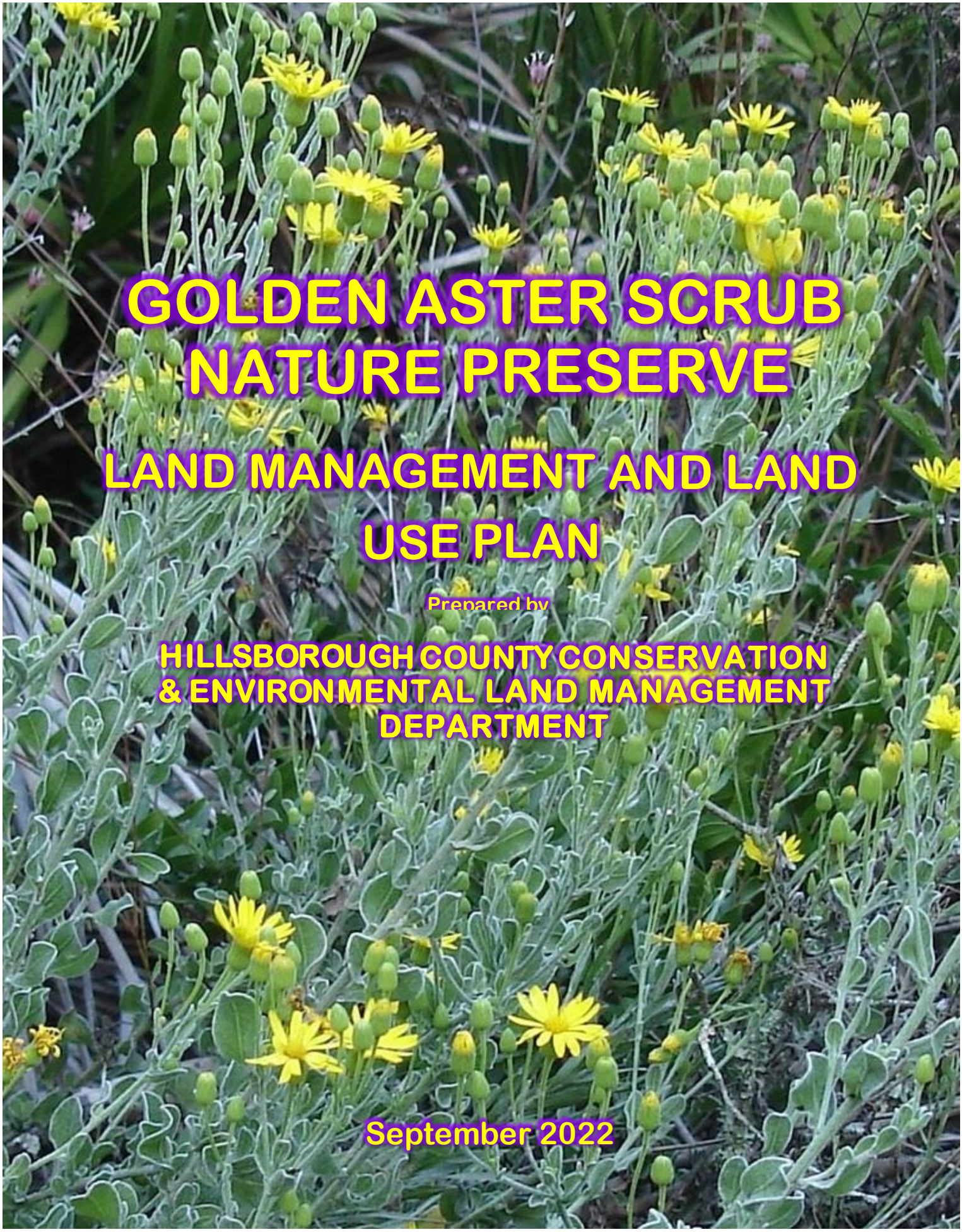


GOLDEN ASTER SCRUB NATURE PRESERVE

LAND MANAGEMENT AND LAND USE PLAN

Prepared by

HILLSBOROUGH COUNTY CONSERVATION & ENVIRONMENTAL LAND MANAGEMENT DEPARTMENT

September 2022

Land Management Plan Compliance Checklist

Required for State-owned conservation lands over 160 acres (updated July 2022)

Instructions for managers:
Complete each item and fill in the applicable correlating page numbers and/or appendix where the item can be found within the land management plan (LMP). If an item does not apply to the subject property, please describe that fact on a correlating page number of the LMP. Do not mark an "N/A" for any items below.

For more information, please visit the stewardship portion of the Division of State Lands' website at:
http://floridadep.gov/lands/environmental-services/content/land-stewardship

Section A: Acquisition Information Items			
Item #	Requirement	Statute/Rule	Page Numbers and/or Appendix
1	The common name of the property.	18-2.018 & 18-2.021	p. 1
2	The land acquisition program, if any, under which the property was acquired.	18-2.018 & 18-2.021	p. 1, App. A
3	Degree of title interest held by the Board, including reservations and encumbrances such as leases.	18-2.021	App. A
4	The legal description and acreage of the property.	18-2.018 & 18-2.021	App. A
5	A map showing the approximate location and boundaries of the property, and the location of any structures or improvements to the property.	18-2.018 & 18-2.021	pp. 1 & 64
6	An **assessment** as to whether the property, or any portion, should be declared surplus. *Provide Information regarding* ***assessment and analysis*** *in the plan, and provide* ***corresponding map*** *.*	18-2.021	pp. 1 - 3, App. A
7	Identification of other parcels of land within or immediately adjacent to the property that should be purchased because they are essential to management of the property. *Please clearly indicate parcels on a map.*	18-2.021	pp. 1 & 86
8	Identification of adjacent land uses that conflict with the planned use of the property, if any.	18-2.021	pp. 1 - 3
9	A statement of the purpose for which the lands were acquired, the projected use or uses as defined in section 253.034, Florida Statutes and the statutory authority for such use or uses.	259.032	p. 3
10	Proximity of property to other significant State, local or federal land or water resources.	18-2.021	pp. 1 - 3; 40 - 42

Section B: Use Items			
Item #	Requirement	Statute/Rule	Page Numbers and/or Appendix
11	The designated single use or multiple use management for the property, including use by other managing entities.	18-2.018 & 18-2.021	pp. 3 - 13
12	A description of past and existing uses, including any unauthorized uses of the property.	18-2.018 & 18-2.021	pp. 3 - 13
13	A description of alternative or multiple uses of the property considered by the lessee and a statement detailing why such uses were not adopted.	18-2.018	pp. 3, 39 - 40; App. B

14	A description of the management responsibilities of each entity involved in the property's management and how such responsibilities will be coordinated.	18-2.018	pp. 1 - 3
15	Include a provision that requires that the managing agency consult with the Division of Historical Resources, Department of State before taking actions that may adversely affect archeological or historical resources.	18-2.021	pp. 58 - 60
16	Analysis/description of other managing agencies and private land managers, if any, which could facilitate the restoration or management of the land.	18-2.021	pp. 60 - 84
17	A determination of the public uses and public access that would be consistent with the purposes for which the lands were acquired.	259.032	pp. 1 - 3; 60 - 84
18	A finding regarding whether each planned use complies with the 1981 State Lands Management Plan, particularly whether such uses represent "balanced public utilization," specific agency statutory authority and any other legislative or executive directives that constrain the use of such property.	18-2.021	Pending finalization of draft
19	Letter of compliance from the local government stating that the LMP is in compliance with the Local Government Comprehensive Plan.	BOT requirement	p. 15; App. D
20	An assessment of the impact of planned uses on the renewable and non-renewable resources of the property, including soil and water resources, and a detailed description of the specific actions that will be taken to protect, enhance and conserve these resources and to compensate/mitigate damage caused by such uses, including a description of how the manager plans to control and prevent soil erosion and soil or water contamination.	18-2.018 & 18-2.021	pp. 15 - 57; 60 - 84
21	*For managed areas larger than 1,000 acres, an analysis of the multiple-use potential of the property which shall include the potential of the property to generate revenues to enhance the management of the property provided that no lease, easement, or license for such revenue-generating use shall be entered into if the granting of such lease, easement or license would adversely affect the tax exemption of the interest on any revenue bonds issued to fund the acquisition of the affected lands from gross income for federal income tax purposes, pursuant to Internal Revenue Service regulations.	18-2.021 & 253.036	pp. 3, 39 - 40; App. B
22	If the lead managing agency determines that timber resource management is not in conflict with the primary management objectives of the managed area, a component or section, prepared by a qualified professional forester, that assesses the feasibility of managing timber resources pursuant to section 253.036, F.S.	18-021	pp. 3, 39 - 40; App. B
23	A statement regarding incompatible use in reference to Chapter 253.034(10).	253.034(10)	pp. 1 - 3

*The following taken from 253.034(10) is not a land management plan requirement; however, it should be considered when developing a land management plan: The following additional uses of conservation lands acquired pursuant to the Florida Forever program and other state-funded conservation land purchase programs shall be authorized, upon a finding by the Board of Trustees, if they meet the criteria specified in paragraphs (a)-(e): water resource development projects, water supply development projects, storm-water management projects, linear facilities and sustainable agriculture and forestry. Such additional uses are authorized where: (a) Not inconsistent with the management plan for such lands; (b) Compatible with the natural ecosystem and resource values of such lands; (c) The proposed use is appropriately located on such lands and where due consideration is given to the use of other available lands; (d) The using entity reasonably compensates the titleholder for such use based upon an appropriate measure of value; and (e) The use is consistent with the public interest.

Section C: Public Involvement Items			
Item #	Requirement	Statute/Rule	Page Numbers and/or Appendix
24	A statement concerning the extent of public involvement and local government participation in the development of the plan, if any.	18-2.021	App. D
25	The management prospectus required pursuant to paragraph (9)(d) shall be available to the public for a period of 30 days prior to the public hearing.	259.032	App. D
26	LMPs and LMP updates for parcels over 160 acres shall be developed with input from an advisory group who must conduct at least one public hearing within the county in which the parcel or project is located. *Include the advisory group members and their affiliations, as well as the date and location of the advisory group meeting.*	259.032	App. D
27	Summary of comments and concerns expressed by the advisory group for parcels over 160 acres.	18-2.021	App. D
28	During plan development, at least one public hearing shall be held in each affected county. Notice of such public hearing shall be posted on the parcel or project designated for management, advertised in a paper of general circulation, and announced at a scheduled meeting of the local governing body before the actual public hearing. *Include a copy of each County's advertisements and announcements (meeting minutes will suffice to indicate an announcement) in the management plan.*	253.034 & 259.032	App. D
29	The manager shall consider the findings and recommendations of the land management review team in finalizing the required 10-year update of its management plan. *Include manager's replies to the team's findings and recommendations.*	259.036	App. C
30	Summary of comments and concerns expressed by the management review team, if required by Section 259.036, F.S.	18-2.021	App. C
31	If manager is not in agreement with the management review team's findings and recommendations in finalizing the required 10-year update of its management plan, the managing agency should explain why they disagree with the findings or recommendations.	259.036	App. C

Section D: Natural Resources			
Item #	Requirement	Statute/Rule	Page Numbers and/or Appendix

32	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding soil types. *Use brief descriptions and include USDA maps when available.*	18-2.021	pp. 15 - 18
33	Insert FNAI based natural community maps when available.	ARC consensus	p. 20
34	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding outstanding native landscapes containing relatively unaltered flora, fauna and geological conditions.	18-2.021	pp. 19 - 39
35	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding unique natural features and/or resources including but not limited to virgin timber stands, scenic vistas, natural rivers and streams, coral reefs, natural springs, caverns and large sinkholes.	18-2.018 & 18-2.021	pp. 19 - 39
36	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding beaches and dunes.	18-2.021	pp. 40 - 42
37	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding mineral resources, such as oil, gas and phosphate, etc.	18-2.018 & 18-2.021	pp. 1 - 3
38	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding fish and wildlife, both game and non-game, and their habitat.	18-2.018 & 18-2.021	pp. 43 - 57
39	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding State and Federally listed endangered or threatened species and their habitat.	18-2.021	pp. 43 - 57
40	The identification or resources on the property that are listed in the Natural Areas Inventory. *Include letter from FNAI or consultant where appropriate.*	18-2.021	App. E
41	Specific description of how the managing agency plans to identify, locate, protect and preserve or otherwise use fragile, nonrenewable natural and cultural resources.	259.032	pp. 15 - 57
42	Habitat Restoration and Improvement	259.032 & 253.034	
42-A	Describe management needs, problems and a desired outcome and the key management activities necessary to achieve the enhancement, protection and preservation of restored habitats and enhance the natural, historical and archeological resources and their values for which the lands were acquired.	259.032 & 253.034	pp. 15 - 57; 80 - 84
42-B	Provide a detailed description of both short (2-year planning period) and long-term (10-year planning period) management goals, and a priority schedule based on the purposes for which the lands were acquired and include a timeline for completion.	259.032 & 253.034	pp. 80 - 84
42-C	The associated measurable objectives to achieve the goals.	259.032 & 253.034	pp. 80 - 84

42-D	The related activities that are to be performed to meet the land management objectives and their associated measures. *Include fire management plans - they can be in plan body or an appendix.*	259.032 & 253.034	pp. 75 - 84
42-E	A detailed expense and manpower budget in order to provide a management tool that facilitates development of performance measures, including recommendations for cost-effective methods of accomplishing those activities.	259.032 & 253.034	p. 85
43	***Quantitative data description of the land regarding an inventory of forest and other natural resources and associated acreage. *See footnote.*	253.034	pp. 15 - 57; App. B
44	Sustainable Forest Management, including implementation of prescribed fire management	18-2.021, 253.034 & 259.032	pp. 39 - 40; 75 - 80; Apps. B & M
44-A	Management needs, problems and a desired outcome (see requirement for #42-A).	18-2.021, 253.034 & 259.032	pp. 43 - 57; 80 - 84
44-B	Detailed description of both short and long-term management goals (see requirement for #42-B).	18-2.021, 253.034 & 259.032	pp. 80 - 84
44-C	Measurable objectives (see requirement for #42-C).	18-2.021, 253.034 & 259.032	pp. 80 - 84
44-D	Related activities (see requirement for #42-D).	18-2.021, 253.034 & 259.032	pp. 75 - 84
44-E	Budgets (see requirement for #42-E).	18-2.021, 253.034 & 259.032	p. 85
45	Imperiled species, habitat maintenance, enhancement, restoration or population restoration	259.032 & 253.034	pp. 43 - 57
45-A	Management needs, problems and a desired outcome (see requirement for #42-A).	259.032 & 253.034	pp. 43 - 57; 80 - 84
45-B	Detailed description of both short and long-term management goals (see requirement for #42-B).	259.032 & 253.034	pp. 80 - 84
45-C	Measurable objectives (see requirement for #42-C).	259.032 & 253.034	pp. 80 - 84
45-D	Related activities (see requirement for #42-D).	259.032 & 253.034	pp. 75 - 84
45-E	Budgets (see requirement for #42-E).	259.032 & 253.034	p. 85
45-F	Assess the feasibility of managing the lands > 40 contiguous acres as a recipient site for gopher tortoises consistent with rules of the Fish and Wildlife Conservation Commission, as prepared by the agency or cooperatively with a Fish and Wildlife Conservation Commission wildlife biologist.	259.105	pp. 52 - 56
45-G	Economic feasibility of establishing a gopher tortoise recipient site, including the initial cost, recurring management costs and the revenue projections.	259.105	p. 85
46	***Quantitative data description of the land regarding an inventory of exotic and invasive plants and associated acreage. *See footnote.*	253.034	pp. 14, 72 - 75
47	Place the Arthropod Control Plan in an appendix. If one does not exist, provide a statement as to what arrangement exists between the local mosquito control district and the management unit.	BOT requirement via lease language	App. K
48	Exotic and invasive species maintenance and control	259.032 & 253.034	pp.14, 72-75, 82-84;App.L
48-A	Management needs, problems and a desired outcome (see requirement for #42-A).	259.032 & 253.034	pp. 72-75, 82-84
48-B	Detailed description of both short and long-term management goals (see requirement for #42-B).	259.032 & 253.034	pp. 72-75, 82-84
48-C	Measurable objectives (see requirement for #42-C).	259.032 & 253.034	pp. 72-75, 82-84

48-D	Related activities (see requirement for #42-D).	259.032 & 253.034	pp. 72-75, 82-84
48-E	Budgets (see requirement for #42-E).	259.032 & 253.034	p. 85

Section E: Water Resources			
Item #	Requirement	Statute/Rule	Page Numbers and/or Appendix
49	A statement as to whether the property is within and/or adjacent to an aquatic preserve or a designated area of critical state concern or an area under study for such designation. *If yes, provide a list of the appropriate managing agencies that have been notified of the proposed plan.*	18-2.018 & 18-2.021	p. 40
50	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding water resources, including water classification for each water body and the identification of any such water body that is designated as an Outstanding Florida Water under Rule 62-302.700, F.A.C.	18-2.021	pp. 19 - 39; 40 - 42
51	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding swamps, marshes and other wetlands.	18-2.021	pp. 19 - 39
52	***Quantitative description of the land regarding an inventory of hydrological features and associated acreage. *See footnote.*	253.034	pp. 19 - 39
53	Hydrological Preservation and Restoration	259.032 & 253.034	pp. 19 - 39; 40 - 42
53-A	Management needs, problems and a desired outcome (see requirement for #42-A).	259.032 & 253.034	pp. 19 - 39; 40 - 42
53-B	Detailed description of both short and long-term management goals (see requirement for #42-B).	259.032 & 253.034	pp. 19 - 39; 40 - 42
53-C	Measurable objectives (see requirement for #42-C).	259.032 & 253.034	pp. 19 - 39; 40 - 42
53-D	Related activities (see requirement for #42-D).	259.032 & 253.034	pp. 19 - 39; 40 - 42
53-E	Budgets (see requirement for #42-E).	259.032 & 253.034	p. 85

Section F: Historical, Archeological and Cultural Resources			
Item #	Requirement	Statute/Rule	Page Numbers and/or Appendix
54	**Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding archeological and historical resources. *Include maps of all cultural resources except Native American sites, unless such sites are major points of interest that are open to public visitation.*	18-2.018, 18-2.021 & per DHR's request	pp. 58 - 60
55	***Quantitative data description of the land regarding an inventory of significant land, cultural or historical features and associated acreage.	253.034	pp. 58 - 60
56	A description of actions the agency plans to take to locate and identify unknown resources such as surveys of unknown archeological and historical resources.	18-2.021	pp. 58 - 60
57	Cultural and Historical Resources	259.032 & 253.034	pp. 58 - 60
57-A	Management needs, problems and a desired outcome (see requirement for #42-A).	259.032 & 253.034	pp. 58 - 60

Golden Aster Scrub Land Management Plan

Information Summary

Lead Agency:	Hillsborough County Conservation and Environmental Lands Management Department
Common Name:	Golden Aster Scrub
Location:	Hillsborough County, Florida
Acreage Total:	1,181 acres
Acreage Breakdown:	**Land Cover Classification** Baygall acres 6 ac. Depression Marsh 75 ac. Hydric Hammock 70 ac. Mesic Flatwoods 518 ac. Mesic Hammock 25 ac. Scrub 121 ac. Scrubby Flatwoods 115 ac. Wet Flatwoods 114 ac. Wet Prairie 6 ac. Other Altered Landcover Types 131 ac.
Use:	Conservation, Limited Passive Recreation, Preservation
Management Responsibilities:	Hillsborough County Conservation and Environmental Lands Management Department
Designated Land Use:	Natural Preservation
Subleases:	None
Contracts:	None
Encumbrances:	None
Type of Acquisition:	CARL, Fee Simple
Unique Features:	Scrub habitat and populations of Florida golden aster.
Archaeological/Historical:	None documented.
Management Needs:	Prescribed burning, exotic plant control, site security, improved access for land management.
Acquisition Needs/Acreage	There are no adjacent properties to purchase.
Surplus Lands/Acreage:	None.
Public Involvement:	TBD

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Executive Summary

Golden Aster Scrub (GAS) is an approximately 1,181-acre nature preserve within the Bullfrog Creek Watershed in southern Hillsborough County. It was purchased from the Emil C. Marquardt, Jr. land trust on 26 May 1995 and subsequently sold to the Preservation 2000/CARL Program. Hillsborough County now leases and manages the site.

Upland and wetland communities on GAS include scrub, scrubby flatwoods, mesic and wet flatwoods, mesic and hydric hammocks, wet prairie, and depression marshes. These natural communities support a diverse array of native plant and animal species and are relatively undisturbed by previous land uses.

The federally listed plant, Florida golden aster (*Chrysopsis floridana*) occurs throughout much of the scrub habitat on site. Other imperiled plant species observed on site include yellow butterwort (*Pinguicula lutea*), redmargin zephyrlily and Treat's zephyrlily (*Zephyranthes simpsonii* and *Z. atamasca var. treatiae*, respectively). At least two Florida scrub endemic plants, Curtiss' milkweed (*Asclepias curtissii*) and nodding pinweed (*Lechea cernua*) also have been documented on this preserve.

Imperiled animal species documented on GAS include the gopher tortoise (*Gopherus polyphemus*), eastern indigo snake (*Drymarchon corais couperi*), Florida scrub-jay (*Aphelocoma coerulescens*), Southeastern American kestrel (*Falco sparverius paulus*), Florida sandhill crane (*Antigone canadensis pratensis*), and several species of wading birds. Two other species that are candidates for federal listing, the eastern diamondback rattlesnake (*Crotalus adamanteus*) and the tricolored bat (*Perimyotis subflavus*) also have been documented on GAS.

The water resources on GAS are limited to the wetland habitats, artificial ponds, and the headwaters of Kitchen Branch stream. Florida Department of Environmental Protection (FDEP) does not recognize any wetlands on GAS as a classified surface water. There are no Outstanding Florida Waters located within or directly adjacent to GAS, and this preserve is not within or directly adjacent to an aquatic preserve.

Recreational use on GAS is limited to hiking on marked trails, guided tours, and passive wildlife observation. The site has minimal facilities in the form of a composting toilet and picnic pavilion.

Significant management accomplishments since the 2008 Land Management Plan include:

- Twenty-one prescribed fires
- Exotic/nuisance plant species surveys and herbicide applications
- Wildlife monitoring in the form of coverboards, camera traps, sonic and ultrasonic surveys, and Christmas bird counts
- Imperiled plant species surveys

This management plan addresses the items on the plan content checklist provided by the Florida Department of Environmental Protection, Office of Environmental Services, Division of State Lands, and is organized accordingly. The following page provides a summary of the information included in the Golden Aster Scrub Preserve Land Management Plan.

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SECTION A: GENERAL INFORMATION

Location of the Golden Aster Scrub Nature Preserve

The lands that now comprise Golden Aster Scrub (GAS) were purchased by Hillsborough County from the Emil C. Marquardt, Jr. land trust on May 26, 1995. The County subsequently sold most of the site to the Preservation 2000/CARL Program of the State of Florida and now leases and manages the site.

GAS encompasses approximately 1,181 acres in Sections 1, 2, and 12 of Township 31 South, Range 19 East within southern Hillsborough County. It is within the Bullfrog Creek Watershed and roughly 1 mile east of Tampa Bay. The site is surrounded by a variety of dissimilar land uses; to the north and south are residential areas, also south of the site are public schools, residential areas, a recently abandoned Hillsborough County maintenance unit and Big Bend Road (SR 672), the I-75 right-of-way is to the east, and immediately west of the site is a CSX railroad line (Fig. 1). These surrounding dissimilar land uses preclude the possibility of expanding the preserve in any direction.

GAS is separated into three unequal-sized tracts by an electrical transmission corridor. The north-south oriented run of this corridor bisects the main portion of the preserve into a western 290-acre portion and an eastern 865-acre portion. This transmission corridor and its designated right-of-way also separates the southern-most 25 acres of the preserve from the 865-acre eastern tract (Fig. 1).

The 25-acre portion of GAS was reviewed for consideration of being declared surplus land. Prior to a final decision being rendered, however, a 1.8-acre portion adjacent to the I-75 corridor was transferred to the Florida Dept. of Transportation (FDOT) for construction of the Big Bend Road x I-75 exit ramp. In exchange for the transfer of the 1.8 acres, a 2.69-acre portion of the abandoned Hillsborough County maintenance facility was deeded to the Conservation and Recreational Lands Program (CARL) and is now included as part of GAS.

Appendix A provides the legal description, lease agreement with CARL, easements, and other legal documents for the preserve.

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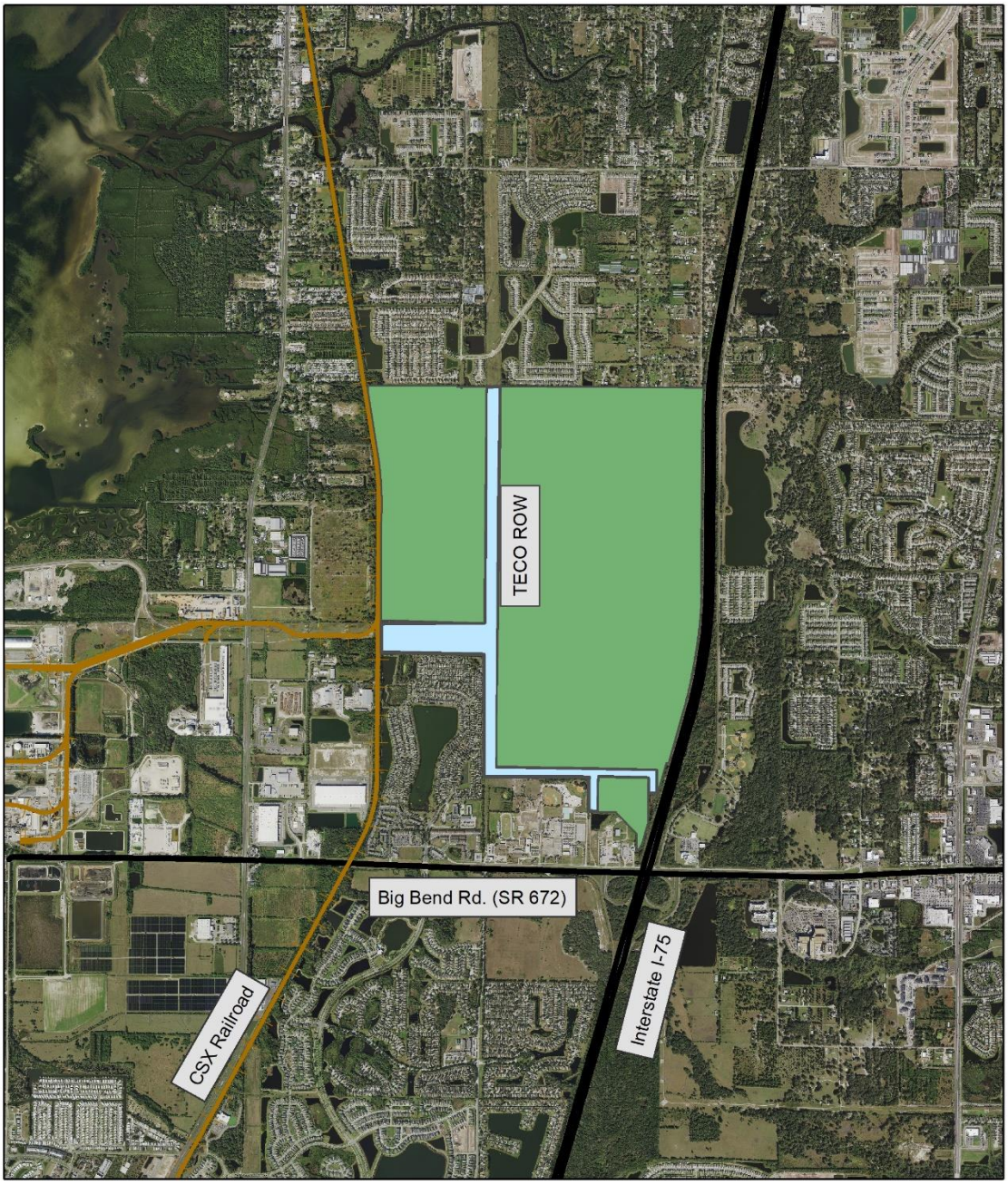


Figure 1
General Location of Golden Aster Scrub

Note: Every reasonable effort has been made to assure the accuracy of this map.

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W E
S

Prepared by:
Hillsborough County Florida

Prepared for:

SECTION B: USES OF THE SITE

History and Objectives of the Preserve

The objective of this acquisition was to protect xeric oak and sand pine scrub habitat as well as one of the few remaining populations of Florida golden aster (*Chrysopsis floridana*). In addition to preservation, the site also is open for hiking and other forms of passive recreation (e.g., observation of wildlife). Commercial and industrial uses, such as mineral extraction, are not considered compatible with the rationale for purchasing the site and there are no known mineral resources within the preserve. A timber assessment for portions of the site was conducted during late 2021, with the final report being issued in February 2022 (Appendix B). In general, GAS does not currently support a marketable stand of trees for logging.

Prior to acquisition, GAS was used for open cattle grazing for 70+ years. During construction of I-75 in the 1980s, a portion of the site was used for an asphalt manufacturing plant. Though now removed, the footprint of this plant remains a disturbed area vegetated with opportunistic species. An extraction operation to provide fill dirt for construction of the highway also was active at that time, resulting in two artificial lakes on the site. Figures 2a – 2i show aerial photographs of the site taken between 1938 and 2020. These figures, as well as all other figures depicting maps, are derived from data in the form of Environmental Systems Research Institute, Inc. (ESRI) shapefiles.

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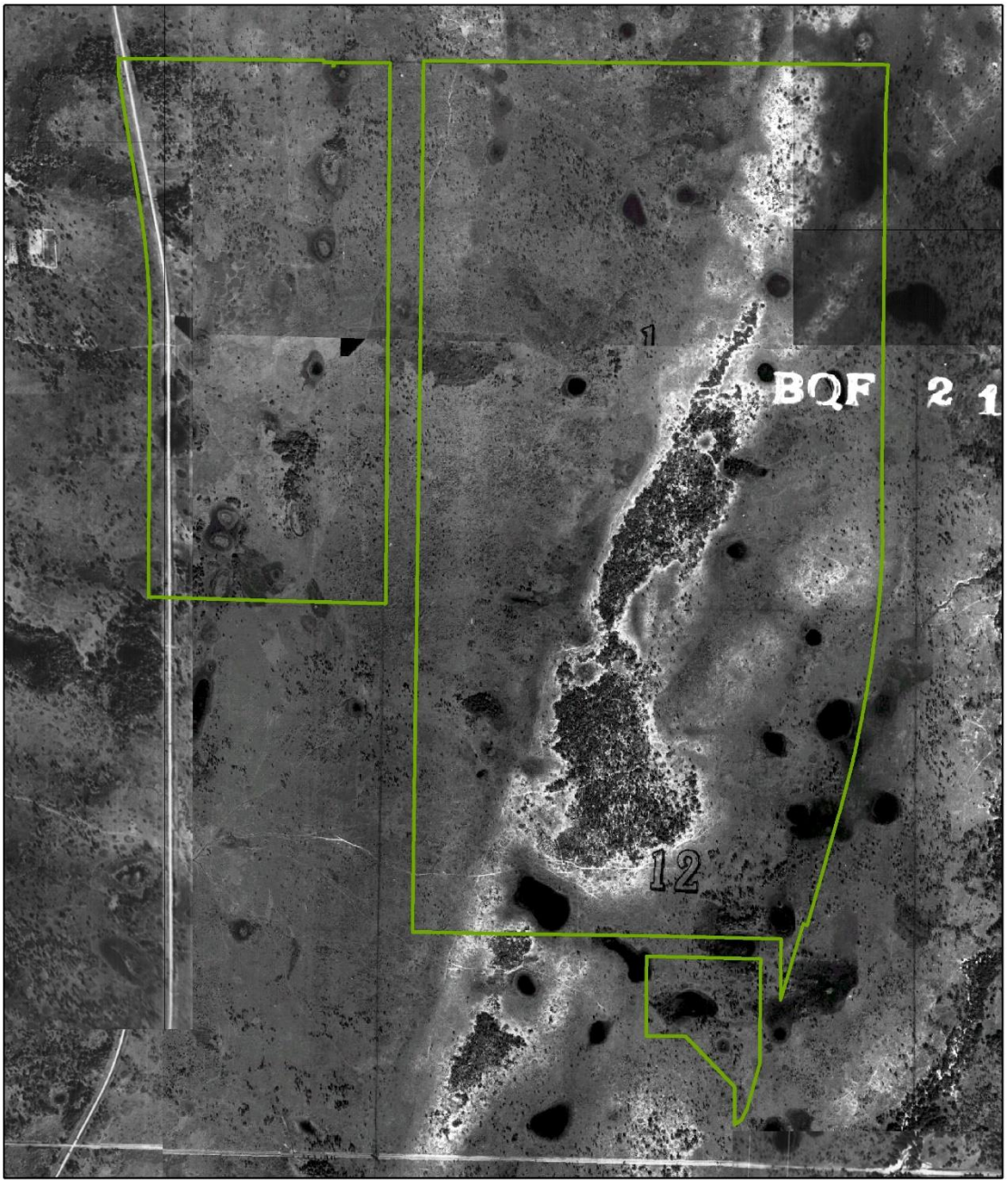


Figure 2a
Golden Aster Scrub
1938 Aerial Photograph

Note: Every reasonable effort has been made to assure the accuracy of this map.

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Figure 2b
Golden Aster Scrub
1957 Aerial Photograph

Note: Every reasonable effort has been made to assure the accuracy of this map.

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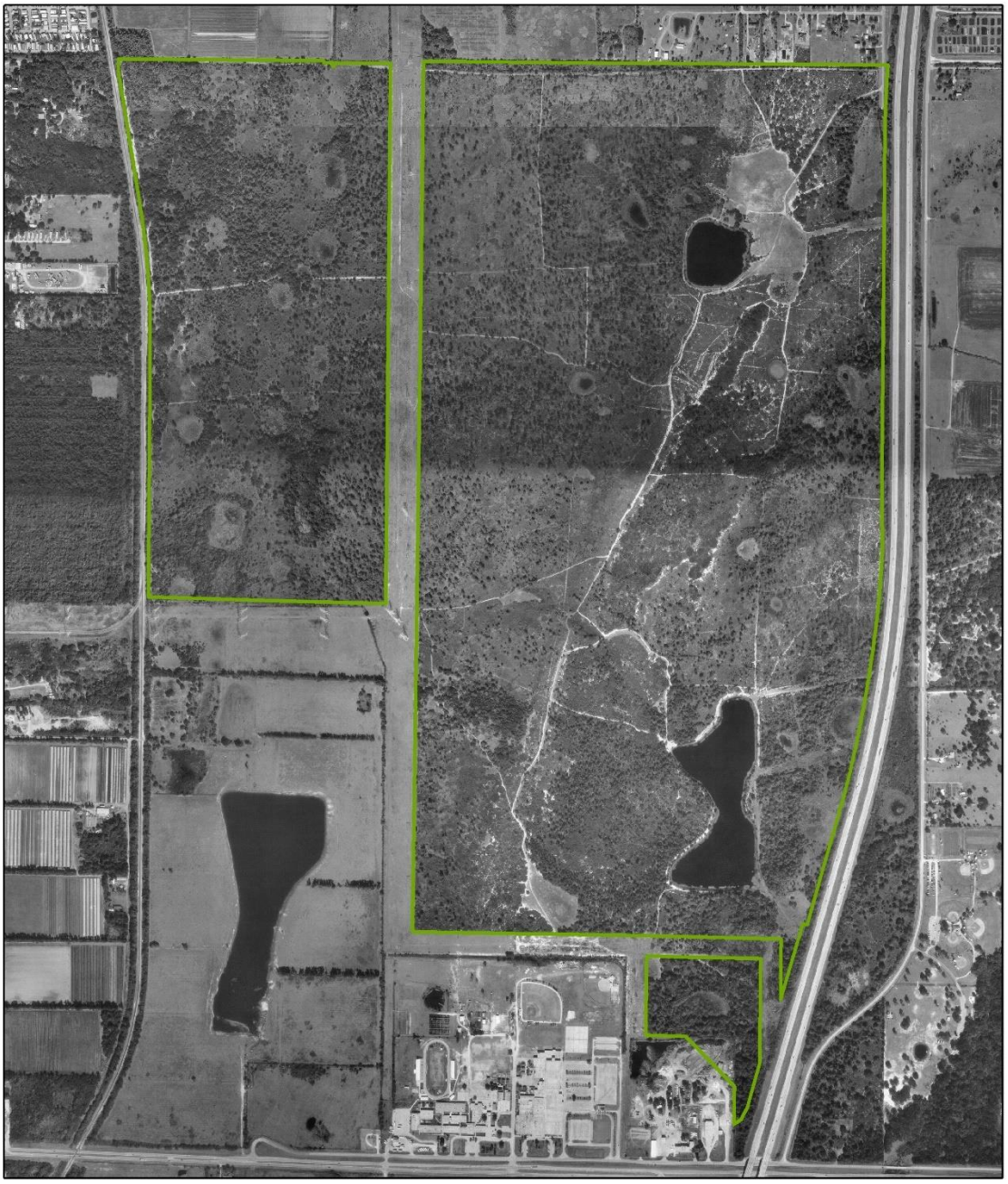


Figure 2c
Golden Aster Scrub
2000 Aerial Photograph

Note: Every reasonable effort has been made to assure the accuracy of this map.

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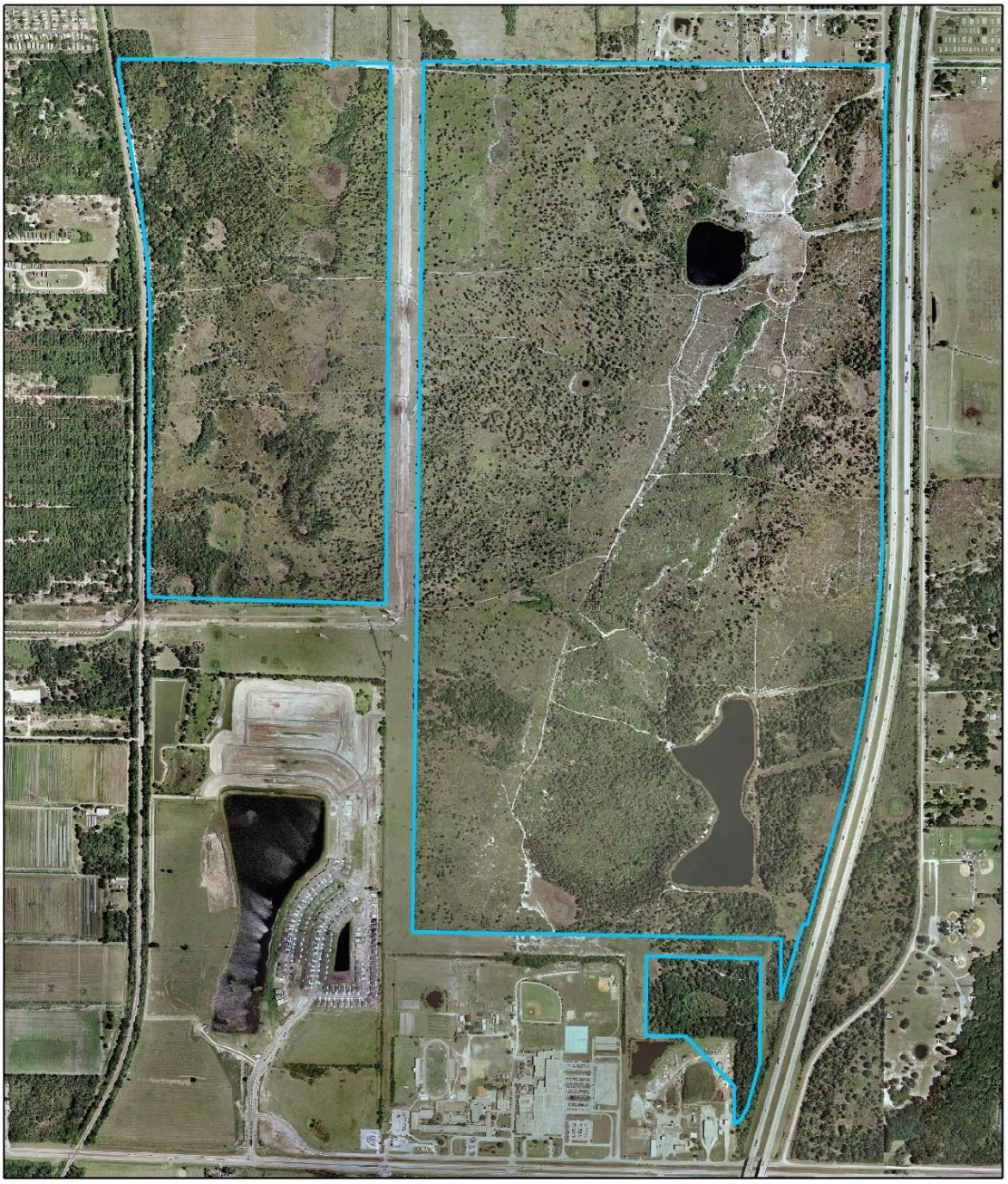


Figure 2d
Golden Aster Scrub
2002 Aerial Photograph

Note: Every reasonable effort has been made to assure the accuracy of this map.

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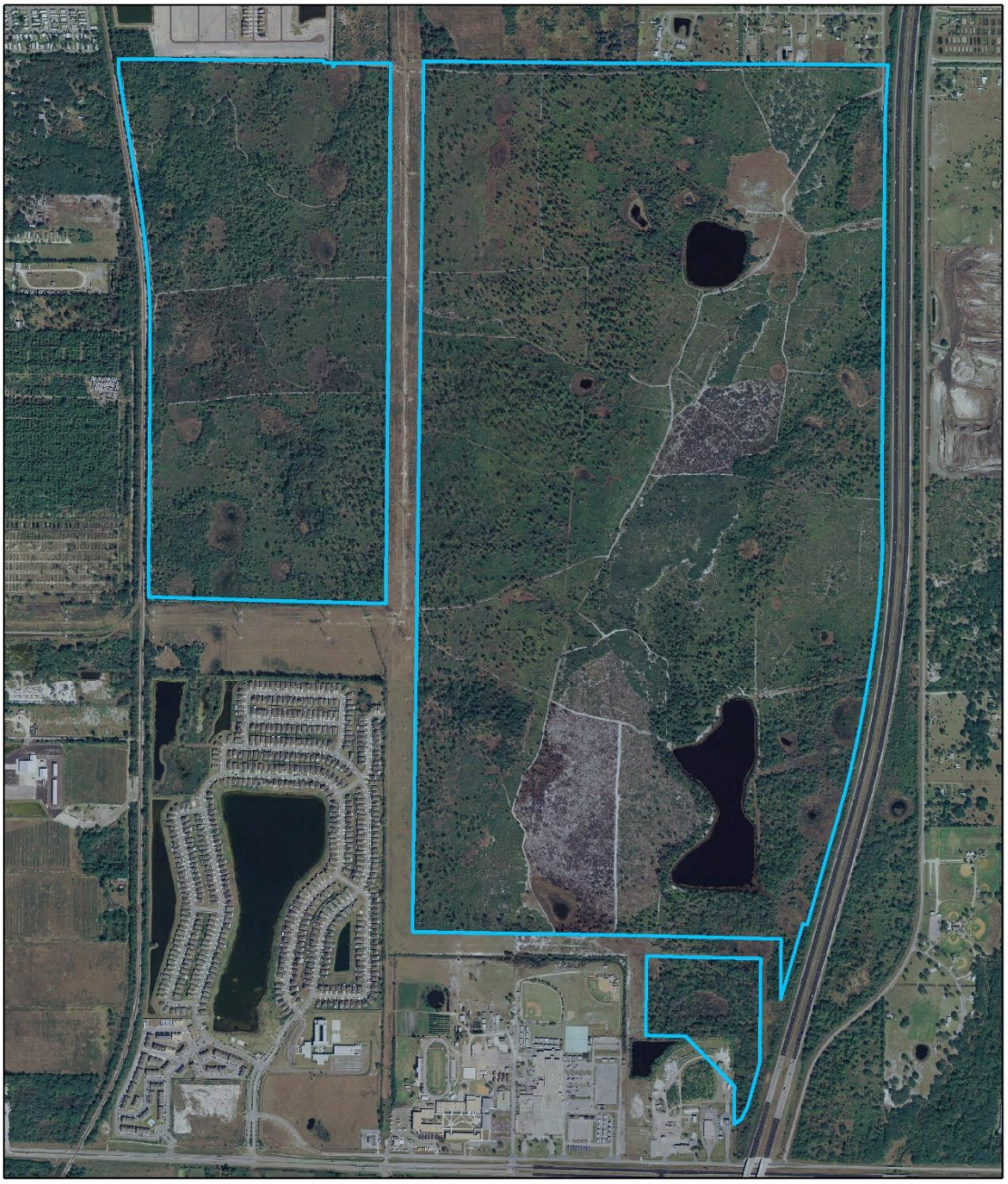


Figure 2e Golden Aster Scrub 2005 Aerial Photograph Note: Every reasonable effort has been made to assure the accuracy of this map.	N W E S	Prepared by: Hillsborough County Florida	Prepared for:

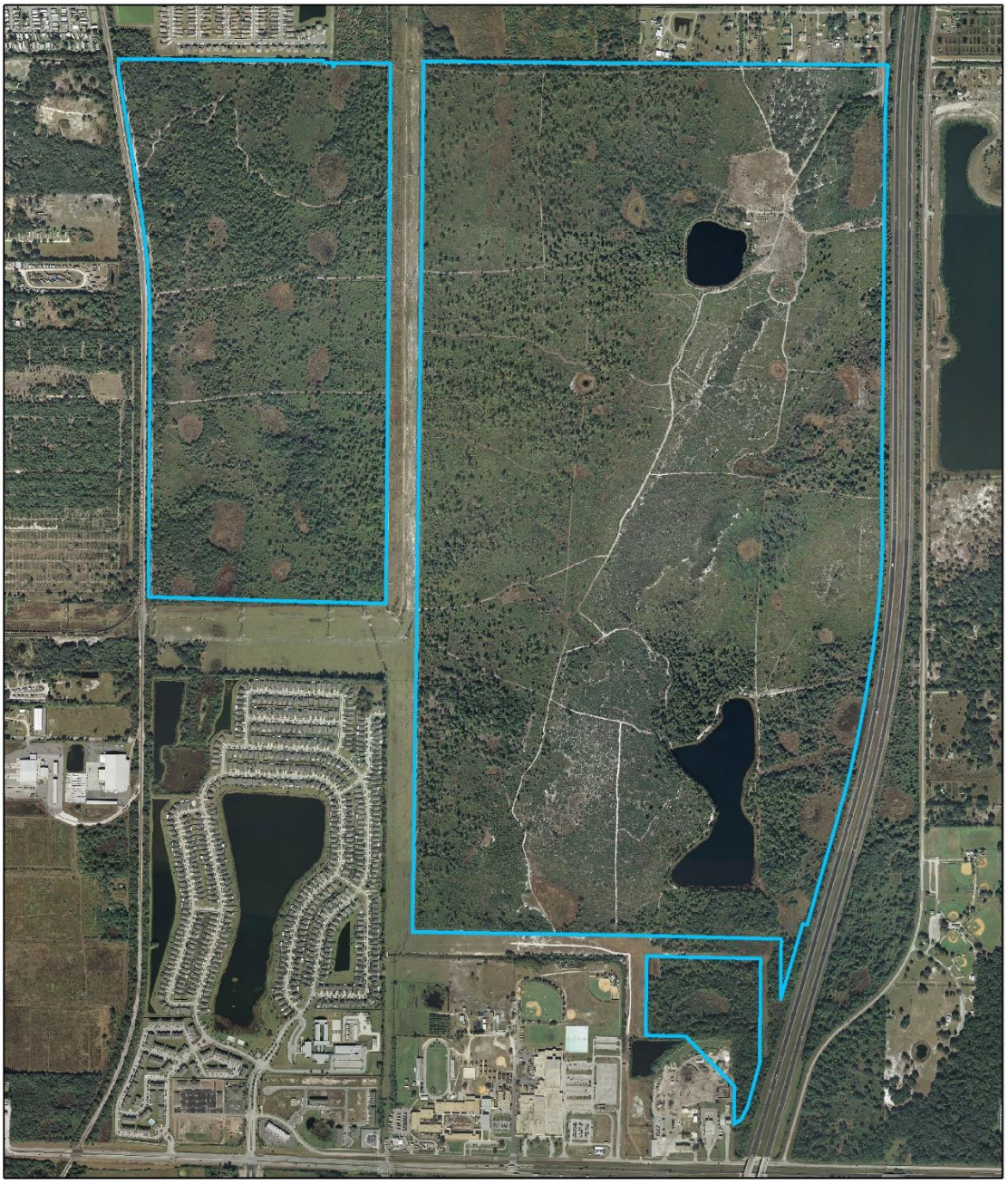


Figure 2f **Golden Aster Scrub** **2008 Aerial Photograph** Note: Every reasonable effort has been made to assure the accuracy of this map.	N W E S	**Prepared by:** Hillsborough County Florida	**Prepared for:**

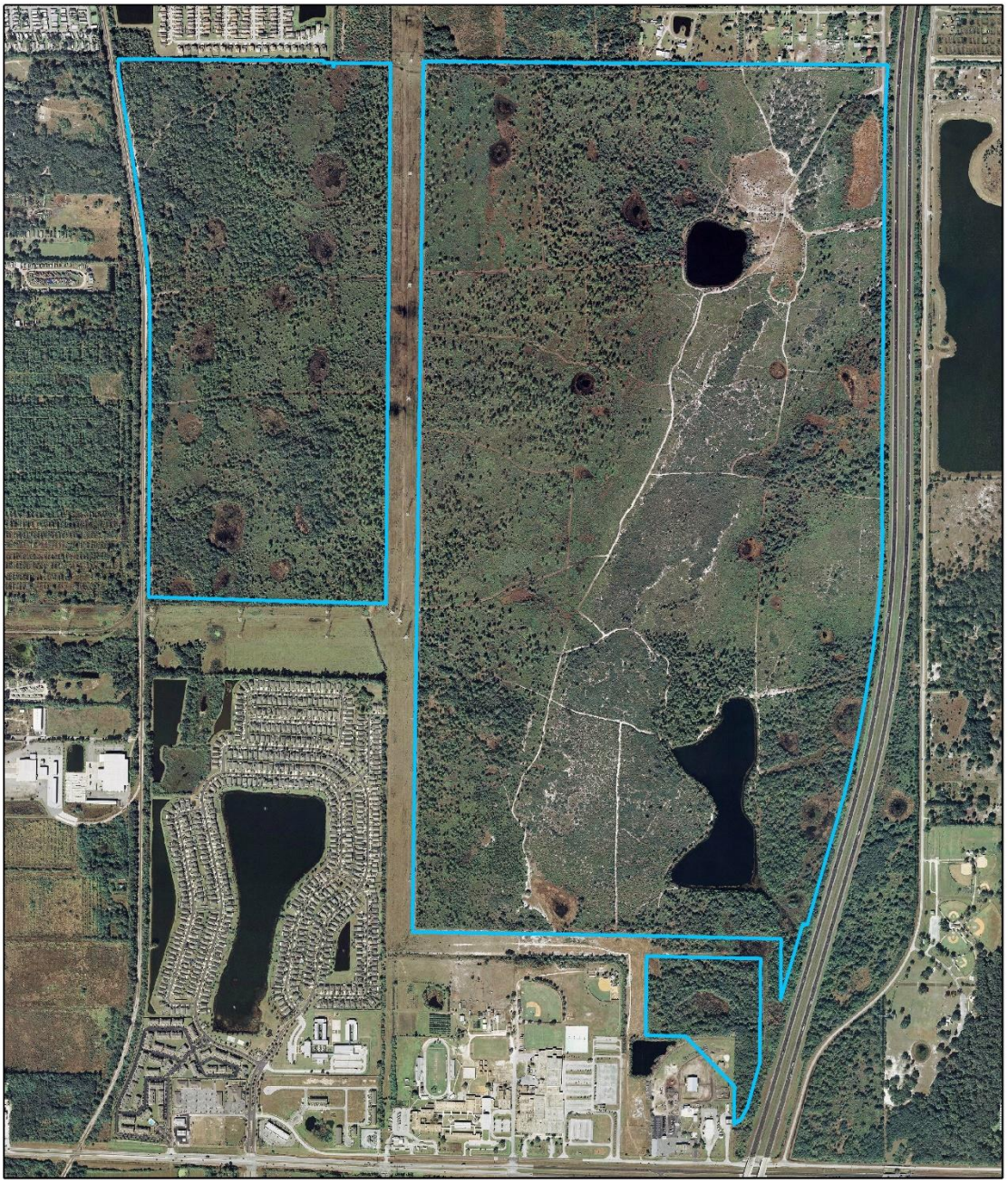


Figure 2g Golden Aster Scrub 2010 Aerial Photograph Note: Every reasonable effort has been made to assure the accuracy of this map.	N W E S	Prepared by: Hillsborough County Florida	Prepared for:

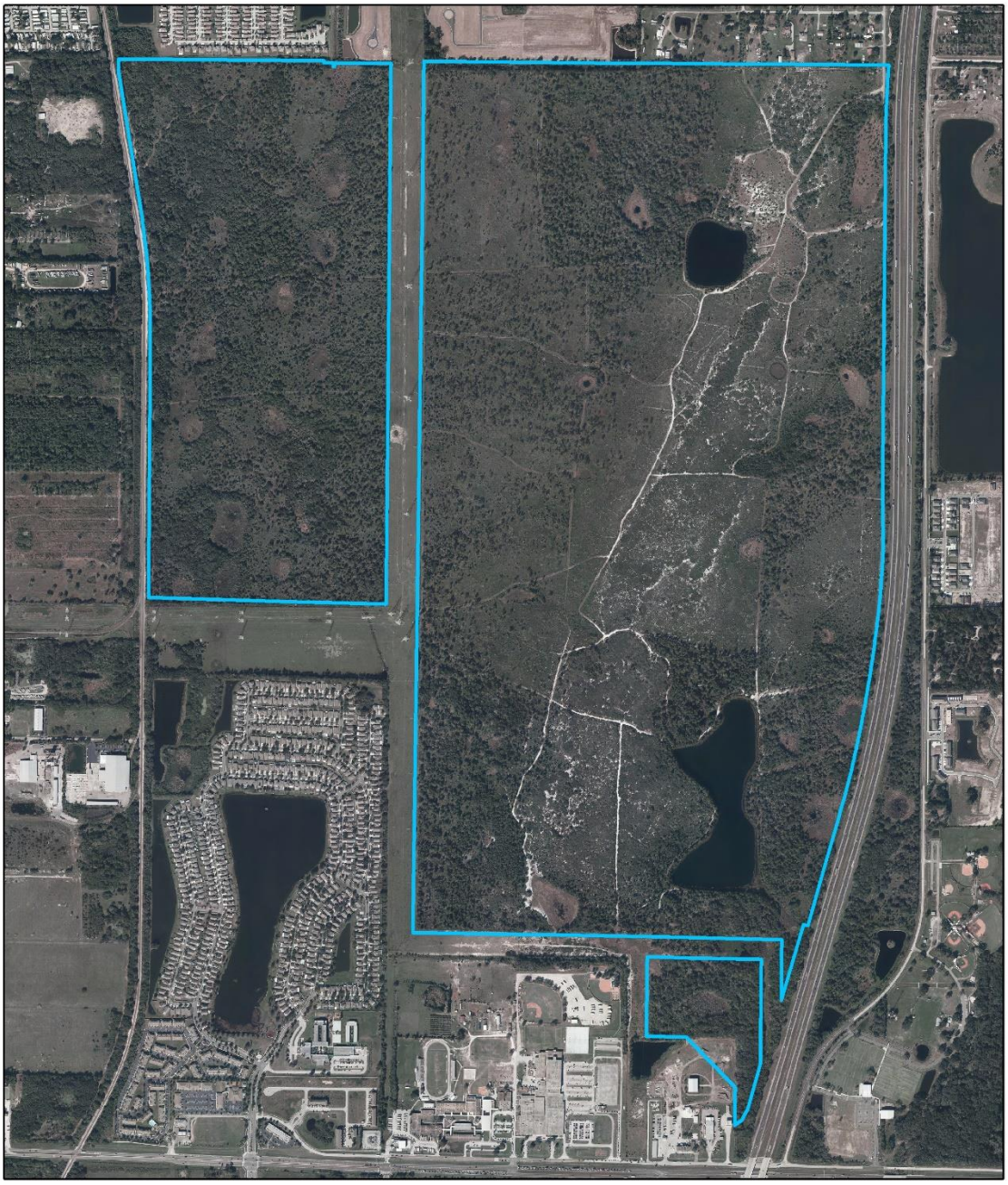


Figure 2h Golden Aster Scrub 2016 Aerial Photograph Note: Every reasonable effort has been made to assure the accuracy of this map.	N W E S	Prepared by: Hillsborough County Florida	Prepared for:

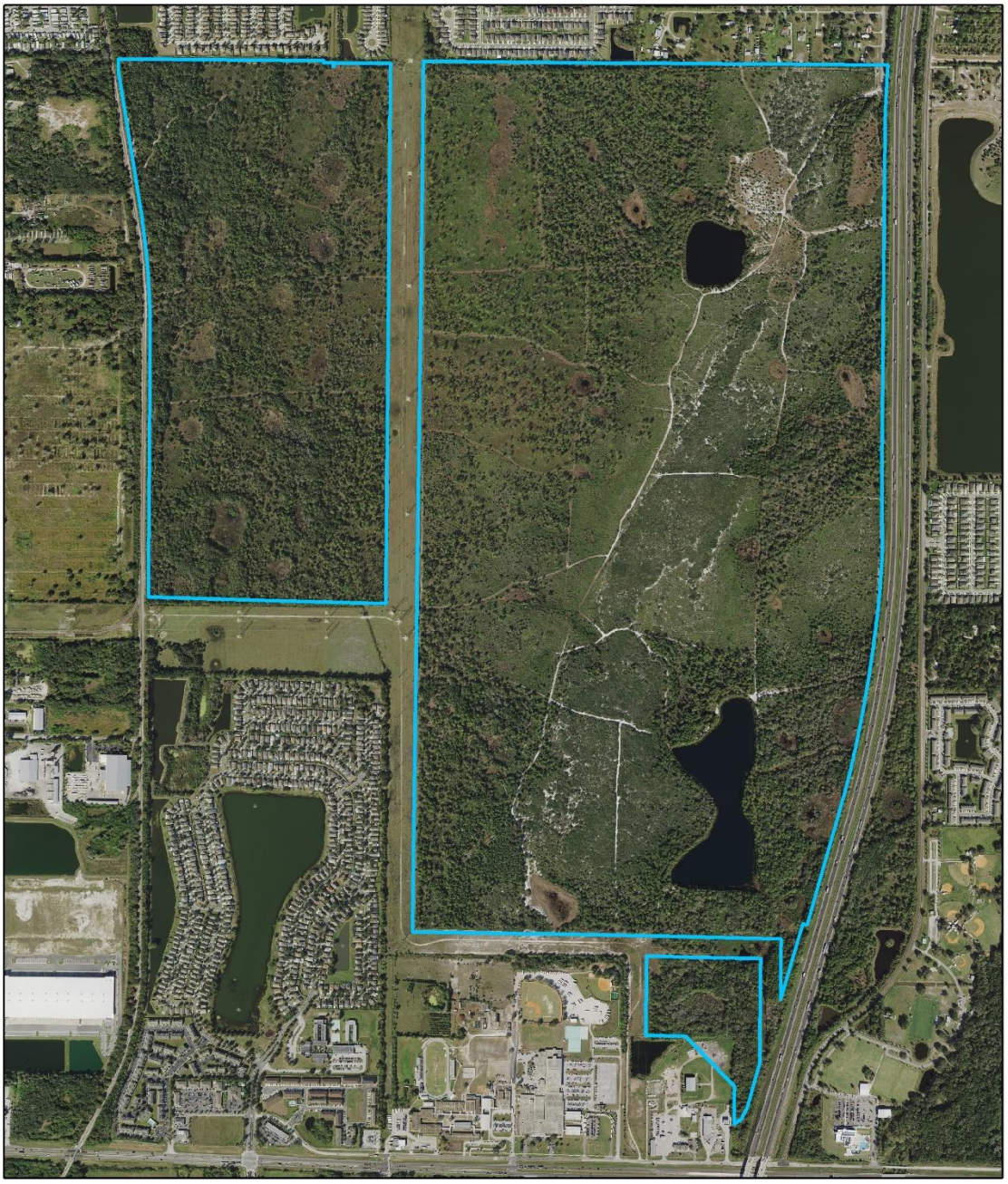


Figure 2i
Golden Aster Scrub
2020 Aerial Photograph

Note: Every reasonable effort has been made to assure the accuracy of this map.

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Previous Management Plans & Land Management Reviews

There were two previous management plans for GAS; the initial plan produced in 1997, and an updated plan written in 2008. This 2022 plan is a revision to the 2008 Land Management Plan, as mandated in the State Statutes. Two land management reviews (LMR) were conducted in the past seven years, the first in 2015 and the second in 2020. Both reports (App. C) identified several deficiencies in the previous management plan, as well as implementation of that plan. A summary of the issues is presented in each relevant section of this revised plan. Further details can be found in App. C.

Summary of Accomplishments 2008 – 2021

A brief generalized summation of work done on GAS between 2008 – 2021 is presented below in Tables 1, 2, & 3. More detailed information is presented in the relevant sections.

Table 1 Summary of maintenance events by year, 2008 – 2021.

Year	Access Maintenance	Security and Boundary Maintenance	Recreational Facility Maintenance
2008	10	1	4
2009	4	1	2
2010	1	1	0
2011	38	13	0
2012	25	2	6
2013	8	13	13
2014	1	3	3
2015	6	4	0
2016	34	31	4
2017	27	19	15
2018	13	8	7
2019	18	23	24
2020	18	35	45
2021	23	15	19

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Table 2 Summary of resource management events and public education events, 2008 – 2021.

Year	Vegetation Monitoring	Habitat Mapping	Exotic Plant Control	Wildlife Monitoring	Recreation / Public Outreach
2008	0	0	2	0	0
2009	0	0	3	0	0
2010	0	0	0	0	0
2011	0	0	4	0	0
2012	0	0	14	4	1
2013	4	0	1	4	1
2014	0	0	3	2	0
2015	1	0	2	2	1
2016	1	0	3	2	1
2017	1	0	2	5	5
2018	2	0	1	4	1
2019	4	0	2	7	0
2020	1	1	13	14	2
2021	1	0	1	6	0

Table 3 Summary of total acreage burned in prescribed fires and wildfires by year, 2008 – 2021.

Year	Total Acreage Burned	No. of Prescribed Fires	Prescribed Fire Acreage	No. of Wildfires	Wildfire Acreage
2008	78.314291	1	78.314291	0	0
2009	53.758417	1	53.758417	0	0
2010	0	0	0	0	0
2011	119.933414	4	119.933414	0	0
2012	16.524765	1	16.524765	0	0
2013	268.838117	3	268.838117	0	0
2014	206.240963	3	206.240963	0	0
2015	0	0	0	0	0
2016	464.8195020	5	343.420799	1	121.398703
2017	0	0	0	0	0
2018	158.2148190	1	79.900528	1	78.314291
2019	58.451025	1	58.451025	0	0
2020	95.6540710	1	17.33978	1	78.314291
2021	0	0	0	0	0

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SECTION C: PUBLIC INVOLVEMENT

Records and summaries of advisory group meetings, public meetings, and documentation that this updated plan is in compliance with the Hillsborough County Comprehensive Growth Management Plan are presented in Appendix D.

SECTIONS D & E: NATURAL RESOURCES (Soils, Habitats and Water Resources, Plants, and Wildlife)

Distribution of Soils.

According to the U.S. Department of Agriculture's (USDA) Natural Resource Conservation Service (NRCS) there are eleven different soils found within GAS (gNATSGO, 2022). Except for the two areas mined for construction of I-75, soils within GAS are relatively intact. Table 4 lists the soils and the surface area each covers within the preserve and the distribution of these soils throughout the preserve are shown on Fig. 3.

Table 4 Soils within GAS.

Soil Type	Acreage (approx.)
Archbold Fine Sand	112
Basinger, Holopaw, and Samsula Soils, Depressional	56
Felda Fine Sand	20
Malabar Fine Sand	62
Myakka Fine Sand	662
Pomello Fine Sand / 0 to 5 % Slope	84
St. Johns Fine Sand	38
Smyrna Fine Sand	36
Wabasso Fine Sand	91
Water	20
Total Acreage	1181

Description of Soils

Archbold Fine Sand. This soil is nearly level and moderately well drained. It is found on low ridges in pine flatwoods. The natural vegetation on this soil may include a sand pine overstory if the fire return interval is extended, a shrub layer containing scrub oaks and saw palmetto, and a ground cover often containing prickly pear, and pineland three awn. This soil type makes up nearly 10% of the total surface soil area and is found in two locations creating a long ridge through the eastern half of GAS.

Basinger, Holopaw, and Samsula Soils, Depressional. This soil supports freshwater marshes, makes up nearly 5% of the total surface soil cover, and is found in fifteen small depressions scattered throughout the site.

Felda fine sand. Felda fine sand is nearly level and poorly drained. It makes up only 1.72% of the surface soils. This soil is found in three areas of the site's western portion. The natural vegetation on this soil includes canopy-forming species such as cabbage palm and slash pine, and understory species such as saw palmetto and wax myrtle.

Malabar Fine Sand. Malabar fine sand is usually found in depressions within pine flatwoods. Native vegetation on this soil includes cabbage palm, longleaf pine, slash pine, saw palmetto,

and wax myrtle. Malabar fine sand comprises 5.3% of the total surface soils and is found in four areas: three in the western half of the site, and one larger area near the southeastern corner of the eastern half.

Myakka Fine Sand. This soil covers approximately 54.98% of the surface soils within the GAS. It is the dominant upland soil within the eastern portion of the site and covers nearly half of the western portion, including a small, isolated area in the northwest corner. This soil is nearly level, poorly drained and supports pine flatwoods with longleaf and slash pine in the canopy and saw palmetto, gallberry, running oak, and wax myrtle in the understory.

Pomello Fine Sand / 0 to 5% Slopes. This soil is nearly level and found on low ridges in the flatwoods. The natural vegetation includes saw palmetto, runner oak, pines, scrub live oak, blue jack oaks, and grasses. It occurs in five different areas and comprises almost 7% of the total surface soils.

St. Johns Fine Sand. This soil is nearly level and poorly drained and is found on low-lying plains in the flatwoods. Vegetation usually found on undisturbed sites includes flatwoods species such as longleaf and slash pines, saw palmetto, wax myrtle, gallberry, running oak, and pine land three awn. This soil type comprises only 3.17% of the total soil surface and is found in four locations in the eastern portion of the site.

Smyrna Fine Sand. This soil covers approximately 3.08% of the surface. It is found on broad low-lying, convex swells in drier flatwoods communities. Three areas of this soil are in the northwestern corner of the eastern portion of the site. The native vegetation would typically include longleaf and slash pine, gallberry, running oak, saw palmetto, wax myrtle, and other species common to pine flatwoods.

Urban Land. The urban land is an area of fill, located in the southern tip of the southern 25-acre portion of GAS. This small (<0.01%) area is likely a remnant of fill from the development of the adjacent parcel. Vegetation on this soil includes non-native, opportunistic species.

Wabasso Fine Sand. This soil type comprises 8.22% and is in the western half of the western portion of GAS. This nearly level, poorly drained soil supports flatwoods vegetation such as longleaf, slash pine, and cabbage palm with an understory of palmetto.

Water. Open water occurs as the two artificial bodies in the eastern portion of GAS and comprises 2.49% of the total surface area. These two lakes were created because of mining sand for construction of I-75.

Soils Management Measures

Management measures include protection of natural vegetation to prevent soil erosion, preventing off-road vehicles from accessing the preserve, and maintaining the network of trails and fire breaks. The goals and objectives of the management plan will preserve the integrity of the native soils by preserving the native vegetation communities within GAS and acting to prevent erosion, should that occur. There are no actions proposed in this ten-year plan that would require impacts to soils, except for maintaining existing firebreaks or installing new firebreaks as needed. There are no plans to exploit any mineral resources, such as oil, gas, or

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phosphate that may be present on the preserve. Any future management measures not included in this plan that require earthwork will implement Best Management Practices prior to construction, as found in https://www.fs.fed.us/biology/resources/pubs/watershed/FS_National_Core_BMPs_April2012.pdf.

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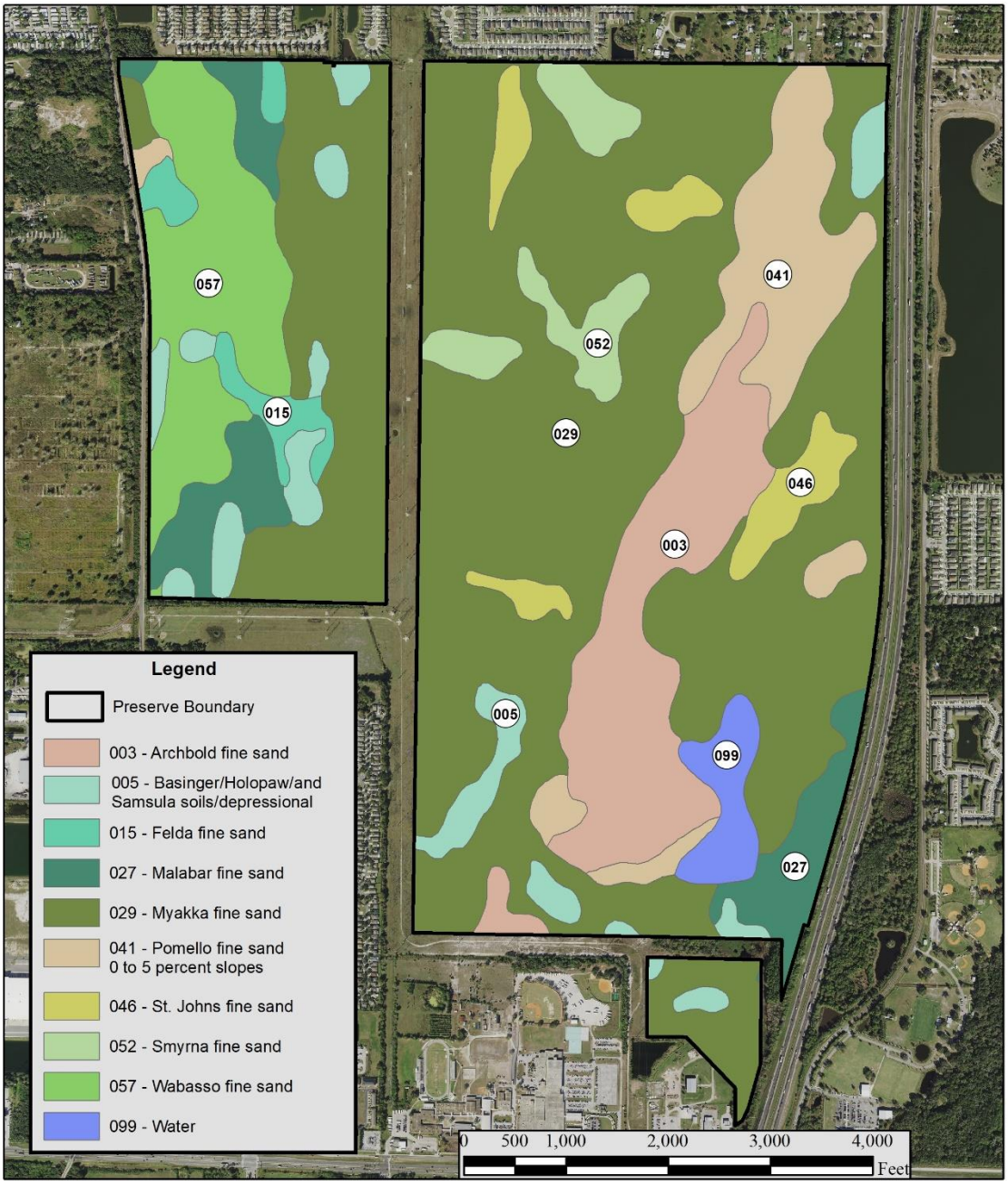


Figure 3
Soils of
Golden Aster Scrub

Note: Every reasonable effort has been made to assure the accuracy of this map.

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Natural Plant Communities

During the 2015 and 2020 LMR evaluations the teams identified two deficiencies in the 2008 management plan and its implementation; 1) a need to update the descriptions and GIS maps of the natural communities, 2) revisions to the management plan regarding current and desired future conditions of mesic hammocks, mesic & wet flatwoods, baygalls, and the sinkhole. In response to these identified deficiencies CELM contracted the Florida Natural Areas Inventory (FNAI) to update the GIS habitat maps for GAS, and then revised management objectives and goals for each habitat identified by FNAI.

FNAI developed the system used in this plan for classifying the natural communities and descriptions contained herein are derived from FNAI (2020). The premise of the FNAI system is that physical factors such as geology, climate, soils, hydrology, and fire determine the species composition of an area; areas similar with respect to these factors will tend to have natural communities with similar species compositions. Habitats on GAS were determined for the 2008 management plan using the FNAI GIS data available at that time. For this 2022 update of the management plan, FNAI visited GAS in 2020 and revised the map of habitats to better reflect current conditions. These revisions resulted in changes to the estimated cover of each habitat occurring on the site. Table 5 lists the natural communities and their respective total acreage on GAS as determined by FNAI during the 2020 assessment. The report produced by FNAI, and the methodology used to identify and map the extent of each habitat are presented in Appendix E. A table of habitats identified in the 2008 management plan also is presented in Appendix E.

Table 5 Summary of natural communities found on GAS during the FNAI 2020 mapping event.

Natural Community	Acreage
Baygall	6
Depression marsh	75
Hydric hammock	70
Mesic flatwoods	518
Mesic hammock	25
Scrub	121
Scrubby flatwoods	115
Wet flatwoods	114
Wet prairie	6
Other altered landcover types (artificial ponds, pastures, pine plantation, clearings, spoil areas, and successional hardwood forests)	131
Total	1,181

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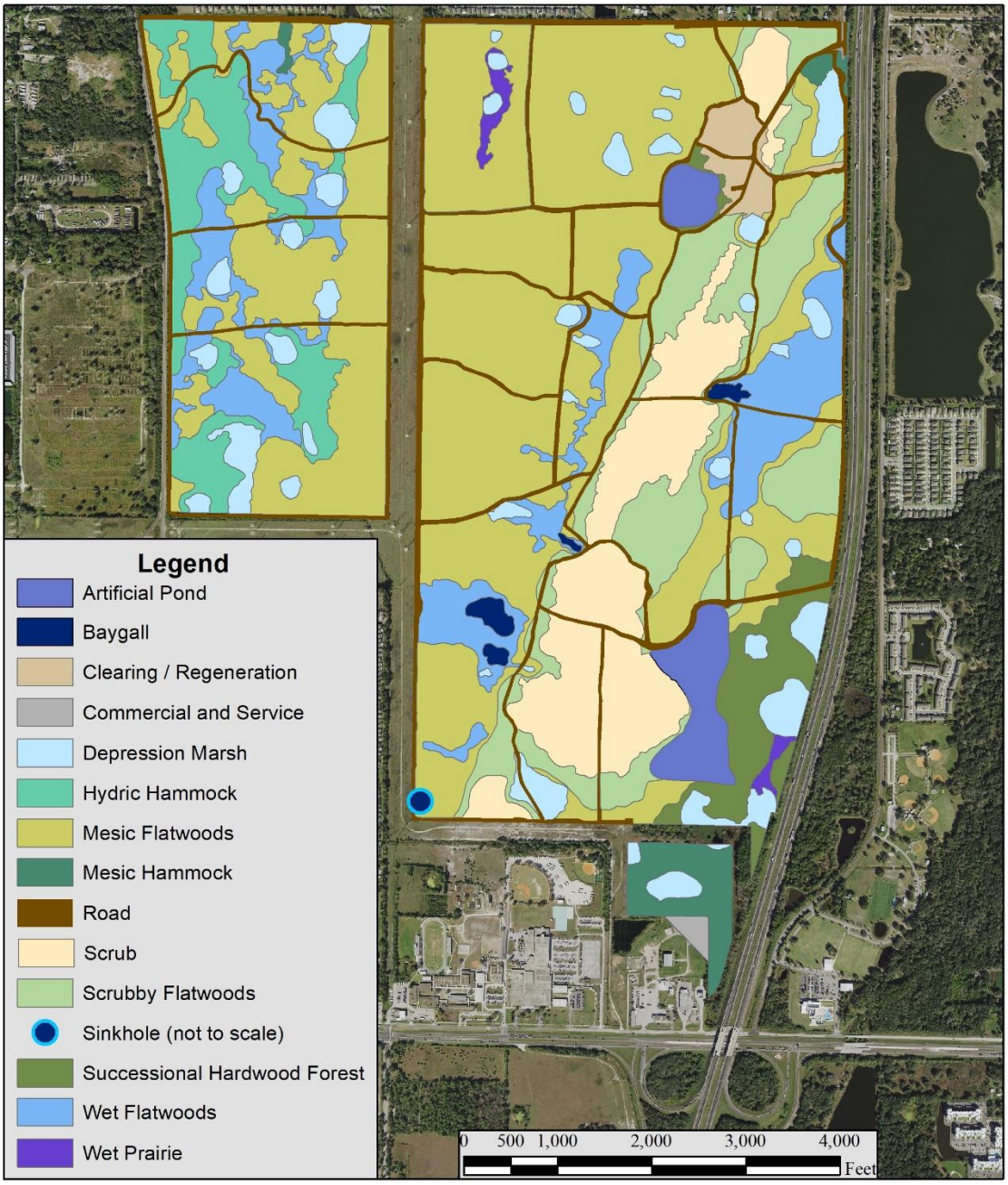


Figure 4
Natural Communities of Golden Aster Scrub

Note: Every reasonable effort has been made to assure the accuracy of this map.

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Vegetation Community Descriptions and Management Needs

GAS is dominated by uplands, chiefly mesic flatwoods (518 acres), with lesser amounts of wet flatwoods (114 acres), scrubby flatwoods (115 acres), and scrub (121 acres). Depression marshes are scattered throughout the flatwoods. Smaller wetlands such as baygalls and wet prairie are present to a lesser extent within the flatwood communities. Patches of hydric hammock occur along small creeks and border depression marshes on the western parcel. Figure 4 illustrates the distribution of habitats on GAS. Although most upland communities remain intact, some uplands on the eastern parcel were converted to artificial ponds or cleared in the past. Depression marshes within the vicinity of these artificial ponds and clearing have undergone significant hydrological alteration. Fire suppression has led to the conversion of some uplands to successional hardwood forest and has allowed for development of mesic hammock within small areas of historic mesic flatwoods. Lack of fire has also led to the expansion of hydric hammock on the western parcel.

Below are generalized descriptions for each of the 9 natural communities delineated by FNAI in 2020 (Fig. 4 & Table 5). Plant species associated with each community are included in the written description. Taxonomic concepts mainly follow *Guide to the Vascular Plants of Florida.* 3rd ed. (Wunderlin and Hansen 2011). Natural community concepts and recommended management measures follow the *Guide to the Natural Communities of Florida* (FNAI 2010).

Baygall

Baygall is an evergreen, forested wetland typically at the base of sandy slopes where water seepage maintains a saturated peat substrate. It may form an ecotone between uplands and swamps, or it may develop as a larger bay swamp in isolated basins or broad areas of seepage. These forests are dominated by a tall canopy of abundant loblolly bay (*Gordonia lasianthus*), sweetbay (*Magnolia virginiana*), and slash pine (*Pinus elliottii*), with swamp bay (*Persea palustris*) and fetterbush (*Lyonia lucida*) often forming a dense thicket in the understory. Soils are generally composed of peat and are acidic.

There is evidence of a small amount of baygall formation near the seepage flanking the large scrub on the eastern parcel. These baygalls have a canopy and subcanopy of loblolly bay. Dahoon (*Ilex cassine*) also is present in the subcanopy (Fig. 5). Shrubs including Virginia willow (*Itea virginica*), fetterbush, and southern bayberry (*Morella cerifera*) may range from dense to sparse at the center of the baygall. Herbs include native and exotic willows (*Ludwigia* sp.), and Virginia chain fern (*Woodwardia virginica*).

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Fig. 5 Baygall habitat on GAS. This photo shows the bay trees and perimeter vegetation of the baygall. Many of the trees in this swamp were destroyed by an arson-caused wildfire of 2006.

Management measures for baygalls

Baygalls occur in saturated areas where acidic organic material has accumulated. They can be allowed to burn along with the adjacent uplands if conditions permit. Typically, fires burn only into the edges of the baygall community and extinguish naturally if the soil is damp. Caution should be used during periods of drought to minimize the chance of peat fires, which may burn for weeks outside of prescription. Management activities for baygalls should focus on maintaining the natural hydrology wherever practical. Any further hydrological disturbances are to be avoided. Plowed firebreaks and ditches should be restored, and hydrology should be returned to its natural state where possible.

Depression Marsh

Depression marshes are shallow, usually rounded depressions embedded in a pyrogenic landscape. These marshes are frequently exposed to fire from the surrounding upland communities. This is a seasonally inundated community characterized primarily by a cover of herbaceous plants. The concentric zones or bands of vegetation that are sometimes observed within depression marshes are related to hydroperiod length, depth of flooding, and fire-carrying characteristics of the marsh vegetation. Woody plant cover is typically low in this community. Shrubs, especially those exceeding three feet, and small trees, are suggestive of fire exclusion.

Small depression marshes are common in pine flatwoods on GAS (Figs. 4 & 6). The soil series within depression marshes at Golden Aster Scrub are predominantly Basinger, Holopaw, and Samsula soils, and St. Johns fine sand.

Depression marshes on Golden Aster Scrub range from undisturbed to heavily altered. Typical vegetation includes an array of grasses, rushes, and sedges such as blue maidencane

(*Amphicarpum muehlenbergianum*), bluestems (*Andropogon* spp.), big carpetgrass (*Axonopus furcatus*), redtop panicum (*Coleataenia rigidula*), cypress witchgrass (*Dichanthelium dichotomum*), hemlock witchgrass (*Dichanthelium portoricense*), maidencane (*Panicum hemitomon*), bunched beaksedge (*Rhynchospora cephalantha*), fascicled beaksedge (*Rhynchospora fascicularis*), sugarcane plumegrass (*Saccharum giganteum*), and sand cordgrass (*Spartina bakeri*). Other herbs include white doll's daisy (*Boltonia asteroides*), Virginia buttonweed (*Diodia virginiana*), dogfennel (*Eupatorium capillifolium*), slender flattop goldenrod (*Euthamia caroliniana*), Carolina redroot (*Lachnanthes caroliniana*), winged loosestrife (*Lythrum alatum*) camphorweed (*Pluchea* sp.), pickerelweed (*Pontederia cordata*), largeflower rosegentian (*Sabatia grandiflora*), American cupscale (*Sacciolepis striata*), Virginia chain fern (*Woodwardia virginica*), and yellow-eyed grass (*Xyris* sp.). Marshes that are fire suppressed typically have an outer edge of encroaching shrubs such as common buttonbush (*Cephalanthus occidentalis*), southern bayberry (*Morella cerifera*), and coastalplain willow (*Salix caroliniana*). Both fire suppression and hydrologic alteration leave these marshes vulnerable to invasive species such as Peruvian primrose willow (*Ludwigia peruviana*) and Brazilian pepper (*Schinus terebinthifolia*).



Fig. 6 Depression marsh on GAS. The grassy area in the background of the photo is one of the many small wetland depressions in the preserve. These areas are hydrated by surface water runoff.

Management measures for depression marshes

Fires in surrounding pyrogenic communities should be allowed to burn into depression marshes and extinguish naturally or burn through the habitat. The outer zone of some marshes may act as a natural firebreak because of substantial shrub cover either within the marsh or surrounding edges, and these marshes should be targeted for repeated lightning season fires on a short return interval.

Hydric Hammock

Hydric hammock is an evergreen hardwood and/or palm forest with a variable understory typically dominated by palms and ferns occurring on moist soils, often with limestone very near the surface. While species composition varies, the community generally has a closed canopy of oaks, palms, or red cedar, an open understory, and a sparse to moderate groundcover of grasses and ferns. Hydric hammock occurs on low, flat, wet sites where limestone may be near the surface and soil moisture is kept high mainly by rainfall accumulation on poorly drained soils. Periodic flooding from rivers, seepage, and spring discharge may also contribute to hydric conditions (Vince et al., 1989). Flooding duration and frequency are primary factors in species composition. While most hydric hammock trees are at least somewhat adapted to flooding, the ranges of tolerance vary according to timing and depth of inundation (Vince et al., 1989).

Fire is not considered an important component of hydric hammock dynamics; however, they do burn occasionally. Of the most common canopy-forming trees, cabbage palms are the most fire tolerant and intense fires tend to favor dominance by this species. Live oak can survive and persist in hammocks subjected to low intensity fires. Red cedar is highly susceptible to fire, however, and may be extirpated following an intense fire.

Historically, small hydric hammocks occurred along creeks and bordering depression marshes on the western parcel of GAS (Fig. 4). Soils are primarily Wabasso and Malabar fine sands but also may include small areas of Felda fine sand. Hydric hammock on GAS has expanded into adjacent wet flatwoods, nearly tripling in acreage from historic conditions, due to fire exclusion.

On GAS the canopy and subcanopy are mainly dominated by swamp laurel oak (*Quercus laurifolia*), live oak (*Quercus virginiana*), and cabbage palm (*Sabal palmetto*) (Fig. 7). In areas that were historically wet flatwoods, slash pine (*Pinus elliottii*) is occasional in the canopy. Less frequent subcanopy species include sugarberry (*Celtis laevigata*), red mulberry (*Morus rubra*), and American elm (*Ulmus americana*). The shrub layer may be open to moderately dense and includes American beautyberry (*Callicarpa americana*), pignut hickory (*Carya glabra*), sugarberry, red mulberry (*Morus rubra*), wild coffee (*Psychotria nervosa*), saw palmetto (*Serenoa repens*), bully (*Sideroxylon* sp.), and Walter's viburnum (*Viburnum obovatum*). The herbaceous layer is typically sparse and includes flatsedges (*Cyperus* spp.), witchgrass (*Dichanthelium* sp.), basketgrass (*Oplismenus* sp.), bracken fern (*Pteridium aquilinum*), and toothed midsorus fern (*Telmatoblechnum serrulatum*). Vines are abundant and include Virginia creeper (*Parthenocissus quinquefolia*), corkystem passionflower (*Passiflora suberosa*), bristly greenbrier (*Smilax tamnoides*), eastern poison ivy (*Toxicodendron radicans*), Florida grape (*Vitis cinerea* var. *floridana*), and muscadine (*Vitis rotundifolia*). Epiphytes are common and include golden polypody (*Phlebodium aureum*), resurrection fern (*Pleopeltis michauxiana*), southern needleleaf (*Tillandsia setacea*), Spanish moss (*Tillandsia usneoides*), and shoestring fern (*Vittaria lineata*). Invasive species are a serious threat in these hammocks. Encountered invasive plants include sword fern (*Nephrolepis cordifolia*), skunk vine (*Paederia foetida*), schefflera (*Schefflera actinophylla*), Brazilian pepper (*Schinus terebinthifolia*), and Caesar's weed (*Urena lobata*). Extensive feral hog digging was also encountered throughout these hammocks.

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Figure 7 Hydric hammock in the northwest portion of GAS.

Management measures for hydric hammocks
Most of the hydric hammock on the property likely was once wet flatwoods, therefore prescribed fire may be beneficial to the understory. However, given the level of past and present disturbance from adjacent urban development, it may be impractical to attempt to fully restore the community to a pine-dominated habitat. Treatment of invasive exotic species and removal of feral hogs should be the main priority in the management of this habitat.

Mesic Hammock
Mesic hammock is a well-developed evergreen hardwood and/or palm forest occurring in naturally fire-protected areas and on soils that are rarely inundated. The canopy is typically closed and dominated by live oak (*Quercus virginiana*) with cabbage palm (*Sabal palmetto*) generally common in the canopy and subcanopy. Mesic hammock may occur as "islands" on high ground within basin swamps or hydric hammocks, or in ecotones between wetland and upland communities. Other landscape positions that can provide protection from the spread of fire from one or more directions are likely places for mesic hammock development, including edges of lakes, sinkholes, other depressional or basin wetlands, and river floodplains. Soils of mesic hammock habitats are sands mixed with organic matter. A thick layer of leaf litter, which maintains high moisture of the soil, also may be present.

On GAS, mesic hammocks appear to be a recent development, representing a conversion of former pine-dominated mesic flatwoods to shaded, oak-dominated hammocks. The isolation of uplands on the preserve caused by surrounding development and a subsequent lack of fire has likely driven this succession.

Mesic hammocks on the property have a closed canopy of live oak and cabbage palm (Fig. 8). The understory is primarily saw palmetto. This community is susceptible to invasive plants, especially in areas of disturbance (e.g., hog rooting).



Figure 8 Mesic hammock on the western portion of GAS.

Management measures for mesic hammocks

Mesic hammocks are of considerable importance to wildlife, providing cover, nesting sites, and hardwood mast. Migratory birds use hammocks for resting cover and foraging, and animals of neighboring wetland communities may take refuge in mesic hammock islands during floods. Because the hammocks on the preserve are derived from historical mesic flatwoods, they would likely benefit from prescribed fire. Fires in the adjacent flatwoods should be allowed to burn into hammocks, and efforts to monitor and treat invasive exotic plant species should remain a high priority.

Mesic Flatwoods

Mesic flatwoods are characterized by an open canopy of tall pines and a dense ground layer of low shrubs, grasses, and forbs. Longleaf pine (*Pinus palustris*) is the principal canopy tree while characteristic shrubs include saw palmetto (*Serenoa repens*), gallberry (*Ilex glabra*), coastal plain staggerbush (*Lyonia fruticosa*), dwarf live oak (*Quercus minima*), shiny blueberry (*Vaccinium myrsinites*), and fetterbush (*Lyonia lucida*). The herbaceous layer is predominantly grasses, most notably wiregrass (*Aristida stricta*), plus many showy forbs.

Mesic flatwoods is the most widespread natural community in Florida, covering the flat sandy terraces left behind by the higher sea level of the Plio-Pleistocene Era. This is a fire-dependent community in which constituent plant species have evolved to recover rapidly from fire. Soils are acidic, nutrient-poor fine sands with upper layers darkened by organic matter. Leon, Myakka, Vero, and Smyrna fine sands are common examples (Gilbert et al., 1994). Drainage in this flat terrain can be impeded by a loosely cemented organic layer (spodic horizon) formed within several feet of the soil surface. The soils are alternately droughty during dry periods and saturated, or even inundated, after heavy rains.

At GAS, mesic flatwoods are the most extensive natural community, occupying most of the area off the scrub ridge. Soil in the flatwoods of GAS is primarily Myakka fine sand. Although fragmented by roads and vehicle trails, the flatwoods appear mostly unchanged from their historic condition; however, some acreage has been lost due to creation of the artificial ponds. There also is some conversion of mesic flatwoods to mesic hammock and successional hardwood forest due to fire suppression, particularly in the southeastern corner of the preserve.

Mesic flatwoods at GAS have an open canopy of longleaf pine (Fig. 9). On the western parcel, fire suppression has allowed both mesic and wet flatwoods to become overgrown, making these two communities difficult to distinguish during the 2020 FNAI habitat mapping. The canopy in this area includes longleaf pine (*Pinus palustris*) or slash pine (*P. elliottii*), with a sparse to moderate subcanopy of water oak (*Quercus nigra*), live oak (*Q. virginiana*), and cabbage palm (*Sabal palmetto*). Typical shrubs include netted pawpaw (*Asimina reticulata*), tarflower (*Bejaria racemosa*), dwarf huckleberry (*Gaylussacia dumosa*), roundpod St. John's wort (*Hypericum cistifolium*), Atlantic St. John's wort (*Hypericum tenuifolium*), fourpetal St. John's wort (*Hypericum tetrapetalum*), gallberry (*Ilex glabra*), coastalplain staggerbush, fetterbush (*Lyonia fruticosa*), southern bayberry (*Myrica cerifera*), wild pennyroyal (*Piloblephis rigida*), dwarf live oak, winged sumac (*Rhus copallinum*), saw palmetto, Darrow's blueberry (*Vaccinium darrowii*), shiny blueberry (*Vaccinium myrsinites*), and deerberry (*Vaccinium stamineum*). The herb layer is sparse to moderate, depending on shrub cover, and includes blue maidencane (*Amphicarpum muehlenbergianum*), purple bluestem (*Andropogon glomeratus* var. *glaucopsis*), wiregrass, Michaux's croton (*Croton michauxii*), cypress witchgrass (*Dichanthelium ensifolium* var. *ensifolium*), hemlock witchgrass (*Dichanthelium portoricense*), tall elephantsfoot (*Elephantopus elatus*), dogfennel (*Eupatorium capillifolium*), slender flattop goldenrod (*Euthamia caroliniana*), Elliott's milkpea (*Galactia elliottii*), pinweed (*Lechea* sp.), thin paspalum (*Paspalum setaceum*), yellow milkwort (*Polygala rugelii*), bracken fern (*Pteridium aquilinum*), sweet goldenrod (*Solidago odora*), lopsided indiangrass (*Sorghastrum secundum*), and yellow-eyed grass (*Xyris* sp.).

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Figure 9 Mesic flatwoods on the eastern portion of GAS.

Management measures for mesic flatwoods
A prescribed fire return interval of 2 to 4 years is recommended for mesic flatwoods. Restoration of the successional hardwood forests may include mechanical tree removal and reintroduction of fire. Where characteristic herbaceous species (e.g., wiregrass) have been lost, reintroduction via seed or plants may be necessary to restore natural species composition and community function. Allowing longleaf pines in the area to naturally increase in number may help to carry fire through the groundcover and promote the growth of native species.

Scrub
Scrub is a xeric community composed of evergreen shrubs, with or without a canopy of pines, and is found on dry, infertile, sandy ridges. The signature scrubby oak species: sand live oak (*Quercus geminata*), Chapman's oak (*Quercus chapmanii*), and myrtle oak (*Quercus myrtifolia*), as well as Florida rosemary (*Ceratiola ericoides*) and sand pine (*Pinus clausa*) are common to scrubs throughout the state. The dominance of these species, however, is variable from site to site.

At GAS, a large scrub ridge extends from the northeast to southwest corner of the eastern parcel (Fig. 4). Soils are primarily Pomello fine sand and Archbold fine sand (Fig. 3). Scrub on this property remains largely intact except for approximately 14 acres of historic scrub that was converted to clearings, roads, or artificial ponds.

Within the ridge of scrub on GAS there is a canopy of sand pine (*Pinus clausa*) on some areas (Fig. 10), but other areas lack this canopy and are dominated by scrub oaks (Fig. 11). The tall and short shrub layers are dense with scrub oaks. Herbs are sparse and include capillary hairsedge (*Bulbostylis ciliatifolia*), coastalplain chaffhead (*Carphephorus corymbosus*), Piedmont pinweed (*Lechea torreyi*), and *blackroot* (*Pterocaulon pycnostachyum*).

Scrub on the northeastern side of the property differs in structure from the largest section of scrub to the south. Fire suppression has led to a scattered canopy of sand live oak. Saw palmetto is much more common here than scrub oaks, and wiregrass is occasional throughout. The overall structure of this area is very similar to overgrown scrubby flatwoods but lacks longleaf pines.



Figure 10 Sand pine dominated scrub near the southeast artificial pond.


Fig. 11 Oak dominated scrub. This photo was taken on the western edge of the scrub facing east.

Management measures for scrub
Scrub fire regimes are highly variable, depending on landscape settings and dominant vegetation. Current scientific research suggests oak-dominated scrub would have naturally burned every 6 to 19 years, but more frequent fires (4 to 10 years) may be necessary to maintain optimal shrub heights for scrub jay habitat. Although future management of scrub habitat at GAS generally will follow the guidelines recommended by FNAI, response of vegetation to restoration work completed 2000 – 2005 suggest it now is necessary to apply prescribed fire more frequently than the recommended fire return interval of 6 to 19 years.

At the time of purchase, scrub and scrubby flatwoods on GAS were severely overgrown because of the long-term absence of fire. Restoration of these habitats began with mechanical reduction of the sand pine and oak dominated canopy, roller chopping, and prescribed fire between 2000 – 2005. Note the change in appearance of the scrub habitat during the period 2000 and 2020, as depicted in aerial photographs (Figs.2c – 2i).

After the restoration efforts located in management units 9, 12, 16a, and 16b, there were 6 fires within the scrub habitat between 2005 – 2020: 3 wildfires of unknown origin and 3 prescribed fires. (Note: The history of fires on GAS is discussed in Section G Facilities & Resource Management). Although the wild and prescribed fires occurred within the recommended fire return interval of 6 to 19 years, many of the scrub oaks are now at or near the maximum height tolerated by scrub-jays. Further, a cursory walk through this scrub suggests oaks sprouting from existing roots have proliferated, causing an overall decline of the number and size of bare sand patches. Countering this trajectory likely will require burning the scrub more frequently than every 6 – 19 years, as well as possibly additional mechanical treatments, at least until the loss of bare sand patches has been reversed. Roller chopping will not be one of the mechanical methods used; its deleterious effects to scrub soil and ground-dwelling herpetofauna would likely be

counterproductive. Effectiveness of future prescribed fire and mechanical treatments will be assessed using the Objective-Based Vegetation Management (OBVM) methods every five years, as described in the monitoring portion of Section G.

Scrubby Flatwoods

Scrubby flatwoods are well-drained pine-dominated communities intermediate between scrub and mesic flatwoods. These communities are characterized by an open canopy of widely scattered pine trees with a sparse shrubby understory and areas of open white sand. The vegetation consists of a combination of scrub and mesic flatwoods species. The canopy typically consists of widely spaced longleaf pine (*Pinus palustris*) and/or slash pine (*Pinus elliottii*) growing over a shrub stratum dominated by scrub species such as sand live oak (*Quercus geminata)*, rusty staggerbush (*Lyonia ferruginea*), Chapman's oak (*Quercus chapmanii*), and myrtle oak (*Quercus myrtifolia*) mixed with typical mesic flatwoods species including saw palmetto (*Serenoa repens*), and a diversity of other low mesic shrubs. The herbaceous groundcover is patchy and usually has some wiregrass (*Aristida stricta* var. *beyrichiana*), and a mix of other herbs. The natural fire regime ranges from 5 – 15 years. Sparse groundcover and incombustible scrub oak leaf litter may reduce the occurrence of fires leading to a slightly longer average fire return interval than is the case for mesic flatwoods. Variability in season and frequency of prescribed fires should produce a mosaic of burned and unburned patches desirable for maintaining high biotic diversity in this community.

At GAS, scrubby flatwoods border the entire scrub ridge and grade into mesic flatwoods (Fig. 4). Soils are primarily Pomello fine sand and Myakka fine sand (Fig. 3). While most of the historic acreage remains intact, approximately 18 acres of scrubby flatwoods has been converted to clearings, roads, or artificial ponds.

The extant scrubby flatwoods on GAS (Fig. 12) have a canopy of longleaf pine and/or sand pine. Shrubs are moderate to dense with open patches of sand throughout. Typical shrubs include netted pawpaw (*Asimina reticulata*), pricklypear (*Opuntia humifusa*), sand live oak, myrtle oak, saw palmetto, and shiny blueberry (*Vaccinium myrsinites*). Scattered herbs include wiregrass, scrubland goldenaster (*Chrysopsis subulata*), tread softly (*Cnidoscolus stimulosus*), pinebarren frostweed (*Crocanthemum corymbosum*), fragrant eryngo (*Eryngium aromaticum*), Piedmont pinweed (*Lechea torreyi*), candyroot (*Polygala nana*), sandyfield beaksedge (*Rhynchospora megalocarpa*), and pineland scalypink (*Stipulicida setacea*).

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Fig. 12 Scrubby flatwoods located north of the ridge of scrub on GAS.

Management measures for scrubby flatwoods
The recommended 5- to 15-year fire return intervals should be sufficient to maintain shrub heights (<3 meters) within the range required by the Florida scrub-jay. Avoiding additional ground disturbance is important to prevent elimination of the natural groundcover and the establishment of weedy species.

Sinkholes
Sinkholes (Fig. 13) are generally round edged depressions with steep sides. These features are typically formed by soil receding into subterranean cavities or the solution of limestone near the surface. In peninsular Florida, they are often associated with hardwood communities including mesic hammocks and upland hardwood forests but may be found in most natural communities.

Vegetation associated with sinkholes is highly variable and influenced most by the matrix community in which they are formed. Often the steep sloped perimeter of sinkholes is devoid of vegetation; however, well-developed hardwood forests may be present particularly where soil covers the underlying rock and/or the area is protected from fire. Species distribution along the slope of a sinkhole can be influenced by several different factors that vary by sinkhole, such as light availability, temperature, humidity, soil presence and type, drainage and seepage, and steepness of the sinkhole walls (Hardin, 1954). Limestone outcrop community is often present in sinkholes and may support rare plant species.

There is one known sinkhole located in the central southern portion of the site east of the TECO easement (Fig. 4). The matrix community, as determined by FNAI in 2020, is mesic flatwoods. Please see the previous section on mesic flatwoods for details about the matrix community's vegetative structure found at GAS. The signature of this feature is not obvious on historic aerials.


Fig. 13 Sinkhole in the central southern portion of GAS.

Management measures for sinkholes.
Sinkholes are fragile communities and may be negatively impacted by human activities. This community is particularly subject to deleterious responses from soil disturbance, excessive groundwater withdrawal, dumping, and activities that would impact its delicate microclimate (e.g., logging, high intensity fires, etc.). Often sinkholes directly drain to underground aquifers; therefore, activities such as dumping and chemical applications are strongly discouraged. Invasive species establishment may be facilitated by the conditions present in this community. When chemically treating invasive species, appropriate selection and application of herbicides is important to avoid groundwater contamination.

Wet Flatwoods
Wet flatwoods (Fig. 14) are open pine forests with a sparse or absent mid-story and a dense groundcover of low shrubs, hydrophytic grasses, and herbs. The pine canopy typically consists of one or a combination of longleaf pine (*Pinus palustris*) and slash pine (*P. elliottii*). The relative density of shrubs and herbs varies greatly in wet flatwoods. Shrubs tend to dominate where fire has been absent for a long period or where cool season fires predominate; herbs are more abundant in locations that are frequently burned during the growing season. Herbs generally include wiregrass (*Aristida stricta*), blue maidencane (*Amphicarpum muhlenbergianum*), and a suite of hydrophytic herb species.

On the eastern parcel of GAS wet flatwoods occur mostly east of the scrub, surrounding several depression marshes. On the western parcel, wet flatwoods are common throughout, often forming a mosaic within mesic flatwoods (Fig. 4). Soils on the eastern parcel are St. Johns fine sand, Malabar fine sand, and Myakka fine sand. Soils on the western parcel are Wabasso fine sand, Malabar fine sand, and Myakka fine sand (Fig. 3). Most wet flatwoods on GAS are heavily fire suppressed. On the southeastern corner of the property, most historic wet flatwoods

have converted to successional hardwood forest. On the western parcel, roughly half have transitioned to hydric hammock.

The canopy and subcanopy is primarily slash pine. Other tree species including sweetbay (*Magnolia virginiana*), swamp laurel oak (*Quercus laurifolia*), and cabbage palm (*Sabal palmetto*) may be present in these layers. The shrub layer is dense with St. John's wort (*Hypericum microsepalum*), dahoon (*Ilex cassine*), gallberry (*Ilex glabra*), fetterbush (*Lyonia lucida*), southern bayberry (*Morella cerifera*), swamp bay (*Persea palustris*), saw palmetto (*Serenoa repens*), American snowbell (*Styrax americanus*), and Darrow's blueberry (*Vaccinium darrowii*). Herbaceous cover is moderate to dense and includes blue maidencane (*Amphicarpum muehlenbergianum*), purple bluestem (Andropogon glomeratus var. glaucopsis), wiregrass, pink sundew (*Drosera capillaris*), slender flattop goldenrod (*Euthamia caroliniana*), narrowleaf sunflower (*Helianthus angustifolius*), clustered bushmint (*Hyptis alata*), Carolina redroot (*Lachnanthes caroliniana*), shrubby primrosewillow (*Ludwigia suffruticosa*), cinnamon fern (*Osmunda cinnamomea*), procession flower (*Polygala incarnata*), yellow milkwort (*Polygala rugelii*), maid Marian (*Rhexia nashii*), Nuttall's meadowbeauty (*Rhexia nuttallii*), Carolina wild petunia (*Ruellia caroliniensis*), largeflower rosegentian (*Sabatia grandiflora*), sugarcane plumegrass (*Saccharum giganteum*), and yellow hatpins (*Syngonanthus flavidulus*).



Figure 14 Wet flatwoods on GAS.

Management measures for wet flatwoods
Wet flatwoods depend on frequent fires to reduce hardwood encroachment and encourage herbaceous species survival and diversity. Fire likely occurred naturally in wet flatwoods every 3-10 years in the late spring/early summer lightning season. Restoration of wet flatwoods encroached upon by successional hardwood forests includes mechanical tree removal and reintroduction of growing season fire. Where characteristic herbaceous species (e.g., wiregrass) have been lost, reintroduction via seed or plants may be necessary to restore natural species composition and community function.

Wet Prairie
Wet prairie (Fig. 15) is an herbaceous community found on continuously wet, but not inundated, soils on somewhat flat or gentle slopes between lower lying depression marshes, shrub bogs, or dome swamps and slightly higher wet or mesic flatwoods. Trees and shrubs are absent or very sparse. It is typically dominated by dense wiregrass (*Aristida stricta*) in the drier portions, along with foxtail clubmoss (*Lycopodiella alopecuroides*), cutover muhly (*Muhlenbergia expansa*), yellow butterwort (*Pinguicula lutea*), and savannah meadowbeauty (*Rhexia alifanus*). In the wetter portions, wiregrass may occur with, or be replaced by, species in the sedge family, such as plumed beaksedge (*Rhynchospora plumosa*), featherbristle beaksedge (*R. oligantha*), Baldwin's nutrush (*Scleria baldwinii*), or slenderfruit nutrush (*S. georgiana*), plus longleaved threeawn (*Aristida palustris*). Also common in wetter areas are carnivorous species, such as pitcher plants (*Sarracenia* spp.), sundews (*Drosera* spp.), butterworts (*Pinguicula* spp.), and bladderworts (*Utricularia* spp.). Other characteristic species in this community include toothache grass (*Ctenium aromaticum*), pineland rayless goldenrod (*Bigelowia nudata*), flattened pipewort (*Eriocaulon compressum*), water cowbane (*Oxypolis filifolia*), and coastalplain yellow-eyed grass (*Xyris ambigua*). The fire return interval in wet prairie is 2 to 3 years. These frequent fires prevent the invasion of weedy shrubs and trees that shade out the herbaceous species.

Wet prairie occurs in the northwest and southeast corner on the eastern parcel of GAS, between depression marshes (Fig. 4). Soils are Malabar fine sand and St. John's fine sand (Fig. 3). Wet prairie in the northwest corner remains intact, as it is surrounded by excellent quality mesic flatwoods. Wet prairie in the southeast corner is now surrounded by successional hardwood forest and threatened by woody encroachment.

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Figure 15 Wet prairie on GAS.

Management measures for wet prairies
Management goals in the northwest corner should focus on implementing frequent prescribed fires. Timing of fires ideally should be during the early lightning season or as close to this period as practicable. In the southeast corner, restoration of surrounding successional hardwood forests to wet flatwoods should be the focus for restoring and maintaining this community.

Other Altered Land Cover Types
Altered land cover refers to landscapes within the managed area where native vegetation has been disturbed to such an extent that they no longer resemble a natural community. Species composition is dependent upon the land use history, historic community, and soil types. Areas of remnant or recolonized vegetation can help to elucidate the historic natural community. Altered land cover types in GAS include artificial ponds, developed areas, clearings, roads, and successional hardwood forest (Fig. 4). It may not be practical or desirable to restore some of the altered land cover areas (e.g., artificial ponds and roads) to the historic natural community.

Open water/artificial ponds (31 acres) – water retention ponds, cattle ponds, etc. Two artificial ponds occur on GAS: one in the northeastern (Fig. 16) and southeastern portions of the eastern parcel (Fig. 17).



Figure 16 Artificial pond in the northeast of GAS.



Fig. 17 Artificial pond in the southeast of GAS.

Management measures for open water/artificial ponds
Motorized boats and swimming are incompatible uses for these lakes and are not permitted on the preserve. Fishing is not allowed because of the potential to disturb sensitive resources around the borrow pits/lakes, such as the Florida golden aster, or foraging wading birds, ducks and other avian species that use the lake. The lakes also are not used for fishing because of the presence of jewel cichlids, an aggressive tropical fish species from South Africa which make it impractical to stock the lakes with more appropriate fish without first removing all the cichlids. The lakes are used as a focal point for visitors, however, and the County has constructed a picnic pavilion, restrooms, and an informative kiosk adjacent to the artificial pond in the northeast of GAS. As discussed further in Section G Facilities & Resource Management, the facilities near the northeast artificial pond are all handicap-accessible by way of a paved road extending to the area from the parking lot.

Clearing/regeneration – Dove fields, wildlife food plots, recent or historic clearings (e.g., old homesites, etc.) that have significantly altered the groundcover and/or overstory of the original natural community. On the eastern parcel of GAS, there is a clearing of historic scrub and scrubby flatwoods in the northeastern corner (Fig. 4) where an asphalt manufacturing plant once stood in the 1980s. Cabbage palm (*Sabal palmetto*) is occasional in the canopy, subcanopy and shrub layers. Other shrubs include groundsel tree (*Baccharis halimifolia*), Brazilian pepper (*Schinus terebinthifolia*), and saw palmetto (*Serenoa repens*). Herbs are dense and weedy, including common ragweed (*Ambrosia artemisiifolia*), partridge pea (*Chamaecrista fasciculata*), Virginia buttonweed (*Diodia virginiana*), fingergrass (*Eustachys* sp.), rustweed (*Polypremum procumbens*), licoriceweed (*Scoparia dulcis*), buttonweed (*Spermacoce* sp.), and dropseed (*Sporobolus* sp.).

Developed areas – Check stations, off road vehicle use areas, parking lots, buildings, maintained lawns (as part of recreational, business, or residential areas), botanical or ornamental gardens, campgrounds, recreational, industrial, and residential areas. Areas mapped as this land cover include the former location of the site security residence, and slivers of adjacent, off-site land uses erroneously included because of discrepancies in the alignment of the various shapefiles and aerial photographs used for updating the habitat map.

Roads – Roads ≥5 meters wide, as well as fire lanes, are delineated on the current natural community map (Fig. 4).

Successional Hardwood Forest – Closed-canopy forest dominated by fast growing hardwoods such as laurel oak (*Quercus hemisphaerica*), water oak (*Quercus nigra*), and/or sweetgum (*Liquidambar styraciflua*), often with remnant pines. These forests are either invaded natural habitat (i.e., mesic flatwoods, sandhill, upland pine, upland mixed woodland) resulting from lengthy fire-suppression or old fields that have succeeded to forest. The subcanopy and shrub layers of these forests are often dense and dominated by smaller individuals of the canopy species. Successional hardwood forests can contain remnant species of the former natural community such as turkey oak (*Quercus laevis*), saw palmetto (*Serenoa repens*), gallberry (*Ilex glabra*) and, infrequently, wiregrass (*Aristida stricta*). Additionally, species such as beautyberry (*Callicarpa americana*), muscadine (*Vitis rotundifolia*), and sparkleberry (*Vaccinium arboreum*) are common. Restoration of these forests includes mechanical tree removal and reintroduction of

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fire. Where characteristic herbaceous species (e.g., wiregrass) have been lost, reintroduction via seed or plants may be necessary to restore natural species composition and community function.



Figure 18 Successional hardwoods on GAS.

On GAS, successional hardwood forest occupies areas of former scrubby, mesic, and wet flatwoods where prolonged fire suppression has resulted in significant changes to the plant community composition and structure (Figs. 4 & 18). The canopy consists of slash pine (*Pinus elliottii*), swamp laurel oak (*Quercus laurifolia*), water oak, and live oak (*Quercus virginiana*). The subcanopy includes loblolly bay (*Gordonia lasianthus*), dahoon (*Ilex cassine*), swamp bay (*Persea palustris*), and cabbage palm (*Sabal palmetto*). The shrub layer is fairly scattered under the heavy shade of canopy trees and incudes remnant flatwoods vegetation such as huckleberry (*Gaylussacia frondosa* var. *tomentosa*), gallberry (*Ilex glabra*), fetterbush (*Lyonia lucida*), saw palmetto (*Serenoa repens*), and shiny blueberry (*Vaccinium myrsinites*). Herbaceous species include bluestem (*Andropogon glomeratus* var. *glaucopsis*), Carolina redroot (*Lachnanthes caroliniana*), whitehead bogbutton (*Lachnocaulon anceps*), maidencane (*Panicum hemitomon*), bracken fern (*Pteridium aquilinum*), and Virginia chain fern (*Woodwardia virginica*).

Forest Management

The 2015 and 2020 LMR teams noted the management plan was deficient in that it lacked a timber inventory and assessment of the potential for logging GAS. To address this deficiency, CELM arranged to have Michael Edwards of the Florida Forest Service conduct a timber

assessment of the preserve on 16 November 2021. The final report for the assessment was released on 18 February 2022. To summarize the report, it was determined the logging of GAS was not a financially feasible objective. The full report can be found in Appendix B.

Water Resources

The 2015 LMR identified a need for improvement to the management plan regarding the monitoring of both surface and ground water quality on GAS. Subsequently, CELM has identified several sources of information documenting the quality of water leaving the preserve and includes below a list of management practices that may help improve the quality of water on GAS.

Aquatic Preserves and Outstanding Florida Waters

GAS is located approximately one mile east of Tampa Bay, 2.5 miles south of the Alafia River, and about 0.5 mile east of Bullfrog Creek (Fig. 1). The Florida Department of Environmental Protection (FDEP) does not recognize any wetlands in GAS as a classified surface water. There are no Outstanding Florida Waters located within or directly adjacent to the preserve and GAS is not within or directly adjacent to an aquatic preserve, a designated area of critical state concern, or an area under study for such designation. It appears that no water bodies on or in the vicinity of GAS provide significant discharge to sensitive aquatic resources.

GAS lies within the Bullfrog Creek/Wolf Branch Creek Watershed. The watershed drains 70.1 square miles in Hillsborough County and contains 11 named lakes and ponds, 2 named bays/bayous, and 13 named rivers, streams, and canals. Hillsborough County contracted a consulting firm to prepare a watershed management plan for Bullfrog/Wolf Branch Creeks watershed. In 2000, the consultant presented their findings and made 21 unspecific recommendations to improve water quality (Dames & Moore, 2000). None of the recommendations will affect GAS and the habitat it provides.

Wetland areas approximately cover 15% (ca. 188 ac.) of the preserve. Hydric hammocks (ca. 70 ac.) are in the western portion of the Preserve (Figs. 4 & 7). Baygalls (ca. 6 ac.) are in the central and southeastern portions of the preserve (Figs. 4 & 5). Depression marshes (ca. 75 ac.) are located throughout the preserve (Figs. 4 & 6). A previously unmapped sinkhole is in the central southern portion of the site east of the TECO easement (Figs. 4 &13). Wet prairies (ca. 6 ac.) are in the northern and southeastern portions of the preserve (Figs 4 & 15). Artificial ponds (ca. 31 ac.) are in the northeast and southeast portions of the preserve (Figs 4, 1, & 17). Approximately 0.2 mi. of Kitchen Branch stream is in the northwestern portion of the preserve and flows east to west, discharging to a canal connected to Tampa Bay (Fig. 19).

There is an off-site water quality sampling station located where Kitchen Branch abuts Tampa Bay. FDEP and the Hillsborough County Environmental Protection Commission (EPC) contribute to this water quality data set. It has been determined by FDEP that Kitchen Branch stream is an impaired waterbody due to the levels of dissolved oxygen, fecal coliform, and chlorophyll-a.

Water Resource Management Measures.

Except for areas historically disturbed prior to acquisition, a 30-ft. vegetated buffer around existing natural wetlands will be maintained to provide protection to the water quality of on-site

wetlands within GAS. It is important to note that the general water resource management measures indicated below are particularly important in respect to the sinkhole located on GAS since sinkholes often directly drain to underground aquifers. CELM should continue to review agency literature and offer support, if feasible, to maintain and improve water quality. Prior to the Covid-19 pandemic County staff received NPDES training on an annual basis. This frequency of training may eventually resume, provided pandemic-related safety protocols can be followed. Additionally, all staff have been trained to report potential pollution and/or environmental hazards to either the EPC or Hillsborough County Public Works.

Due to the impaired status of Kitchen Branch stream the following specific management measures are recommended:

- If feasible, identify and remediate any potential sources of nutrients (e.g., fertilizers, septic systems, sewage treatment plants, urban runoff etc.) to prevent high concentrations of chlorophyll a, excess amounts of algae, and low dissolved oxygen.
- If feasible, identify and remediate any sources of fecal indicator bacteria (e.g., wastewater treatment plant effluent, leaking septic systems, stormwater runoff, sewage discharged or dumped from recreational boats, domestic animal and wildlife waste, improper land application of manure or sewage, etc.).

General management measures required with respect to maintaining or improving the water quality in the vicinity of the Preserve would be to:

- Control exotic vegetation with an approved herbicide used according to the label or use biocontrol agents if available.
- Preserve or restore vegetation around the perimeter of the borrow pits/lakes to act as buffers against surface water impacts.
- Avoid soil disturbances to prevent erosion and subsequent turbidity and sedimentation in surface waters.
- Implement best management practices during any construction or other disturbance of the soils or vegetation.
- Protect the water quality in the lakes and wetlands on site and protect the lakes from inappropriate uses which would degrade the water quality.
- Protect water quality in the creek in the northwest corner of the Preserve and its flow off-site.

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Fig. 19 Kitchen Branch stream. It is in the northwestern portion of the preserve and flows east to west, discharging to a canal connected to Tampa Bay.

Flora and Fauna

During the 2015 and 2020 LMRs both review teams expressed the need for increased monitoring of listed and imperiled flora and fauna, as well as non-game species. Both teams also stressed the need for increased monitoring to assess the effects of fire and other habitat management practices on flora and fauna in general, as well as the habitats for imperiled or listed species. In previous years gathering of information regarding listed, imperiled, and non-game fauna was limited to reporting of incidental observations made during other activities. To improve knowledge of species on the preserve CELM staff compiled all known resources providing documentation of species observed on GAS and began conducting generalized non-specific wildlife surveys in 2017 (Table 6).

Table 6 Wildlife monitoring: acoustic (sonic and ultrasonic), camera trapping, coverboards, general wildlife survey and mapping, incidental observations.

Year	No. of visits	Activity
2012	4	General wildlife observations
2013	4	General wildlife observations
2014	2	General wildlife observations
2015	2	General wildlife observations
2016	2	General wildlife observations
2017	5	General wildlife observations (4); wildlife survey and mapping (1)
2018	4	General wildlife observations (3); wildlife survey and mapping (1)
2019	7	General wildlife observations (4); wildlife survey and mapping (3)
2020	14	Acoustic (sonic) monitoring (6); acoustic (ultrasonic) monitoring (1); camera trapping (4); general wildlife survey and mapping (3)
2021	6	Acoustic (ultrasonic) monitoring (2); camera trapping (1); coverboards (3)

Appendix F contains cumulative lists of wildlife and plant species observed on GAS since acquisition of the property in 1997. Species on these lists either were observed during wildlife and plant surveys or seen incidentally during other work. General, non-specific wildlife surveys on GAS between 2017 and 2020 were conducted using camera traps, coverboards, sonic and ultrasonic acoustic recorders (Table 6), as well as seasonal Christmas and Breeding Bird Counts hosted by the Audubon Society. Eleven species of amphibians and 16 species of reptiles have been observed on the preserve. These species include two introduced amphibian species and one introduced reptile. To date, 141 native and 7 non-native species of birds have been observed on GAS. Eighteen native and two non-native mammal species have been recorded on the preserve. To date, 381 plant species have been observed within the preserve boundaries; 363 native species, of which 18 are considered endemic to Florida and 45 non-native species, of which 22 are considered invasive.

Special Status Species

Appendices F & G of this management plan and results of surveys conducted 2017 – 2020 (Table 6) were consulted to determine which special status or endemic species have been observed on GAS (Table 7). The four sources listed below were consulted to determine which species observed on GAS have a special status designation.

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1)https://www.fdacs.gov/Consumer-Resources/Protect-Our-Environment/Botany/Florida-s-Endangered-Plants/Endangered-Threatened-and-Commercially-Exploited-Plants-of-Florida
2) http://www.fl-dof.com/forest_management/plant_conserve_list.html
3) https://myfwc.com/media/1945/threatened-endangered-species.pdf
4) https://ecos.fws.gov/ecp0/reports/ad-hoc-species-report-input

Table 7 Special status and endemic species observed on GAS.

Common Name	Scientific Name	Listed Status[1]
Birds		
Black Skimmer	*Rynchops niger*	ST
Least Tern	*Sternula antillarum*	ST
SE American kestrel	*Falco sparverius paulus*	ST
Florida Sandhill Crane	*Antigone canadensis pratensis*	ST
Little Blue Heron	*Egretta caerulea*	ST
Tricolored Heron	*Egretta tricolor*	ST
Roseate Spoonbill	*Platalea ajaja*	ST
Wood stork	*Mycteria americana*	FT
Florida scrub-jay	*Aphelocoma coerulescens*	FT
Reptiles		
American alligator	*Alligator mississippiensis*	FT(S/A)
Eastern indigo snake	*Drymarchon corais couperi*	FT, ST
Gopher tortoise	*Gopherus polyphemus*	ST
Plants		
Curtiss' milkweed	*Asclepias curtissii*	ScE
Florida golden aster	*Chrysopsis floridana*	FE
Nodding pinweed	*Lechea cernua*	ScE
Yellow Butterwort	*Pinguicula lutea*	ST
Giant airplant	*Tillandsia utriculata*	E
Redmargin zephyrlily	*Zephyranthes simpsonii*	ST
Treat's zephyrlily	*Zephyranthes atamasca var. treatiae*	ST

[1]Listed Status: ST – State Threatened; FT – Federally Threatened; FT(S/A) – Federally Threatened (Similarity of Appearance); ScE – Scrub Endemic; FE – Federally Endangered

Listed Flora and Management Measures

Five listed plant species and two scrub endemic plant species have been documented within GAS. These species are primarily located within the scrub and mesic flatwoods. The distribution of threatened and endangered plant species within GAS is periodically notated; various incidental observations from 2017 – 2020 and a special status plant species survey conducted in 2019 recorded most of these occurrences. Additional surveys are recommended to add to the knowledge of the special status plant distribution and sizes of populations. Known habitats make it relatively easy to predict where most are likely to be found. Surveys to determine general locations of the documented imperiled species, as well as others encountered, can be included as part of the general vegetation surveys done to assess plant communities of the preserve, but must also be undertaken at the time of year when each species can be most easily identified. Geo-referenced locations of observed individuals, an estimated extent of the population, and photographs of the plants taken *in situ* will be documented using the FieldMap App. Vouchering at a recognized institutional herbarium (http://sweetgum.nybg.org/science/ih/) and proper identification of each imperiled species found in the preserve is critical and will be

conducted provided the integrity of the population can be maintained. CELM has developed and maintained a close working relationship with the University of South Florida (USF), and representative plants from several Hillsborough County's preserves and parks have been deposited at the USF Herbarium and can be seen at http://www.florida.plantatlas.usf.edu/.

Curtiss' milkweed
This perennial plant is endemic to scrub habitats of central peninsular Florida. It thrives on the bleached, excessively drained sandy soils along with Chapman and myrtle oaks, and other scrub species. The plants grow individually and at a low density; an acre of scrub may have only one plant (Karl, 1994).

Management measures for Curtiss' milkweed
The main reason for decline of this species is habitat loss. Except for a few areas that have been preserved, the majority of scrub habitat supporting this species has been turned into citrus groves or developed into subdivisions. On GAS, known populations should be located and mapped with GPS and photo-monitored to determine the success of management measures. Management measures to protect this species on the preserve include conducting seasonally appropriate prescribed fires, controlling exotic plants and animals, avoiding disturbance to soil within the scrub habitat, and discouraging and prosecuting collectors.

Florida golden aster
The Florida golden aster is a perennial herb resembling many other asters in Florida, apart from its densely haired leaves. The wooly, almost white appearance of the leaves makes this yellow-flowered species stand out among the many other aster species in the area. This aster is endemic to Florida scrub and is known to only a few sites in the central Florida area and GAS was purchased primarily for the preservation and enhancement of the resident Florida golden aster population.

Management measures for Florida golden aster
Florida golden aster requires the well-drained sandy soils of sand pine and oak scrub and seems to prefer disturbed patches of these soils, such as those excavated by gopher tortoises or armadillos. Fire is an important management tool to ensure that areas within scrub remain open and sunny for the asters. Invasive plant species are a serious threat to the Florida golden aster, particularly cogon grass which spreads vegetatively and can aggressively crowd the aster out of its native habitat. In addition, cogon develops a large amount of biomass which burns significantly hotter than a fire would under normal circumstances. These hotter fires may destroy the Florida golden aster and its seed reserve (USFWS, 1999).

CELM conducts regular prescribed burns on the Preserve and monitors and treats infestations of invasive plant species to protect the Florida golden aster. It is recommended that the GPS locations of each Florida golden aster population be periodically photo-documented to determine the success of the habitat maintenance and restoration. CELM also collaborates with Bok Tower Gardens to collect seed to help ensure availability of a genetically diverse source of seeds and plants. The USFWS recovery plan for this species is available at (https://ecos.fws.gov/ecp/species/Q272).

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Nodding pinweed
Nodding pinweed is another plant endemic to scrub habitat. It is a small perennial herb species, branched at the base, with small, hirsute, alternate leaves and numerous small flowers, blooming in June and July. This fire-dependent species requires open, well-drained, sandy soils to survive. This species is found in scrub sites on both the east and west coasts of central Florida (FNAI, 2022).

Management measures for nodding pinweed
As with the other scrub species described in this plan, the nodding pinweed requires fires to maintain the open habitat and can succumb to encroachment by invasive exotic vegetation such as cogon grass. CELM conducts regular prescribed burns on the Preserve and monitors and treats infestations of invasive plant species to protect the nodding pinweed. It is recommended that GPS locations be identified for each population and photo-documentation be maintained to determine the success of the habitat maintenance and restoration (FNAI, 2022).

Yellow Butterwort
Yellow Butterwort is a carnivorous plant that grows in moist to wet sandy-peat soils of seepage bogs, pine savannas and flatwoods, and adjacent to ditches and roadsides. Rosettes to about 15 cm broad; leaves yellowish green, ovate to oblong, the sides rolled upward increasingly to the tips, ciliate on the margins near base and upper surface glandular-pubescent; corolla is sulphur yellow with spur slender and tapering (Godfrey & Wooten, 1981).

Management measures for yellow butterwort
One study (Primer et. al., 2018) suggests habitat structural changes due to lack of management could have long-term demographic impacts on P. lutea. In the absence of fire, open maintained sites become grassy and are eventually invaded by woody vegetation. As sites become more encroached, fewer individuals will bloom and reproduce as less prey are captured, negatively influencing reproduction, growth, and survival of the population. To assist with the persistence of this species and as well as maintain the health of the longleaf pine ecosystem, following the recommended frequent burn regime of every 2–3 years (Noss et al., 2015) should decrease grass cover and prevent complete woody encroachment. Generally, anthropogenic changes such as fire suppression, drainage, or nitrogen loading (Jennings & Rohr, 2011) have unique impacts on carnivorous plants.

Giant air plant
The giant air plant is native to the cypress swamps, hammocks, pinelands, tree islands, sloughs, scrub, mangrove swamps, and many other similar natural habitats, both wet and dry, throughout central and southern Florida and the Keys. It is one of the largest species of bromeliads in Florida, sometimes reaching 2 or 3 feet. This species is epiphytic on tree trunks, branches, and large twigs that can support the plant's weight (Larson et al., 2004). Threats to this species include habitat destruction, collecting, and infestation by the Mexican bromeliad weevil (*Metamasius callizona*) (Larson et al., 2004).

Management measures for giant air plant
This large air plant is a favorite of collectors and is in danger of being over-collected. A more serious threat is the Mexican weevil which has been observed in the vicinity but not yet documented on GAS. The weevil has been decimating populations of this bromeliad throughout

south and central Florida, but recent efforts to develop a natural predator program for the weevil look promising, with the parasitoid tachinid fly (*Lixadmontia franki*) recently released into a Hillsborough County Park and other locations around the state (Appendix G). The populations of giant air plant in the preserve should be monitored to determine if any are infested with the weevil and if so, steps should be taken to prevent it from spreading. Preventative steps could include the release of the parasitic fly and the isolation and quarantine of the infected plants.

Redmargin zephyrlily
The red-margin or Simpson's zephyrlily is a member of the lily family and it is identified by its white flowers with pink or purplish tints, appearing in February through April. The zephyrlily grows in low, mesic pine flatwoods and savannas and at the margins of wet hammocks. It thrives in areas that are periodically mowed, which apparently reduces the competition from other plants (FNAI, 2022).

Management measures for the redmargin zephyrlily
This species' adaptability to mowing or grazing have allowed it to survive thus far, but conversion of flatwoods to subdivisions results in the species' extirpation. On GAS, management measures to help this species perpetuate include conducting prescribed burns, preserving existing drainage patterns, and controlling exotic plant and animal species.

Treat's zephyrlily
Treat's zephyrlily is a member of the lily family and may be identified by its white (sometimes pinkish flower) in which the perianth segments are spread at full anthesis; style and stigmas extend somewhat beyond the anthers; leaves are 1-2 mm wide and sulcate. This species occurs in wet pine flatwoods and in greater abundance during the spring following a fire. They are also found adjacent to mowed sod roadsides and permanent pastures on or near former flatwoods sites (Godfrey & Wooten, 1981).

Management measures for Treat's zephyrlily
This species' adaptability to mowing or grazing have allowed it to survive this far, but the conversion of flatwoods to subdivisions is rapidly extirpating the Treat's zephyrlily. On the preserve, management measures such as conducting prescribed burns, preserving existing drainage patterns, and controlling exotic plant and animal species will help this species to persist.

Management Measures for Fish and Wildlife
The primary management measures for protection and conservation of wildlife on GAS are the prescribed burn program to enhance and manage the habitat, and the control of nuisance exotic vegetation and animals. These management measures are conducted in the preserve on an as-needed basis, and as prioritized by CELM staff. Other measures include maintaining site security to prevent trespassing, poaching, dumping, and other illegal activities.

One of the most important management needs for GAS is greater knowledge of the species present, especially the distribution and sizes of these populations within the preserve. To address this need surveys on the site will continue in perpetuity. A variety of methods will be used; some techniques will target a wide variety of vertebrates, such as drift fence arrays that can capture small mammals and most reptiles; other methods will be species-specific, such as Line Transect Distance Sampling to assess the resident gopher tortoise population, sonic acoustic

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monitoring to assess what species of frogs and birds occur on the preserve, and ultrasonic acoustic monitoring to assess what species of bats use the site.

Listed Fauna and Management Measures

Wading birds (roseate spoonbill, little blue heron, tricolored heron, and wood stork)

Surveys to determine the presence of wading bird rookeries will take place in the late winter or early spring. If any rookeries are discovered measures will be taken to protect these nesting areas. Such measures may include, but not necessarily be limited to, restricting human access by reducing hiking and rescheduling of nearby planned prescribed burns so these occur outside the nesting seasons. Should it become necessary to prevent depredation of eggs or fledglings, efforts also will be taken to control feral cats and dogs.

Although wading bird rookeries have to date not been detected on GAS, some species do exploit the preserve as foraging habitat. Since GAS was acquired, 14 species of wading birds, including four species listed as threatened by either the USFWS or FWC (Table 7) have been observed on the preserve. Additionally, USFWS data (USFWS, n.d.) indicates GAS is within the core foraging area of one known wood stork colony (Fig. 20). Future surveys will take place during each season to determine the extent to which wading birds are exploiting areas within the preserve as foraging habitat. The USFWS, FWC, and various conservations groups (e.g., Audubon Society) also will be consulted to determine what other recent surveys have been done in the general area and if other data, such as recently updated GIS data regarding locations of known rookeries, are available.

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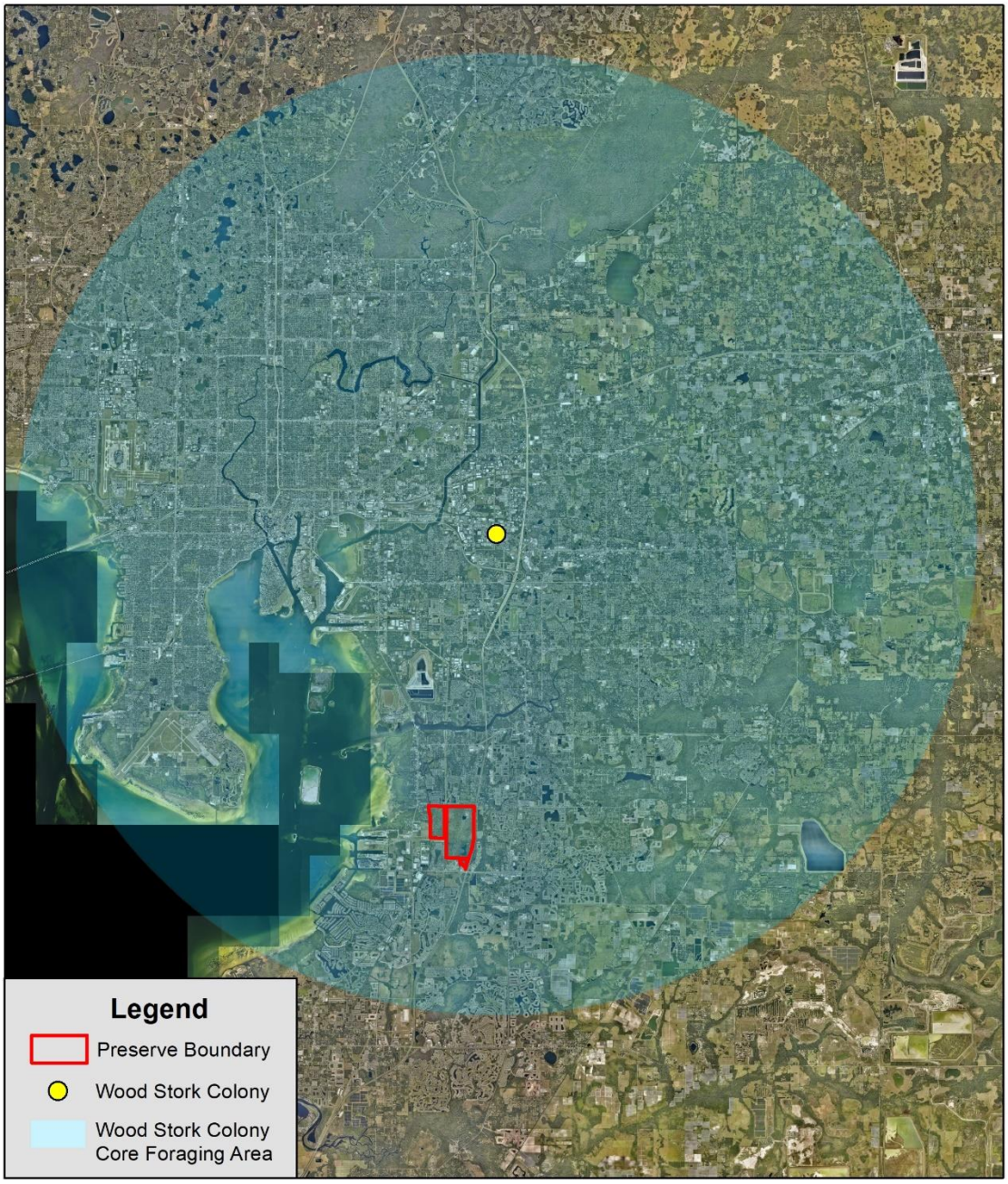


Figure 20
Wood stork colony and core foraging area

Note: Every reasonable effort has been made to assure the accuracy of this map.

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Sandhill cranes
Regularly scheduled surveys of potential nesting habitat within the preserve will take place during the breeding season, which runs from late December through August (B. Stys, 1997). Any nesting habitat or upland foraging habitat located within or adjacent to a management unit scheduled for a prescribed burn also will be surveyed immediately prior to the burn to search for fledglings too young to fly. Other measures to protect adult and juvenile cranes, such as restricting human access to nesting or foraging areas will be implemented on an as needed basis.

Southeastern American kestrel
Nesting boxes were placed on the preserve in the past and used by kestrels, though how frequently is unknown. Surveys to relocate the next boxes and document use by Southeastern American kestrels will need to take place during the late spring after northern migrants leave the area. The Southeastern subspecies also is regularly seen foraging along the TECO ROW that bisects GAS and have been observed nesting in cavities of wooden power poles within the ROW. Consultations and potential collaborations with TECO may result in placing wooden poles and nest boxes along the boundary of the ROW to improve nesting habitat for this species. Other management practices to improve conditions for kestrels on GAS include frequent burning of flatwoods to maintain low-growing herbaceous plant communities, creating more open foraging areas by reducing canopy-forming trees and dense shrubs in fire-suppressed uplands and protecting dead trees that can serve as natural breeding habitat (B. Stys, 1993).

Bald eagle
The habitat on GAS is protected in perpetuity, should bald eagles ever nest there. Prescribed fires and control of exotic vegetation will prevent the degradation of potential habitat and provide nesting opportunities for the future. The USFWS recovery plan for the bald eagle is available at: https://www.fws.gov/media/national-bald-eagle-management-guidelines.

The bald eagle population has increased in the last forty years from around 500 nesting pairs to approximately 10,000 nesting pairs presently found in the lower 48 states. As a result of this increase, per 50 Code of Federal Regulations 17, the Federal Government has elected to delist the bald eagle in the lower 48 states, effective August 8, 2007. With an estimated 1,133 nesting pairs in the state of Florida FWC also delisted the bald eagle.

The eagle is still federally protected by the Migratory Bird Act and the Bald and Golden Eagle Protection Act, however, and the USFWS has prepared the National Bald Eagle Guidelines (USFWS, 2007) with the following intentions:

- To publicize the provisions of the Eagle Act that continue to protect bald eagles, in order to reduce the possibility that people will violate the law,
- Advise landowners, land managers, and the general public of the potential for various human activities to disturb bald eagles, and
- Encourage additional nonbinding land management practices that benefit bald eagles.

While the USFWS treats each case separately, the FWC requires a minimum buffer of 330 feet around a nest during the nesting season, depending upon the activity.

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The USFWS National Bald Eagle Guidelines can be found at: https://www.fws.gov/media/national-bald-eagle-management-guidelines-0.
The FWC Bald Eagle Management Plan can be found at: https://myfwc.com/media/1778/baldeaglesap.pdf.

Florida scrub-jay

The Florida scrub-jay has very specific habitat requirements, and this has exacerbated the decline of this species. Optimal Florida scrub-jay habitat is dominated by shrubby scrub live oaks, myrtle oaks, or scrub oaks from 3 to 10 feet tall, covering 50-90% of the area. This bird also requires bare ground or sparse vegetation less than 6 inches tall covering 10 to 50% of the area, and scattered trees with no more than 20% canopy cover. The Preserve provides approximately 121 acres of scrub habitat (Table 5), and efforts to improve and maintain this habitat for the jays are ongoing.

Management measures for the Florida scrub-jay.

A contractor monitored and banded resident scrub-jays intermittently between 2010 and 2019. By 2017 only three scrub-jays, assumed to be one family group, could be found on GAS and no immigration to the site had been documented in at least 10 years. Considering the small number of individuals and lack of immigration to the site the decision was made in 2017 to begin the process of trapping the resident jays and relocating them to the Duette Preserve in Manatee County, approximately 20 miles southeast of GAS. The contractor began the process of acclimating the resident scrub-jays to traps during the summer of 2017 and continued the effort through the fall of 2019.

Attempts to consistently acclimate the entire family group were unsuccessful. By February 2019 only two jays could be found on GAS. These two scrub-jays made two nesting attempts in 2019. The first attempt failed, but the second attempt resulted in two fledglings. In February 2020, both adults and the two young were observed on GAS. Based on these observations suggesting the resident adult scrub-jays were reproducing, the decision was made to cease efforts to trap and relocate the resident individuals.

Management guidelines for the Florida scrub jay (Fitzpatrick 1991) suggest each family group of jays requires approximately 29 – 30 acres of high-quality scrub habitat. The roughly 121 acres of scrub on GAS therefore may support an estimated maximum of 4 family groups, provided the extant habitat is consistently maintained in good condition. Considering the relatively small amount of scrub present on GAS and its degree of isolation when compared to larger, contiguous patches of scrub to the south in Manatee County, it seems unlikely scrub on GAS will make an as significantly positive contribution to the long-term survival of Florida scrub jays as will conservation efforts elsewhere (e.g., scrub in Manatee County and points further south). Management decisions regarding scrub habitat on GAS will therefore not be based on a single-species approach. Rather, habitat management decisions will be based on benefits realized for the overall floral and faunal communities of the scrub habitat.

Future management of scrub habitat at GAS generally will follow the guidelines recommended by FNAI. It may become necessary, however, to apply prescribed fire more frequently than the recommended fire return interval of 10 to 30 years to achieve conditions suitable for scrub-jays. At the time of purchase, scrub and scrubby flatwoods on GAS were severely overgrown because

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of the long-term absence of fire. Restoration of these habitats within management units GAS 09, GAS_12, GAS_16a, and GAS_16b began with mechanical reduction of the sand pine and oak dominated canopy and roller chopping, followed by one application of prescribed fire to each unit between 2000 – 2005. Two of the units (GAS_09 & GAS_12) also burned during a wildfire of unknown origin in 2006. Although the wild and prescribed fires occurred within the recommended fire return interval of 10 – 30 years, many of the scrub oaks are now at or near the maximum height tolerated by scrub-jays. Further, a cursory walk-through of scrub within the restoration area suggests oaks sprouting from existing roots have proliferated throughout the site, causing an overall decline of the number and size of bare sand patches. Countering this trajectory likely will require burning the scrub more frequently than every 10 years, as well as possibly additional mechanical treatments, at least until the loss of bare sand patches has been reversed.

Effectiveness of future prescribed fire and mechanical treatments will be assessed using the OBVM methods every five years. Any additional vegetation and habitat structure monitoring necessary to assess quality of the habitat specifically for scrub-jays will be done concurrently with the OBVM surveys. Surveys to determine the number of individual scrub-jays and family groups will be conducted annually, either by CELM personnel, qualified contractors, or volunteer groups such as Jay Watch.

American alligator

Alligators have in the past been observed in the large borrow pit located in the southeast portion of the preserve. Systematic surveys for alligators or nests have not been done but it is assumed the species still inhabits the southern borrow pit as well as the smaller pit in the northeast portion of the site. Protecting the alligators on GAS will require protection from poaching, avoiding impacts to water quality, preventing significant fluctuations in water elevation, and preventing human interference. Alligators which have lost their fear of humans and are considered a nuisance will be removed by the Florida Fish and Wildlife Conservation Commission.

Eastern indigo snake

There have been no verified observations of eastern indigo snakes on GAS during the past 15 years. The species may be detected in the future using more intensive survey methods planned for over the next 10 years, such as herp arrays, coverboards, and funnel trapping of gopher tortoise burrows. Protection and management of the eastern indigo snake's habitat requires conducting prescribed burns, controlling the exotic vegetation, and preventing or controlling the influx of exotic animals such as feral pigs that destroy the vegetation and alter habitat, and tegu lizards that are known to feed on eggs and small vertebrate species.

The current U.S. Fish and Wildlife Service recovery plan for the eastern indigo snake is located at https://ecos.fws.gov/ecp/species/646.

Gopher tortoise

Surveys to estimate size of the resident gopher tortoise population and map the distribution of burrows within the preserve have yet to be done. Hillsborough County's acquisition of a fiber optic burrow camera will allow tortoise surveys to be done using the new "Line Transect Distance Sampling" method being adopted by FWC (Smith & Howze, 2013). The extent of soils and habitats considered suitable for tortoises on GAS, however, has been estimated by

conducting a GIS analysis of the site using established criteria of the National Resources Conservation Service (NRCS) and FWC, as well as the recently updated habitat map produced by FNAI.

NRCS uses seven criteria to rate and assign each type of soil to one of four levels of suitability for *G. polyphemus*: highly, moderately, and less suitable, or unsuitable (NRCS 2017, Appendix H). Application of the NRCS (2017) criteria to GAS reveals there are two highly suitable soils (Archbold and Pomello fine sands), one moderately suitable soil (Myakka fine sand), and two less suitable soils (Wabasso and Smyrna fine sands) on the preserve (Table 8). In addition to open water, there are five unsuitable soils on GAS (Basinger, Holopaw, and Samsula fine sand, Felda fine sand, Malabar fine sand, and St. Johns fine sand).

FWC (2020) assigns polygons of NRCS-defined suitable soils to one of two qualitative categories based on size: acceptable (≥40 acres) or desirable (≥250 acres). To account for suitable soils occurring as disjunct polygons FWC (2020) views separate polygons as a single patch if one or more of the polygons are within 1000 feet of each other and not separated by barriers to movement such as paved roads or rivers, or habitat considered unsuitable for *G. polyphemus* (e.g., perennial wetlands, urban lands, row crops, etc.).

Application of the FWC patch criteria indicates there are eight patches of suitable soil on GAS, six of which are too small to meet the minimum threshold for being considered acceptable. One of these six patches, No. 8, is separated from the main body of GAS and expected to be impacted by improvements to an adjacent off ramp of I-75. None of these smaller patches (1 – 5, & 8) will be considered further when making management decisions regarding gopher tortoises on GAS. Of the remaining two, patch 6 exceeds the minimum size for the acceptable category and patch 7 exceeds the minimum size for the desirable criteria (Table 8, Fig. 21).

Table 8 Soils suitable for gopher tortoises on GAS.

Patch No.	Patch Size (Ac.)	Highly Suitable (Ac.)	Moderately Suitable (Ac.)	Less Suitable (Ac.)
GAS 01	0.010069	0	0.010069	0
GAS 02	< 0.00001	0	0	< 0.00001
GAS 03	0.392564	0	0	0.392564
GAS 04	0.136229	0.136229	0	0
GAS 05	0.497798	0	0.497798	0
GAS 06	192.972486	2.682704	100.047662	90.242120
GAS 07	724.693539	188.828172	500.147536	35.717831
GAS 08	19.104245	0	19.104245	0
Total Acreage	937.806930	191.647105	619.807310	126.352515

A second GIS analysis, using the recently updated FNAI data, was done to determine the habitat composition of patches 6 & 7 (Table 9 & Fig. 22). This analysis indicates 117.58 acres of mesic flatwoods is the only habitat suitable for gopher tortoise in patch 6. Patch 7 contains three suitable habitats: mesic flatwoods (356.01 ac.), scrub (120.47 ac.), and scrubby flatwoods (113.66 ac.). This analysis also revealed several areas within each patch support plant communities considered unsuitable for gopher tortoises, resulting in a reduction of the soil-based estimate of suitable area in patch 6 by 75.38 acres (39%) and in patch 7 by 109.24 acres (15%).

Within patch 6 the majority of unsuitable habitat consists of hydric hammock (39.67 ac.) and wet flatwoods (29.07 ac.). In patch 7 most areas considered unsuitable consists of one of four types of landcover; wet flatwoods (48.26 ac.), internal roads and fire lanes (33.97 ac.), areas previously cleared of vegetation (15.26 ac.), and depression marshes (9.18 ac.). The quality of the identified suitable gopher tortoise habitat on the GAS also needs assessment using either the methodology described in FWC's gopher tortoise permitting guidelines (FWC, 2020) or those described for the OBVM, with necessary modifications to include all variables of interest to FWC.

The difference between estimates of available habitat resulting from soil-based and habitat-based analyses likely is the result of the scale at which the two types of maps were created. NRCS soil maps are generally based on interpretation of aerial photographs, and polygons of one type of soil also may include areas of dissimilar soils. In contrast, the FNAI habitat map was done *in situ* on the preserve, and therefore is considered the more conservative and likely most reliable estimate of habitat suitable for gopher tortoises.

Table 9 Habitat composition of patch 6 and patch 7.

Habitat	Suitable for *G. polyphemus* (Yes, No)	Patch 06		Patch 07	
		No. of Polygons	Total Acreage	No. of Polygons	Total Acreage
Mesic Flatwoods	Yes	21	117.589	53	356.015
Mesic Hammock	Yes			2	1.898
Scrub	Yes			38	120.478
Scrubby Flatwoods	Yes			68	113.667
Successional Hardwood Forest	Yes			8	23.391
Total Suitable Habitat			117.589		615.449
Artificial Pond	No			20	0.089
Baygall	No			8	2.142
Clearings / Regeneration	No			10	15.269
Depression Marsh	No	22	3.303	41	9.184
Developed Land	No			1	0.003
Hydric Hammock	No	20	39.672		
Roads	No	3	3.332	40	33.973
Wet Flatwoods	No	20	29.075	24	48.260
Wet Prairie	No			7	0.321
Total Unsuitable Habitat			75.382		109.241

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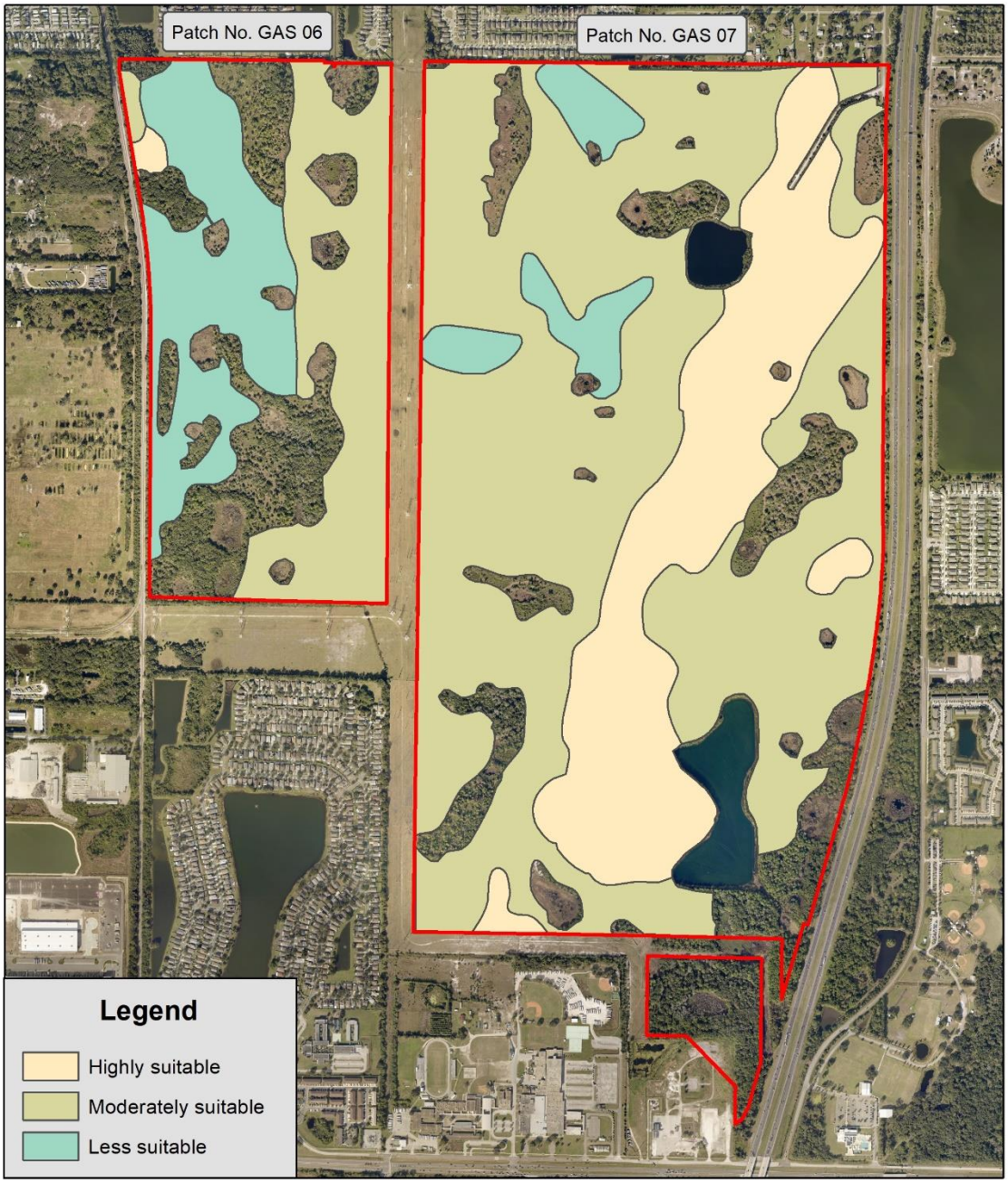


Figure 21
Soils suitable for gopher tortoises

Note: Every reasonable effort has been made to assure the accuracy of this map.

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Prepared for: Florida Department of Environmental Protection

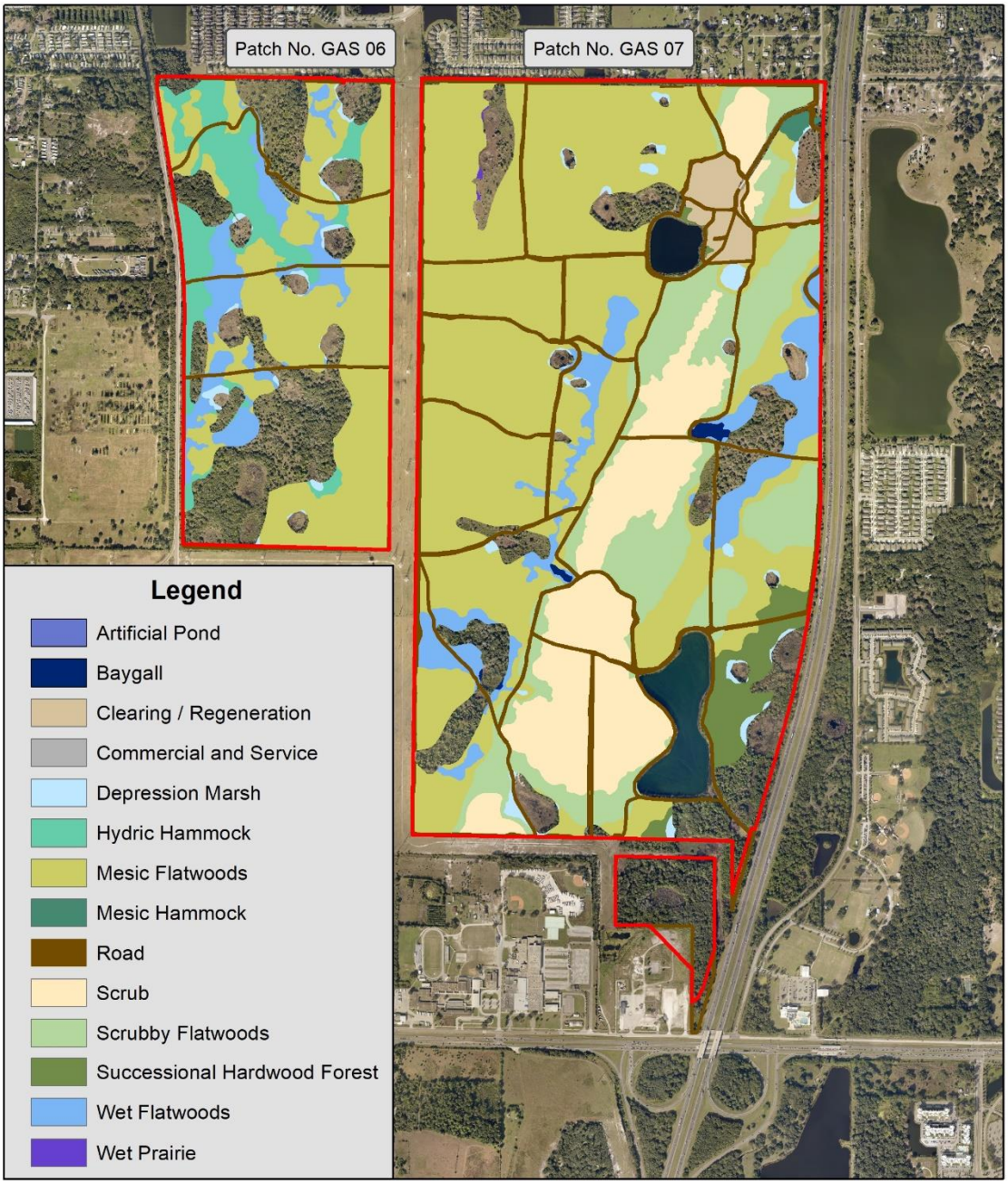


Figure 22
Habitat composition of patches 6 & 7

Note: Every reasonable effort has been made to assure the accuracy of this map.

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Prepared by: Hillsborough County Florida

Prepared for: Florida Department of Environmental Protection

Management Measures for all Special Status Species
Management measures for all protected species in GAS include control of exotic vegetation and animals, maintenance of natural hydroperiods and drainage patterns, restriction of vehicular traffic and inappropriate recreational uses, apprehension and prosecution of poachers and trespassers, and periodic monitoring to assess the status of the various species. If pets are allowed in the preserve, they will be required to be kept on a hand-held leash. Pedestrian access is restricted from sensitive areas. The public should be educated so that they know to avoid disturbing imperiled species and that their carelessness with trash, cigarettes, and other debris could contribute to the decline of these protected species.

Periodic wildlife surveys will be conducted to determine the presence and monitor the status of the protected species on the preserve. GPS tracking of burrows, nests, territories, important foraging areas, and the location of listed plant populations will be part of these surveys. To the greatest extent practicable, habitat-specific management practices will be conducted in a manner consistent with the natural life cycle of the imperiled flora and fauna, such as the prescribed burning of uplands during the appropriate seasons to encourage reproduction. In addition to protection of existing species, the site should be evaluated as a relocation area for other listed species such as gopher tortoises or scrub-jays. CELM's specific resource management policies are provided as Appendix I.

10-year planning period
During the 10-year planning period monitoring of plant and vertebrate species will continue with methods that yielded useful results and proved feasible and affordable during the 2-year short-term planning period. In addition to generalized monitoring, specific surveys for imperiled species, such as gopher tortoises and cavity-nesting species (e.g., Southeastern American kestrels), will be conducted on a regular basis to assess the responses of these species to various maintenance practices and restoration efforts. All collected data will be stored in the form of Excel spreadsheets and GIS shapefiles.

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SECTION F: HISTORICAL, ARCHEOLOGICAL, AND CULTURAL RESOURCES

Definition of Terminology

There are five widely accepted categories of cultural resources: 1) archeological; 2) historic structures; 3) cultural landscapes; 4) ethnographic; and 5) museum collections. On GAS, only archaeological or historic resources are likely to be present. As defined in the National Historic Preservation Act and its implementing regulations in 36 Code of Federal Regulations (CFR) 800, historic properties are those buildings, "Area of Potential Effects", sites, districts, artifacts, and remains that are related to culturally important places and events, and that are listed in or eligible for inclusion in the National Register of Historic Places. The significance of historic properties is assessed by the property's ability to meet the following four criteria for inclusion in the National Register of Historic Places (36CFR60.4):

- Association with events that made a substantial contribution to the patterns of our history.
- Association with the lives of persons important in our past.
- Sites that embody characteristics of a type, period, or methods of construction or that represent the work of a master, possess high artistic value, or represent a distinguishable entity.
- Have yielded, or may be likely to yield, information important to prehistory or history.

Properties may be eligible for the National Register of Historic Places for contribution at the national, state, or local level. For a structure to be listed in the National Register of Historic Places, it must possess historic integrity of those features necessary to convey its significance, such as location, designs, setting, workmanship, materials, feeling, and association in accordance with National Register guidelines.

Agency Correspondence

In the cultural resource analysis of the 1997 Golden Aster Scrub Preserve Management Plan (Hillsborough County, 1997) for the State Lands Management Review Team, it was stated that "there are no archaeological or historical sites recorded in the Florida Site File for the project area. Although the site has never been subjected to a systematic, professional survey, it was noted that data from similar properties in Hillsborough County indicated only marginal potential for archaeological sites." In 2004, Mr. Louis Tesar of the Division of Historic Resources stated that "a recent check of the Florida Master Site File confirmed that there are no archaeological sites recorded within the subject tract, although there are sites recorded within the Kitchen Branch at the northwest corner of the property and along the drainage located near the eastern side of the tract. The subject tract may have been used for incidental hunting activities by the occupants of these two site cluster areas. No archaeological or historical survey in advance of ground disturbing property management activities seems necessary, however, such activities should be monitored by park staff and incidental artifact finds and their discovery locations reported to this agency."

Management Measures for Cultural Resources

CELM staff will coordinate with DHR on the protection and management of archaeological and historical resources, should these be found on GAS. The management of any discovered archaeological and historic resources will comply with the provisions of Chapter 267, Florida Statues, specifically Sections 267.061 2(a) and (b). The collection of artifacts or the disturbance

of any archaeological and historic sites found on GAS will be prohibited, unless prior authorization has been obtained from the Department of State, DHR.
Best Management Practices for Protecting Archaeological Sites, available from the Department of State, DHR (2013) continue to be followed as part of CELM policy. Additionally, the Heritage Monitoring Program (https://hms.fpan.us/hms/home) has been suggested as a means for potential help searching for new, undiscovered sites. Hillsborough County will comply with DHR "Management Procedures for Archaeological and Historical Sites and Properties on State-Owned or Controlled Properties (DHR, 2021). Per these procedures, the County must provide DHR the opportunity to review, comment and provide recommendations on any undertakings regarding historic or cultural resources including land clearing or ground disturbing activities.

Given the low probability of potential archaeological or historical sites, and the fact that no construction or other potential disturbance of the native soil is likely to occur on GAS, no survey was recommended by Mr. Tesar. Mr. Tesar also states that all management activities should be conducted with an awareness of the potential for discovery of cultural resources and should be monitored by CELM. Mr. Richard Estabrook of the West Central Regional Public Archaeology Center at the Museum of Science & Industry (MOSI), however, reviewed records for known cultural resource sites in the vicinity and determined that the presence of sites on adjacent property was an indication that other sites may be present on GAS.

Considering Mr. Estabrook's conclusions, additional surveys may be required for the site if significant earthwork is required in conjunction with other projects. Although most of GAS will remain undisturbed by development activities, limited construction work may occur on the property to accommodate public access and passive recreational uses. DHR will be consulted prior to initiation of significant ground-disturbing improvements. DHR's recommendations, such as development of a cultural resources model to determine the need for a phase I assessment within the limits of construction, will be followed. Should cultural resources be discovered during routine operations or site construction activities, or if evidence is found suggesting the presence of an archaeological or historic resource at the project site DHR will be contacted immediately and work will cease until an evaluation is conducted.

Short-term management goals for the protection of cultural resources
Training – CELM will ensure staff are trained in cultural resource management. Staff periodically will be sent to Archeological Resource Management Training through DHR or other similar programs. Trained staff should periodically consult the DHR web site and obtain updated training as needed.

Education/Interpretation – Historical information can be incorporated into all programming. Interpretation of known cultural resources on the preserve will be made available to the public through various educational forums, including kiosks, signs, web-based information, and education programs. The staff will also be working closely with the local Florida Public Archaeology Network (http://www.flpublicarchaeology.org/) to learn more about the protection and interpretation of cultural resources.

Inspections – Any cultural or historical sites found will be inspected at least once a year to ensure that damage or vandalism has not occurred. Security measures such as posting, fencing,

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inspections, and law enforcement should be implemented as needed to deter vandalism or prosecute violators.

Long-term management goals

CELM's one long-term management goal regarding cultural resources is for additional surveys of the site, as funding permits. Newly discovered sites will be recorded with DHR and afforded the same level protection as currently known sites.

SECTION G: FACILITIES (Infrastructure, Access, and Recreational Resources) & RESOURCE MANAGEMENT

During the 2015 and 2020 LMR, both teams identified areas in need of improvement in both the management plan as well as the implementation of the plan; improve management of facility resources, specifically waste disposal, and improve resource protection through enhanced signage at the entrance and perimeter of GAS.

Existing Recreational Facilities

The facilities on GAS (Fig. 23) presently include a picnic pavilion with tables (Fig. 24) and a composting toilet, one parking area (Fig. 25), a kiosk, and marked hiking trails. To address deficiencies identified by the LMR teams regarding protection and management of these resources, CELM staff has increased the rate of visitation to ensure the recreational facilities and parking area are clean and secure. Unfortunately, these facilities are frequently targeted by vandals who physically damage or deface them with graffiti. Regarding signage on GAS, information provided at the kiosk is updated regularly, and posts delineating the hiking trails are routinely inspected and repaired as needed (Tables 10, 11, & 12).

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Table 10 Maintenance of recreational facilities on GAS (bathroom cleaning and maintenance, building maintenance, garbage removal, hiking trail, kiosk, and trail sign maintenance).

Year	No. of visits	Activity
2008	4	Hiking trail maintenance
2009	2	Hiking trail maintenance
2010	0	
2011	0	
2012	6	Bathroom cleaning and maintenance (3); garbage removal (1); kiosk and trial sign maintenance (2)
2013	13	Bathroom cleaning and maintenance (5); building maintenance (2); garbage removal (1); hiking trail maintenance (3); kiosk and trail sign maintenance (2)
2014	3	Bathroom cleaning and maintenance (2); building maintenance (1)
2015	0	
2016	4	Bathroom cleaning and maintenance (2); garbage removal (2)
2017	15	Bathroom cleaning and maintenance (1); building maintenance (1); garbage removal (11); hiking trail maintenance (2)
2018	7	Garbage removal (4); hiking trail maintenance (3)
2019	24	Bathroom cleaning and maintenance (1); garbage removal (11); hiking trail maintenance (12)
2020	45	Bathroom cleaning and maintenance (3); building maintenance (1); garbage removal (21); hiking trail maintenance (16); kiosk and trail sign maintenance (4)
2021	19	Garbage removal (15); hiking trail maintenance (4)

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Table 11 Maintenance of access (repair, mowing, and trimming of roads and points of entry).

Year	No. of Visits	Activity (no. of events)
2008	10	Access road mowing (10)
2009	4	Access road mowing (4)
2010	1	Access road mowing
2011	38	Access road mowing (38)
2012	25	Access road mowing (24); access road trimming (1)
2013	8	Access road mowing (5); access road trimming (3)
2014	1	Access road mowing
2015	6	Access road mowing (6)
2016	34	Access point maintenance (5); access road mowing (13); access road trimming (16)
2017	27	Access point maintenance (3); access road mowing (14); access road trimming (10)
2018	13	Access point maintenance (9); access road mowing (4)
2019	18	Access point maintenance (10); access road mowing (8)
2020	18	Access point maintenance (4); access road mowing (4); access road trimming (10)
2021	23	Access point maintenance (10); access road repair (1); access road mowing (11); access road trimming (1)

Table 12 Security and boundary maintenance of GAS (boundary marking, fence installation, fence maintenance and repair, law enforcement visit, security check and inspection, security camera installation and maintenance).

Year	No. of visits	Activity
2008	1	Security check and inspection
2009	1	Security check and inspection
2010	1	Security check and inspection
2011	13	Security check and inspection
2012	2	Security check and inspection
2013	13	Fence maintenance and repair (2); security check and inspection (11)
2014	3	Security check and inspection
2015	4	Security check and inspection
2016	31	Fence maintenance and repair (21); security check and inspection (10)
2017	19	Boundary marking (3); fence maintenance and repair (7); security check and inspection (9)
2018	8	Fence maintenance and repair (3); security check and inspection (5)
2019	23	Fence maintenance and repair (2); security check and inspection (21)
2020	35	Fence maintenance and repair (4); law enforcement visit (2); security cameras (3); security check and inspection (26)
2021	15	Security check and inspection

The Preserve is open for hiking, birding, and nature study seven days a week during daylight hours. Due to the sensitive natural resources on the site, no additional resources have been developed. Guided interpretive tours are available upon request for school groups such as during the Great American Teach-In. Twelve events took place on GAS between 2012 – 2020; one was a collaborative effort to train Hillsborough County Fire and Rescue, and eleven were focused on educating interested citizens about the habitats, flora, and fauna on GAS (Table 13). Boating and fishing are not allowed in the borrow pits because of safety concerns and lack of appropriate facilities and access. Other resource management activities that have already been implemented

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are trail maintenance (Table 12) and invasive plant control. A brochure has been prepared which describes the amenities of GAS and list activities that are appropriate and inappropriate for the visitor.

Table 13 Public outreach and educational events.

Date (mm/dd/yyyy	Event
11/10/2012	Collaborated in training of Hills. Co. Fire & Rescue for S-130/190 courses
4/11/2013	Hosted advanced placement / honors course for Riverview High School
10/8/2015	Provided guided tour for University of South Florida Osher Lifelong Learning Institute
7/16/2016	Hosted guided nighttime hike
3/11/2017	Hosted guided nighttime hike
5/16/2017	Hosted guided hike for faculty and students from the University of Tampa
10/15/2017	Hosted guided hike for Florida Birding & Nature Festival
12/15/2017	Hosted program guided by Nature's Guardians
12/29/2017	Hosted guided sunset hike
8/8/2018	Hosted field trip for Nature's Classroom faculty and staff attending a Florida Master Naturalist course
2/8/2020	Hosted trail marking event for volunteers
12/29/2020	Hosted guided nighttime hike

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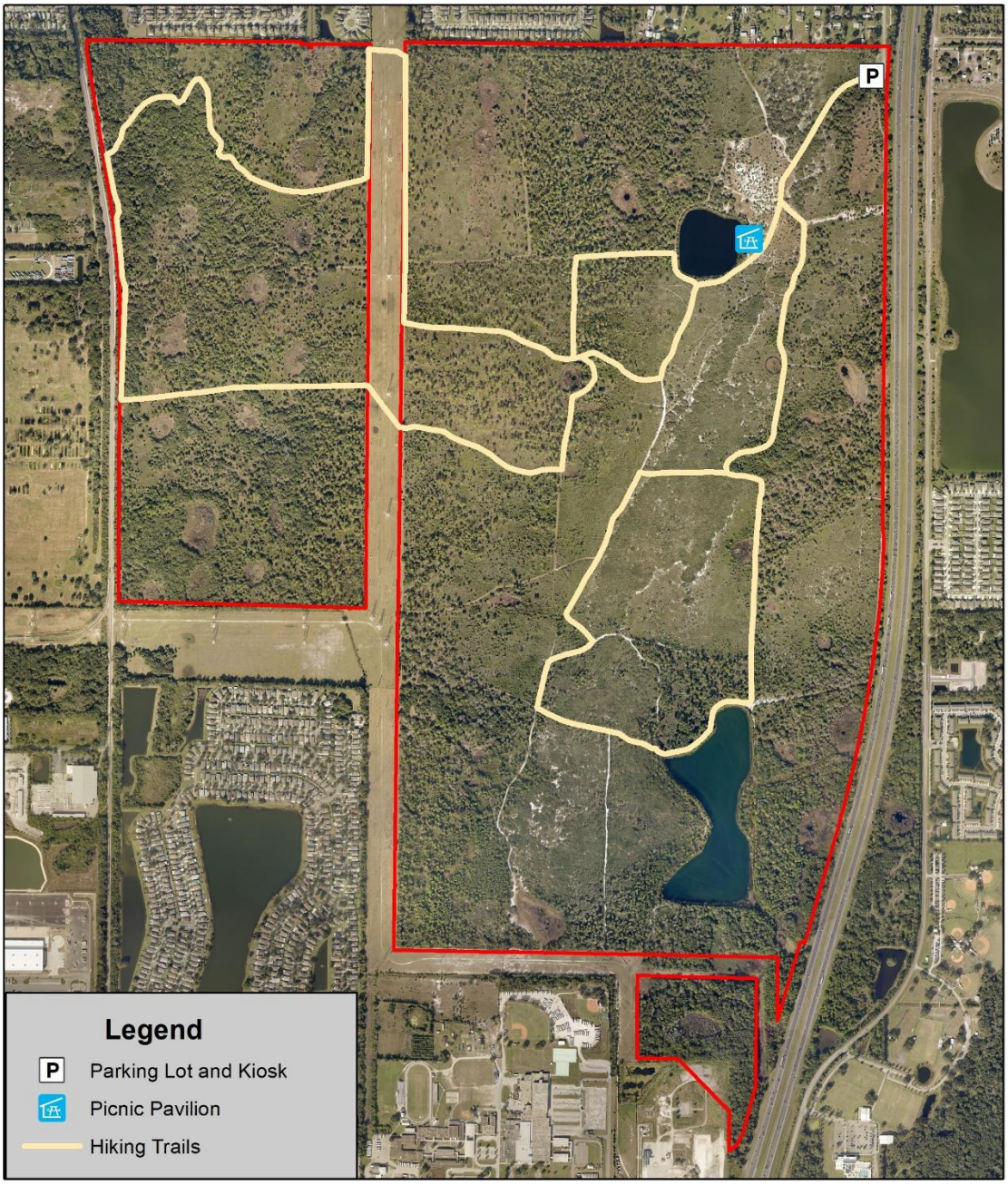


Figure 23
Recreational Resources

Note: Every reasonable effort has been made to assure the accuracy of this map.

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Prepared by: Hillsborough County Florida

Prepared for: Florida Department of Environmental Protection



Figure 24 Picnic pavilion overlooking the northeast artificial pond.



Figure 25 Parking lot at the entrance to GAS. This offers ample parking and a walk-through gate to accommodate hikers as well as wheelchair-bound and other individuals of limited mobility. Brochures are available at the kiosk which provide a map of the Preserve and a description of

Proposed Recreational Facilities
A nature center is proposed for development on the site of the former asphalt plant if funding becomes available. The nature center would be incorporated into the interpretative program. No other facilities are proposed at this time.

Greenways and Trails
The 2015 LMR team encouraged CELM to be proactive regarding potential impacts of the proposed greenway routes along the TECO right-of-way. In response, CELM has maintained a presence at meetings regarding the establishment of a greenway in the vicinity of GAS and conducted a preliminary assessment of potential impacts to GAS should a particular route be chosen.

Excerpts of the Hillsborough Greenways Master Plan and the South County Recreational Corridor Plan pertaining to GAS are provided in Appendix J. The proposed route of concern for a segment of the Adamsville / South Coast Greenway involves GAS. This paved, multi-use trail will traverse the southern portion of the county, extending from McKay Bay to River Bend Ranch north of the Little Manatee River, using existing roads, TECO electrical transmission corridors, and other existing or proposed bike trails. This proposed route would begin where East Bay Road terminates as a dead end near the current main entrance to GAS at the northeast corner of the preserve. From this entrance the proposed trail would proceed westward until it encounters the TECO powerline right-of-way (ROW), roughly 4,500 feet from the point of entry. At the TECO ROW the proposed trail will turn southward and travel approximately 8,500 ft until both the GAS property line and TECO ROW again turn eastward. From this corner the trail would then travel eastward roughly 2,300 feet until again turning southward and eventually ending at Big Bend Road (Fig. 26).

In March 2022 CELM's Environmental Lands Research & Analysis Team (EL – RAT) did a preliminary assessment of environmental impacts that may occur on GAS should this proposed route be constructed. This preliminary assessment consisted of a GIS analysis of the soils and habitats along the proposed route, a review of lists of state or federally protected species documented on the site or suspected to be present, and a cursory pedestrian and vehicular survey along most of the proposed route. It must be stressed that this assessment is strictly preliminary in nature and not intended to convey the full extent of impacts and permitting requirements that may result should this proposed route be constructed.

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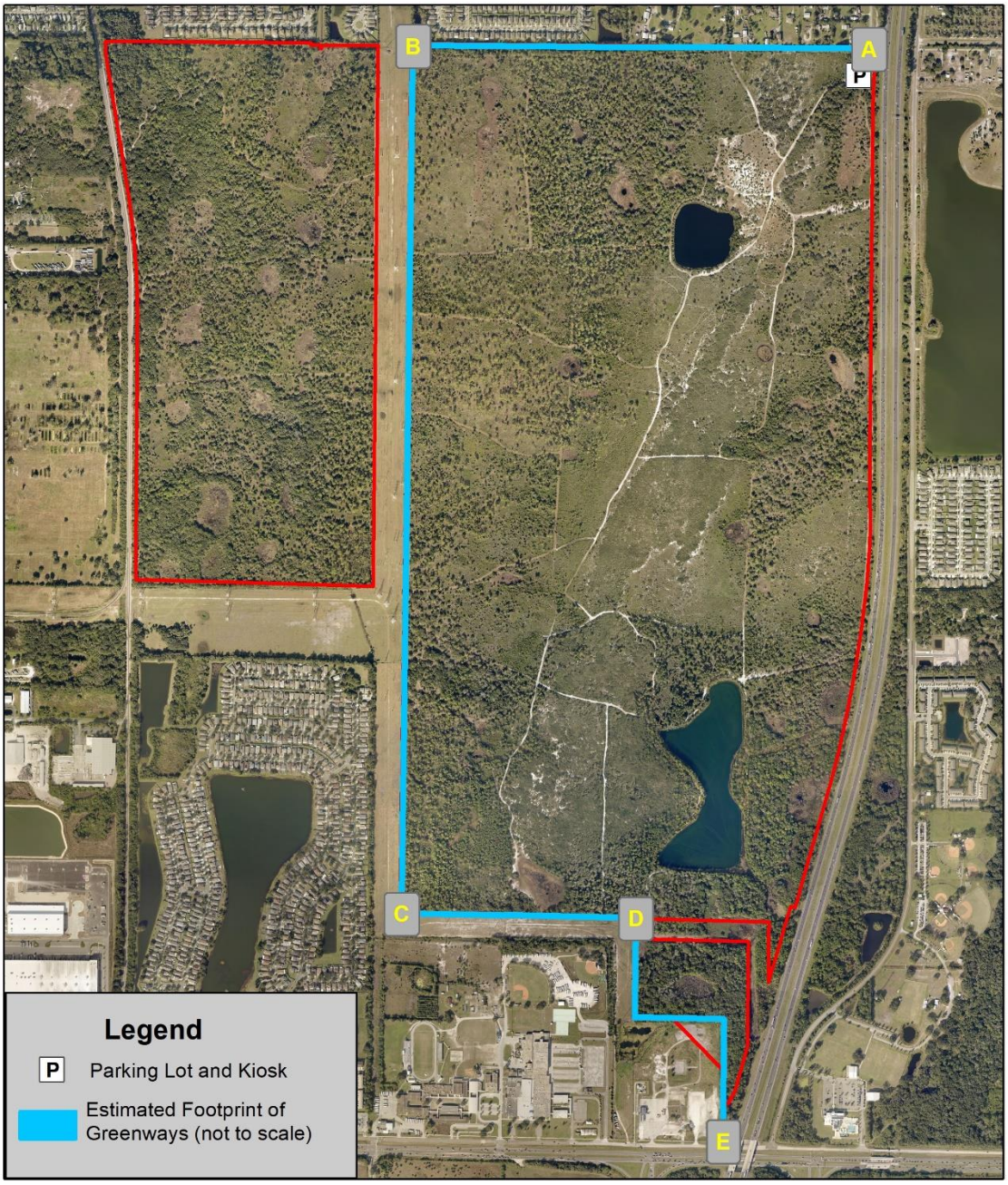


Figure 26
Proposed Route of Adamsville Greenways

Note: Every reasonable effort has been made to assure the accuracy of this map.

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Prepared by: Hillsborough County Florida

Prepared for: Florida Department of Environmental Protection

GIS analysis of soils and habitats.
The GIS analysis was limited to the area assumed to be within the footprint of the proposed trail route. A shape file of the trail was made based on the assumption the trail would be limited to 29 feet in total width beginning at the property boundary of GAS and not require additional land such as for property line setbacks, stabilization embankments, or surface water runoff treatment. This GIS analysis also does not include any potential impacts to upland areas resulting from trail amenities such as rest areas or on-site mitigation requirements to address wetland impacts. Therefore, these estimates of impacts to soils and habitats should be considered a minimum and additional impacts likely may occur.

To estimate potential impacts to soils the trail route shape file was overlaid onto the soil layer provided by the U.S. Dept. of Agriculture Soil Conservation Service. This revealed the trail would cross over 6 (six) types of soil. Four are assigned to Hydrologic Groups D or B/D, some of which may be subject to wetland jurisdiction, permitting, and mitigation requirements. One soil is assigned to Hydrologic Group A, and one to Hydrologic Group C (Table 14).

Table 14 Soils potentially impacted by the proposed Adamsville greenways trail.

Hydrologic Group	Soil Name	Total Acreage (approx.)
D	Basinger/Holopaw/Samsula Soils Depressional	0.39063
B/D	St. Johns Fine Sand	0.00004
B/D	Smyrna Fine Sand	0.31552
B/D	Myakka Fine Sand	9.34659
A	Archbold Fine Sand	0.44853
C	Pomello Fine Sand/0 to 5% Slopes	0.15703

The estimate of impacts to habitats was derived by a similar method; the trail footprint shape file was overlaid onto the updated 2020 Florida Natural Areas Inventory (FNAI) Cooperative Land Cover habitat map for GAS. This exercise revealed the trail would likely traverse from 6 to 8 habitats (Table 15). Potential impacts to habitats are presented as a range because of the mapping methodology used by FNAI (Appendix E); a polygon is assigned to the dominant habitat within that area and small patches of different habitats within the polygon are listed as "included". For example, a polygon identified as mesic flatwoods also may include wet flatwoods.

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Table 15 Habitats potentially impacted by the proposed Adamsville greenways trail.

Dominant Habitat	Included Habitats	Acreage (approx.)
Depressional Marsh	None	0.1427
Mesic Flatwoods	None	0.0347
Mesic Flatwoods	Wet Flatwoods	0.0636
Mesic Flatwoods	Wet Flatwoods, Scrubby Flatwoods	0.0309
Mesic Hammock	Scrubby Flatwoods	0.0211
Mesic Hammock	Successional Hardwood Forest	1.5489
Road (fire lane)	Mesic Flatwoods	8.6824
Scrub	None	0.0450
Scrubby Flatwoods	Mesic Flatwoods	0.1432

Review of species lists.

To date, eleven plant species and eight species of birds of listed status have been documented on GAS (Table 7). The gopher tortoise is the one state-threatened reptile documented on GAS. This species is also under review for being listed as federally threatened. One federally threatened species of snake, the eastern indigo snake, has not been documented on GAS in the past 15 years but is suspected to be present. One species of snake under review for listing as federally threatened, the eastern diamondback rattlesnake, has been documented on GAS. No state or federally listed species of mammal has been documented on GAS. One species under review for being listed as federally threatened, the tricolored bat, has been documented on GAS.

Cursory pedestrian and vehicular survey.

One state-threatened plant, Simpson's Zephyrlily, was documented in the southern half of segment B-C of the trail (Fig. 26). Portions of segments A-B and C-D (Fig. 26) cross soils that support scrub or scrubby flatwoods. These areas have the potential for supporting three scrub endemic listed plant species documented on GAS: Florida golden aster, Curtiss' milkweed, and nodding pinweed.

The surveys documented the presence of gopher tortoise burrows on each segment of the proposed trail. As noted above these surveys were limited to the estimated footprint of the proposed trail, so the total number of gopher tortoise burrows that could be impacted is unknown but likely greater than the number seen during this survey. Per FWC guidelines, all gopher tortoise burrows within 25 feet of construction activity would require permitting. Gopher tortoises occupying burrows impacted by the trail and its construction would have to be captured and relocated either on-site or to an off-site permitted recipient site.

It is, however, the policy of CELM that impacts to gopher tortoise burrows be avoided and gopher tortoises are not removed from ELAPP preserves unless all other options have been exhausted. Relocating affected gopher tortoises further into GAS likely will require permitting with FWC as well as mitigation fees. Permitting also potentially could include encumbering the preserve with a conservation easement written in favor of FWC. Additionally, if the number of impacted gopher tortoise burrows exceeds a certain threshold, the U.S. Fish and Wildlife Service may require a survey for eastern indigo snakes.

Throughout the years following acquisition of the preserve, Southeastern American kestrels have been routinely observed forging within the TECO ROW adjacent to GAS. Suitable nesting habitat for this state-threatened falcon, in the form of cavity-bearing tree snags, was observed on

all segments of the proposed trail route. The number of tree snags along the route that could be impacted is unknown at this time. Should the width or location of the trail need to vary, more tree snags could be affected. Additionally, safety considerations may dictate removal of some snags near the trail. Additional surveys and subsequent permitting and mitigation may be required before impacts to snags along the proposed route could occur. It is important to note that the value of these tree snags is not limited to nesting habitat for Southeastern American kestrels. Numerous other birds rely on this same type of habitat for nesting. Tricolored bats, a candidate species for being federally listed as threatened, also may rely upon some snags for roosting as well as breeding.

A small number of the federally threatened Florida scrub jay reside on the northeast-southwest oriented ridge of scrub and scrubby flatwoods on the preserve (Fig. 4). Currently, the birds are believed to be limited to the middle portion of habitat and not near the proposed trail route. Should the birds expand to areas north or south of their current location, or restoration efforts result in suitable habitat returning to areas where scrub soil is located along segments A-B and C-D of the trail (Fig. 26) permitting to avoid impacts to this federally listed species may be required.

The cursory survey did not include an official wetland delineation. Nevertheless, several areas along segments C-D and D-E were identified where the proposed route of the trail may either directly impact wetlands or cross through required wetland setbacks. If wetland impacts are permitted, mitigation such as wetland creation could be required to take place on site and this could lead to additional impacts to natural upland habitat, grandfather oak trees, gopher tortoise burrows, or other listed species. If wetland impacts or encroachments into setbacks are not allowed and the trail is required to relocate further into GAS, the impacts to upland habitat and species would possibly be much greater.

In addition to potential wetland impacts or setback encroachments subject to state or local regulations and permitting, nearly the entire length of the proposed trail route occurs along areas of GAS that are mapped as Significant Wildlife Habitat (SWH), per the Hillsborough County Land Development Code (LDC). Based on the observed presence of several listed plant and animal species within or near the estimated footprint of the trail, the project also may be subject to the Essential Wildlife Habitat (EWH) ordinance of the LDC. It is unclear as to what mitigation could be required for such impacts because of the unique nature of this project, that being impacts to environmentally sensitive land within a property that was acquired for habitat conservation.

Additional impacts to natural habitats and species may result from other design considerations. For example, the segment A-B of the trail is adjacent to a residential area. Should the residents protest the current alignment and request the trail to be moved further away from their houses impacts to environmentally sensitive areas will likely increase. Also, there is an unfenced retention pond adjacent to segment D-E. Should this retention pond require fencing for safety considerations additional impacts may occur.

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In summary, this preliminary assessment of the proposed route has found:

- The minimum estimated footprint of the route will impact native soils, some of which may be considered hydric soils (Table 14) and subject to wetland permitting.
- Impacts to well-drained upland soils (Table 14) within the proposed footprint also may result in impacts to state and federally listed imperiled plant species (Table 7).
- Although most of the proposed footprint will be located on an existing fire lane, impacts to native upland habitats are still expected to occur (Table 15). Should the route deviate further into GAS, or if the footprint is expanded to meet trail-associated needs, the extent of these adverse impacts likely will increase.
- One listed plant species has been documented within the proposed footprint and other imperiled plant species may be present as well.
- Gopher tortoise burrows were observed along each segment of the proposed route. If impacts to burrows can't be avoided, affected tortoises would need to be relocated out of harm's way. This will likely result in the need for additional permitting and possibly encumbering the property with a conservation easement written in favor of FWC.
- Impacts to gopher tortoise burrows may trigger a requirement for an eastern indigo snake survey, per guidelines of the U.S. Fish and Wildlife Service.
- Southeastern American kestrels are known to forage along the TECO ROW and likely nest in the cavity bearing trees and tree snags on GAS that are either within or near the footprint of the proposed route. Impacts to this species or its nesting habitat may require mitigation.
- Wetland impacts or encroachments into wetland setbacks may occur if the proposed trail route is constructed. Mitigation for these impacts or changing the route of the trail to avoid such impacts may lead to additional impacts to natural upland habitats and imperiled species.
- Nearly all of GAS along the proposed trail route is mapped as SWH and may also be subject to the EWH permitting, preservation, or mitigation.
- The implementation of this project will effectively bisect the Preserve, limiting the ability of animals to access the habitat in the western portion without the risk of predation or human impact.

Should this trail be constructed as proposed, the boundaries of GAS will need to be fenced along the TECO corridor to prevent open access to natural areas. Walk-through gates or walk-over features will be installed to accommodate the existing hiking trail which bisects the transmission corridor in two areas.

For the reasons discussed above, CELM **does not support** the construction of the Adamsville / South Coast Greenway along the boundary of, or through, GAS.

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Resource Management
Site Security
GAS no longer has a site security resident. The Preserve lies in unincorporated Hillsborough County and is therefore within the jurisdiction of the County Sheriff's Office. Without a site security residence, the department relies upon staff conducting regular visits to the site and regular patrols from the Sheriff's Office to discover violations (Table 12).

Ongoing problems on the Preserve include illegal access through cut or damaged fences, illegal harvesting of saw palmetto fruit, vagrant camps, vandalism of facilities, illegal dumping, and arson. There are chronic problems with cut fences and illegal activities such as unauthorized camping and parties along the southern boundary adjacent to the schools. The electrical transmission corridors through the Preserve also make the site more vulnerable to illegal activities by facilitating access.

All gates on GAS remain locked except when a prescribed fire is taking place, or the department is responding to a wildfire or arson. The main gate also is posted against trespassing and hunting. Fences are periodically checked for damage and repaired as needed. Improvements to site security could include cameras monitoring areas where illegal dumping and trespassing is suspected or known to occur and increased patrols by the County Sheriff's Office. A summary of CELM's site security related activities is presented in Table 12.

Exotic Species Management
The teams of the 2015 and 2020 LMR identified a need to improve the management plan regarding the monitoring, prevention, and control of non-native invasive and problematic flora, fauna, and pathogens. In this updated management plan CELM identifies methods to be used for the detection, monitoring, and control of these undesirable species. The 2015 LMR team also recommended negotiating with TECO, FDOT, and CSX Transportation to form partnerships to control exotics within the utility and transportation corridors.

After the 2015 LMR, TECO began leasing their ROW for cattle grazing and this has reduced the level of infestation in this corridor. In 2021 CELM and FDOT began discussions on forming a cooperative arrangement on the removal and subsequent control of invasive exotic plant species along the I-75 corridor in southern Hillsborough County, including that portion of I-75 that borders GAS. FDOT agreed to pursue funding in their next fiscal year and CELM agreed to remove all invasive plant species on preserved lands within 1000 feet of the I-75 corridor. To date, CSX has not been contacted to discuss a similar arrangement.

Control of exotic and invasive plant and animal species are important components of maintaining intact habitats and ensuring success of restoration projects. A long-term plan for controlling undesirable species must contain certain elements for there to be a realistic expectation of success. The plan must include a monitoring program capable of detecting undesirable species when infestations are still controllable and have enough statistical power to assess whether efforts at control produce the desired results.

Monitoring of exotic and invasive plant species will follow the same procedures used to monitor natural plant communities throughout GAS such as, but not necessarily limited to, methods described in the FWC (2021) OBVM or in the Bureau of Land Management's Technical

Reference *Measuring & Monitoring Plant Populations* (Elzinga, et al., 1998). Monitoring for exotic animal species will be included as part of the ongoing standardized sampling for native vertebrate species. Whether for exotic plant or animal species, it is anticipated that some species-specific sampling methods will be necessary on a case-by-case basis.

The plan to control exotic species also must include secure resources for implementing the monitoring program as well as controlling infestations. These resources may be in the form of adequate staff and material for monitoring and controlling of exotics, or enough funds for hiring qualified contractors to do the work, or a combination of these two options.

Regarding the control of pathogens, CELM in collaboration with the Mosquito Management Services of the Hillsborough County Public Works Department has developed an arthropod control plan (Appendix K).

Invasive Exotic Plants

The predominant invasive exotic plants known to exist on GAS are Brazilian Pepper (*Schinus terebinthifolia*), Japanese and Small-leaf Climbing Ferns (*Lygodium spp.*), Lead Tree (*Leucaena leucocephala*), Camphor Tree (*Cinnamomum camphora*), Caesar Weed (*Urena lobata*), Skunk Vine (*Paederia foetida*), Tropical Soda Apple (*Solanum viarum*), Cogon Grass (*Imperata cylindrica*), Guinea Grass (*Urochloa maxima*), Torpedo Grass (*Panicum repens*), Paragrass (*Urochloa mutica*), and Australian Pine (*Casuarina equisetifolia*), but these species are generally under control. New species and new infestations can occur frequently, and the staff surveys the Preserve on a regular basis to prevent new infestations from becoming established. Areas are treated on an as needed basis, prioritized by the staff according to resources available. Table 16 summarizes the number of exotic plant control events 2008 – 2021. It is important for staff to gather GPS data regarding the location and extent of each infestation to monitor the success of the treatments and to determine if new infestations are occurring.

Table 16 Exotic plant control events 2008 – 2021.

Year	Total Number of Visits	Management Units Treated
2008	2	Unknown, general spraying across site
2009	3	Unknown, general spraying across site
2010	0	N/A
2011	4	Unknown, general spraying across site
2012	14	6a, 6b, 10a, 10b, 14, 18
2013	1	6a, 6b, 14, 17a
2014	3	3, 4, 5, 6b, 7, 10a, 14, 21
2015	2	1a, 1b, 2, 3, 4, 5, 6a, 19
2016	3	5, 6a, 18
2017	2	1a, 5, 18
2018	1	6b, 18
2019	2	5, 6a, 6b, 7, 8a, 10a, 18
2020	13	1a, 1b, 2, 3, 4, 5, 6a, 6b, 10a, 10b, 11, 15, 17b, 18
2021	1	6a, 6b

Exotic plants can be treated by mechanical, physical, chemical, or biological methods, or combinations of one or more of these methods. Mechanical treatments include cutting or pulling vegetation and often is followed by chemical spraying. Physical treatments include use of

prescribed fire or water impoundment to kill or at least slow spread of exotic plants. Chemical treatments are the most widely used and effective method, at least for the short term. This involves use of herbicidal sprays applied from backpack sprayers or sometimes from helicopters. Biological controls are the slowest methodology of treatment, but when implemented properly, can be the most effective over the long term. Biological control involves introduction of a natural predator or pathogen that destroys the targeted exotic species. Biological treatment requires years of testing to ensure the introduced control does not create new problems in the environment.

Treatment methodologies for exotic plant species are continually changing as new herbicides and biological controls are developed. There are numerous references available for types of chemical herbicide application and biological treatment and the science of exotic control continues to evolve. CELM is committed to using the latest technology and the safest methodology available to reduce existing infestations. Some resources online include:

Center for Aquatic and Invasive Plants Web site http://plants.ifas.ufl.edu.

Florida Invasive Species Council (FISC) Web site https://floridainvasivespecies.org/

Identification and Biology of Non-Native Plants in Florida's Natural Areas. K.A. Langeland and K. Craddock Burks. 165 pp. 1998. IFAS Publication SP 257.

Integrated Management of Non-Native Plants in Natural Areas of Florida. K.A. Langeland and R.K. Stocker. 34 pp. 2001. IFAS Publication SP 242.

Help Protect Florida's Natural Areas from Non-Native Invasive Plants. K.A. Langeland. 1999. IFAS Circular 1204.

The most effective method for the treatment of exotic plant infestations is prevention. This will require periodic monitoring of vulnerable areas in the Preserve and maintenance of all occurrences while they are in the early stage of development.

2-year planning period

Regarding exotic plant species, the goals of the 2-year planning period are a general assessment of conditions within GAS, including production of an updated GIS layer showing all documented infestations of exotic plants. This information will be the foundation of a triage process to determine priorities and treatment schedules for habitats within each management unit. Management units yielding the greatest benefit from immediate actions will take priority over areas requiring intensive efforts over a longer period to realize measurable improvements. From the perspective of exotic plants, examples of areas benefitting from immediate actions are those supporting otherwise intact natural plant communities but contain exotic plant infestations that can be reduced to tolerable levels within one or two years.

After triage, standard sampling methods for assessing plant populations will be used to determine the extent of exotic species or overgrown native species within areas designated for treatment during the next two years. Following treatment, these areas will again be surveyed to assess whether management efforts reduced exotic species and overgrown native plants to within

tolerable levels. Depending on results of the initial assessments, securing the services of a qualified contractor to conduct pre- and post-treatment surveys as well as efforts to eradicate the undesirable vegetation may be more efficient than attempting the work with county staff.

10-year planning period

Activities during the 10-year planning period will consist of regular monitoring and efforts to control invasive and exotic species. For plants, monitoring will be done in conjunction with surveys of native plant communities but also will include sampling designed for early detection of outbreaks and assessing the effectiveness of efforts to control the undesirable species. The overall goal is to limit undesirable species to, or below, tolerable levels on an annual basis during this 10-year planning period. All collected data will be stored in the form of Excel spreadsheets and GIS shapefiles.

Invasive Exotic Animals

The exotic animals observed on GAS to date are feral pigs, domestic cats, nine-banded armadillos, and Cuban tree frogs. Argentine black and white tegus are known to occur on other areas such as Rhodine Scrub Preserve and Balm Boyette Scrub Preserve and there has been one unverified sighting of this exotic lizard on GAS. Periodic monitoring to determine the presence of nuisance species is recommended so removal can occur before the feral animals breed on site and become a serious problem. Discovery of some exotic species likely will occur during informal searching that is coincidental to routine activities such as mowing, maintaining firebreaks, and controlling exotic vegetation. Systematic surveys using statistically valid and repeatable methods are essential, however, if two fundamental goals of controlling exotic wildlife are to be achieved; 1) detecting exotic species while populations are still small enough to control and 2) assessing the effectiveness of measures taken to control the exotic species.

Feral hogs are especially destructive to natural areas because they disturb the soil and potentially facilitate exotic plant invasions. Trapping of hogs on GAS by CELM staff has not been successful. Between Dec. 2012 and Nov. 2013 there were 13 trapping events that resulted in the capture and removal of 3 feral hogs. Beginning in 2013 Hillsborough County has contracted with professional trappers to capture and remove entire social groups (sounders) from the preserve. Between 2013 and 2021 these trappers reported removal of 341 feral hogs from GAS. Additional information regarding feral hogs is provided in Appendix L – Exotic Species Information. Feral cats are humanely trapped by staff and taken to the County's Pet Resource Center.

One invertebrate pest recently found in the vicinity of GAS is the Mexican bromeliad weevil (*Metamasius callizona)*. This weevil was inadvertently imported to south Florida in 1989 and has since spread throughout the State. The weevil destroys native bromeliads such as *Tillandsia utriculata*. Scientists at the University of Florida released *Lixadmontia franki*, a parasitic fly native to Honduras in several test areas to determine its efficacy in controlling the weevil. If this fly appears to be safe to use in natural areas, it will be released throughout Florida to control the weevil. In the meantime, the Florida Council of Bromeliad Societies has initiated a program to collect and preserve seeds of the bromeliads, especially the rare species, to prevent the extirpation of these unique and important plants (https://entnemdept.ufl.edu/frank/bromeliadbiota/danger.htm).

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Prescribed Burns

The teams of the 2015 and 2020 LMRs identified a need for increasing the amount of area burned, as well as frequency and seasonality of prescribed fires. As shown in Table 17 (below), CELM is aware that the prescribed fire program for GAS is behind schedule. Given the situation of GAS in relation to the surrounding landscape acceptable wind and other weather conditions are limited, making getting authorization to conduct prescribed fires on this preserve difficult. Nevertheless, CELM is committed to improving the frequency of seasonally appropriate prescribed fires on this preserve. Table 18 (below) summarizes the prescribed fires and wildfires that have taken place 2008 – 2021.

The 2015 LMR team also recommended that CELM pursue funding for a tractor plow to help with prescribed burns on preserves with an extensive urban interface, such as GAS. As of Hillsborough County's fiscal year 2021 – 2022, a 2020 John Deere 650K Dozer has been acquired and the department is awaiting delivery of a Mathis Model P-32H 2-disc hydraulic fireline plow attachment. In addition to this equipment CELM now has a Prescribed Fire Team whose responsibility is to prepare sites for the safe application of prescribed burns, especially where preserves are adjacent to urban and residential areas.

Prescribed burns are conducted as resources become available and when climate conditions are appropriate. CELM will conduct the burns, with assistance from the Florida Forest Service when available. Upon surveying the pre-burn conditions, additional site preparation activities may be implemented to achieve natural community specific goals (e.g., roller-chopping, hardwood reduction, etc.).

GAS is divided into separate burn units (Fig. 27) based on the type of habitat and the recommended fire return interval (FRI), as indicated by FNAI's Natural Community Classification Guide 2010. For instance, burns within mesic flatwoods should occur on a two to four-year interval to encourage the growth of pine flatwoods species. An example of the prescription required to conduct a burn is provided in Appendix M.

CELM prioritizes prescribed burns for areas which contain listed species or plant communities dependent on fire (e.g., gopher tortoises, mesic flatwoods, etc.), areas in need of restoration plantings, and/or areas in need of fuel reduction adjacent to urban areas. There are four natural communities that are targeted for active fire management at GAS: mesic flatwoods, wet flatwoods, scrubby flatwoods, and scrub. Other natural communities that are burned opportunistically include baygall, depression marsh, hydric hammock, mesic hammock, successional hardwood forest, and wet prairie. These habitats tend to burn more completely along the edges and may not burn homogeneously throughout the entire patch of habitat. The following is a summary of the four natural communities with active fire management.

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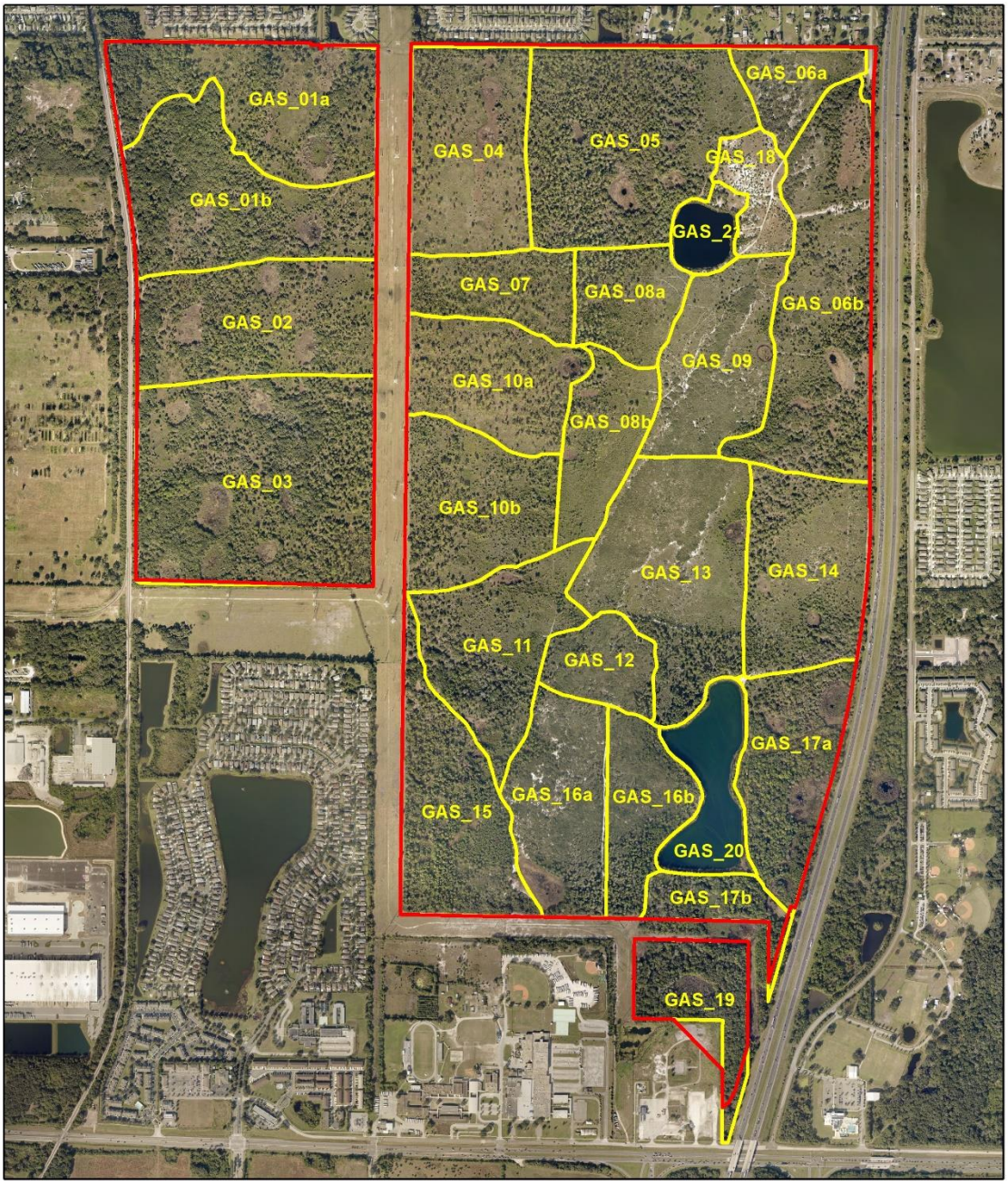


Figure 27
Management Units of GAS

Note: Every reasonable effort has been made to assure the accuracy of this map.

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W E
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Prepared by: Hillsborough County Florida

Prepared for: Florida Department of Environmental Protection

Mesic Flatwoods (frequent fire, FRI 2-4 years): Mesic flatwoods is the dominant natural community on the site (~518 ac.); this habitat is found primarily west of the central scrub (Fig. 4). Three management units (Fig. 27) with a significant area of mesic flatwoods have been burned within the recommended fire return interval (units 2, 4, and 7); however, over 50% of the mesic flatwoods on GAS are one to five years outside of the recommended FRI (units 1a, 1b, 3, 5, 8a, 9b, 10a, 10b, 11, and 13). These units should be prioritized for prescribed fire. The remaining areas of mesic flatwoods, which are over five years outside the recommended FRI, occur as small, isolated patches surrounded by scrubby flatwoods.

Scrub (occasional fire, FRI 10-30 years): With a total of ~121 ac., scrub is a significant habitat at GAS (Fig. 4) which provides critical habitat to several listed wildlife and plant species. All the scrub on GAS is within the recommend FRI, having burned within the last 30 years; however, five managements units (9, 13, 12, 16a, and 16b) could benefit from more frequent prescribed fire since they were subject to mechanical reduction habitat restoration in 2004.

Scrubby Flatwoods (occasional fire, FRI 5-15 years): Most scrubby flatwoods occur in the transition zone between mesic flatwoods and scrub (Fig. 4) and is within the recommended FRI. This habitat can be burned concurrently with the management units dominated by scrub.

Wet Flatwoods (frequent fire, FRI 2-4 years): The majority of wet flatwoods consists of smaller patches within mesic flatwoods (Fig. 4) and is 1-5 years outside the recommended FRI. This habitat can be burned concurrently with the management units dominated by mesic flatwoods.

Table 17. Area (acres) of fire-maintained natural communities by fire status on GAS.

Natural Community	**Within FRI** (acres)	**1-5 Years Outside FRI** (acres)	**> 5 Years Outside FRI** (acres)	**Total** (acres)
Mesic Flatwoods	108 **21%**	338 **65%**	72 **14%**	518 **100%**
Scrub	121 **100%**	-	-	121 **100%**
Scrubby Flatwoods	93 **81%**	15 **13%**	7 **6%**	115 **100%**
Wet Flatwoods	11 **10%**	61 **54%**	41 **36%**	113 **100%**

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Table 18 Management unit and acreage details for prescribed fires (P) and wildfires (W), 2008 – 2021.

Date (mm/dd/yyyy)	Type	Management Units	Total Acreage Treated[1]
10/16/2008	P	GAS_06b	78.314291
6/10/2009	P	GAS_04	53.758417
8/23/2011	P	GAS_07	26.142111
10/31/2011	P	GAS_08a	24.526778
11/17/2011	P	GAS_10a	41.097032
12/18/2011	P	GAS_08b	28.167493
3/27/2012	P	GAS_06a	16.524765
4/24/2013	P	GAS_04	53.758417
7/16/2013	P	GAS_07, GAS_08a, GAS_08b, GAS_10a, GAS_10b	167.140243
10/31/2013	P	GAS_11	47.939457
5/7/2014	P	GAS_08a, GAS_08b	52.694271
5/13/2014	P	GAS_13	69.897931
12/2/2014	P	GAS_05	83.648761
7/12/2016	W	GAS_01a, GAS_01b	121.398703
5/25/2016	P	GAS_06a	16.524765
8/25/2016	P	GAS_02	58.451025
9/14/2016	P	GAS_03	105.949274
10/20/2016	P	GAS_01a, GAS_01b	121.398703
11/8/2016	P	GAS_10a	41.097032
4/30/2018	W	GAS_06b	78.314291
12/19/2018	P	GAS_04, GAS_07	79.900528
5/8/2019	P	GAS_02	58.451025
3/9/2020	W	GAS_06b	78.314291
9/30/2020	P	GAS_06a	17.33978

[1]Total Acreage Treated: Equivalent to the acreage of the management unit; it is assumed each unit burned in a mosaic pattern and the entirety of the unit did not burn but was exposed to fire.

The Importance of Fire

Prescribed fire is a land management tool used to restore and maintain fire-dependent ecosystems, enhance forest health, improve wildlife habitat, and prevent dangerous, uncontrolled wildfire by reducing hazardous fuels. Fire promotes healthy ecosystems by clearing out competing vegetation, cycling nutrients into the soil, providing food for wildlife, and stimulating fire-dependent plants to grow and produce seed (USDA Forest Service, n.d.). Concerns regarding smoke created by prescribed fire are a priority, due to the major highway forming the eastern boundary, and the recent development of subdivisions nearby.

Because of Florida's long history of lightning fires, many of the state's natural systems are adapted to fire and depend on periodic fire to remain healthy. Prescribed burning is a vital tool for managing pine flatwoods, pine sand hills, and sand pine/oak scrub found in the region. These natural systems shelter many threatened and endangered plant and animal species that rely on fire to survive, such as Florida black bear, Florida scrub-jay, eastern indigo snake, gopher tortoise, and scrub holly. When fire is kept out of these areas, some plant and animal populations decline and eventually disappear (Myers & Ewel, 1990).

Management Measures for Fire

Prescribed fires are conducted on County-managed lands as resources become available and when climate conditions are appropriate. Preparation for burns includes the preparation of a burn plan, preparation of fire lanes, surveying pre-burn site conditions, and notifying homeowners that may be affected by the burn. CELM will share some of these responsibilities with the assistance of the State of Florida Forest Service or specialized contractors. The burn units established for the Preserve are shown in Fig. 27. A sample burn plan is included in Appendix M.

Summary of Management Goals and Objectives

Habitat Restoration

Goals of the 2-year Planning Period

Short-term management goals for GAS range from those addressing immediate needs to those serving as the foundation for attaining long-term goals (Table 19). Of primary importance is conducting prescribed burns on management units that are overdue to burn and establishing a baseline of habitat conditions using the Objective-Based Vegetation Management (OBVM) program (FWC 2020).

OBVM

The Florida Natural Areas Inventory (FNAI) natural community classification system is the basis for categorizing and mapping plant communities within GAS. The re-mapping work conducted by FNAI in 2020 set the groundwork needed to establish the level of effort required to achieve desired conditions for measurable attributes characteristic of each habitat. Quantitative methods such as, but not necessarily limited to, FWC's OBVM will serve as the basis for describing initial conditions and measuring changes of selected attributes in response to various practices. Use of additional methods, such as monitoring certain species-specific attributes, will occur on an as needed basis.

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Table 19 Habitat restoration goals of 2-year planning period (1 Oct. 2022 – 30 Sep. 2024), presented chronologically.

Category	Activity	Schedule	Labor Source
Maintenance	Continue protection and management of all listed species populations in the Preserve.	Ongoing	Staff
Maintenance	Continue to conduct prescribed burns and other vegetation management measures, such as roller-chopping, to improve habitat conditions and reduce fuel loads for prescribed burns.	Ongoing	Staff
Maintenance	Continue to manage invasive exotic species in the Preserve. There are known populations of feral hogs on the Preserve, which can be highly detrimental to native habitats.	Ongoing	Staff or contractor
Long-term Monitoring	Continue wildlife survey work in the Preserve, with emphasis on listed species. Continue to map listed species and implement management strategies for protection of these species.	Ongoing	Staff
Long-term Monitoring	Conduct OBVM.	Begin Nov. 2022	Staff
Outreach	Continue efforts to bring environmental education to schools, with emphasis on local schools. Keep the Preserve open to the public as much as possible while preserving the integrity of the habitat and protecting wildlife populations.	Ongoing	Staff

Goals of the 10-year planning period

The 10-year planning period is a logical extension of the 2-year short-term planning period and focuses on maintenance of natural habitats. The way these activities are carried out will reflect both the long-term potential for habitats and limitations identified during consultations with the FFS, FWC, and the Planning Commission.

Prescribed fire is one of the most important tools for managing many upland habitats within GAS. Following any necessary fuel reduction burns, all areas to be maintained as pyrophytic habitats will be placed on a rotating schedule of growing season burns. The frequency of burning any area will be consistent with the plan for maintaining a specific habitat within that area. The long-term goal is for all patches of intact fire-maintained habitat to have been burned the appropriate number of times during the ten-year lifespan of this management plan (e.g., areas maintained as flatwoods will be burned every two to four years, or two to five times during the span of this management plan).

Monitoring

The long-term monitoring program for GAS will be a continuation of those methods successfully used during the 2-year planning period. The frequency with which monitoring is done depends upon the information needed. For example, monitoring to detect new infestations of invasive species will likely need to be done on an annual or semi-annual basis while monitoring to assess the effects of various management practices will likely be done less frequently, such as every

three to five years. Monitoring of the plant communities on GAS will in part be based on methods described in the FWC's (2020) OBVM. It is anticipated that some species-specific methods also will be needed to address questions such as how management practices affect the demography of an imperiled plant species. All collected data will be stored in the form of Excel spreadsheets and geodatabases.

Table 20 Monitoring goals of 10-year planning period (1 Oct. 2022 – 30 Sep. 2032), presented chronologically.

Category	Activity	Schedule	Labor Source
GAS – Long-term Monitoring	Periodic vertebrate sampling and species-specific surveys	2023, 2026, 2029, 2032	Staff or Contractor
GAS – Long-term Monitoring	Periodic monitoring of GAS management units, with special emphasis on special status plant species	2023, 2026, 2029, 2032	Staff or Contractor
GAS – Long-term Maintenance	Restrict invasive plant infestations to, or below, tolerable levels	Annually	Staff or Contractor
GAS – Long-term Maintenance	Increase the percentage of natural habitat within the recommended fire return interval to 100% by end of 10-year period.	Annually	Staff

Habitat Maintenance

Habitat maintenance is one of the essential elements of a preserve management plan, along with planning, monitoring, and restoration. Activities considered habitat maintenance are those long-term efforts intended to maintain a particular habitat in a desirable condition, such as using prescribed fire on an appropriate schedule or limiting invasive plant species to, or below, tolerable levels.

To a certain degree, efforts to maintain habitats within GAS are influenced by conditions beyond the boundaries of the preserve. For instance, how and when management units are subjected to fire may depend on the distance and direction to smoke-sensitive areas. Adjacent properties potentially being a continual source pool for exotic plant infestations may necessitate an ever-increasing expenditure of resources to control undesirable plants.

The extent to which external factors, such as those indicated above, influence maintenance activities will likely vary over time as conditions change both within the preserve as well as in the surrounding landscape. Therefore, the schedule for meeting long-term objectives for maintenance of habitats may vary as conditions change. For example, it may become necessary to significantly increase efforts to control exotic plant infestations if conditions change for the worse on adjacent lands.

Activity: Update and implement prescribed fire management plan following consultations with the Planning Commission, FFS, and FWC.

- Short-term Objectives
    - Install new fire lanes as necessary and modify existing fire lanes as needed.
    - Update GIS and other data bases to reflect revised fire management plan.
    - Establish short- and long-term fire-related goals for each management unit.

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    - Develop short- and long-term schedule for burning individual units in accordance with the revised plan.
    - Burn all units scheduled for burning during the initial 2-year planning period.
- Long-term Objectives
    - Burn all management units the expected number of times during the 10-year period this management plan is in effect (e.g., management units on 2- to 3-year rotations are burned three to five times).
    - Conduct short- and long-term post-burn monitoring of management units to ascertain if progress toward long-term goals is acceptable and, if needed, modify prescribed fire management accordingly, especially if special status plants or imperiled fauna are being adversely affected (e.g., change frequency of burns, firing techniques, etc.).

Activity: Control of exotic and invasive plant infestations.

- Short-term Objectives
    - Use standard ecological methods to estimate frequency of occurrence and percent cover of exotic and invasive plants.
    - Conduct triage assessment of management units for prioritizing efforts to control exotic and invasive plant infestations during the short- and long-term periods of the management plan.
    - Reduce exotic and invasive plant species to, or below, tolerable levels within short-term priority management units, and evaluate success of efforts using appropriate sampling methods.
- Long-term Objectives
    - After initial efforts, restrict exotic and invasive plant infestations to, or below, tolerable levels throughout GAS on an annual basis.

Activity: Control of exotic and invasive wildlife infestations

- Short-term Objectives
    - Determine presence of invasive wildlife during initial and cursory wildlife surveys
    - Develop species-specific sampling methods for monitoring changes in distribution or size of exotic wildlife populations.
    - Initiate efforts to control exotic wildlife through either use of staff or by securing services of appropriate contractors.
    - Assess effectiveness of initial control efforts using previously developed sampling methods.
- Long-term Objectives
    - Consistently restrict populations of exotic animal species to, or below, tolerable levels on an annual basis.
    - Annually monitor known populations of exotic animal species to detect increases in numbers and newly established exotic wildlife.

Monitoring

The purpose of monitoring within GAS is to assess progress toward achieving the various habitat maintenance or restoration goals discussed in this management plan. Monitoring will focus on measuring the effectiveness of maintenance efforts such as controlling exotic flora and fauna and

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using prescribed fire for improving habitat of native species. Quantitative monitoring of vegetation will be done using standardized methods such as OBVM (FWC, 2021) and those described in (Elzinga et. al., 1998). Monitoring for wildlife will generally follow well-established methods for the sampling of small vertebrate populations. Species-specific sampling techniques for both flora and fauna will be used as needed, such as assessing the effectiveness of efforts to control certain exotic species (e.g., feral swine) or efforts to improve habitat conditions for imperiled species. The short- and long-term objectives of the monitoring program for this ten-year management plan are as follows:

Activity: Monitoring of native and exotic flora and fauna within GAS

- Short-term Objectives
    - Determine appropriate monitoring techniques, including species-specific methods as needed.
    - Obtain necessary state and federal permits for trapping and marking wildlife.
    - Obtain necessary permits to collect special status plant and/or plant parts.
    - Establish floral and faunal sampling stations throughout GAS.
    - Initiate seasonally appropriate vegetation monitoring in each habitat.
    - Initiate seasonally appropriate wildlife monitoring in each habitat.
    - Develop schedule and initiate pre-treatment sampling of exotic species infestations and repeat post-treatment as needed to assess effectiveness of efforts.
    - For all monitoring projects, develop data management quality control procedures that are consistent with FNAI standards.
- Long-term Objectives
    - Conduct OBVM every 5-years according to the established protocol.
    - Continue monitoring at a frequency sufficient to estimate overall trends of focal species during the 10-year management plan.

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SECTION H: OTHER ITEMS AND MANAGING AGENCY TOOLS

Both LMRs recognized the need for additional funding for CELM.

Budgets for GAS & Summary of Management Objectives

Hillsborough County has a centralized management operation for all natural preserve lands which have been acquired by the ELAP program. Except for capital improvement projects, such as fencing, road construction, site security residences, etc., site management expenses are not budgeted on a site-specific basis. The program is funded to cover capital equipment, personnel, and operating expenses for the Regional Parks and Conservation Services section of the Hillsborough County Parks, Recreation, and Conservation Department.

CELM currently consists of 46 permanent full-time positions, 4 permanent part-time positions, and a variable number of temporary/seasonal staff. Currently, the annual operating budget for the Section is just under $5,327,900. These funds are used to manage the approximately 64,000 acres of land overseen by CELM. The staff is in four offices in Plant City, Ruskin, Riverview, and Odessa. Most activities will be performed by teams of two or three staff members, including plant and animal inventories, exotic plant control, trail, and fire lane maintenance, etc. Prescribed burns will be conducted by a burn crew consisting of a burn boss and CELM members, with a Florida Forest Service (FFS) unit on site in stand-by mode if conditions warrant. Volunteers occasionally participate on burn crews but must be FFS certified and registered in the County's Volunteer Program. Volunteer participation has also been used for ELAPP site management on most of the County's natural preserve sites and includes activities such as plant and animal inventories, exotic plant control, nest box construction, installation and maintenance, trash removal, habitat restoration (planting natives), fence and gate installation and repair, site patrol, trail installation and maintenance, etc. CELM staff will work with local residents who express an interest in preservation and management of the site. Such volunteers can be invaluable in reporting unauthorized activities, as well as providing additional site observations such as wildlife sightings and public usage.

ELAPP Policies and Ordinances

Hillsborough County created ELAPP in January 1987 by adopting Environmentally Sensitive Land Ordinance No. 87-1 (amended by Ordinances 91-2 and 93-15), which provided $21 million dollars over a four-year period for acquisition of environmentally sensitive land. In June 1990 Ordinance No. 90-19 was approved providing, among other things, for issuance of up to $100 million in bonds over a 20-year period for acquisition of additional land. In November 2008, voters approved Ordinance No. 08-16 for issuance of up to $200 million in bonds to continue acquisition of environmentally sensitive land. In addition to the ELAPP ordinances, the CELM manages and develops Hillsborough County parks consistent with park ordinances Nos. 08-17 and 10-18. All ordinances are consistent with Section 253.034, Florida Statutes. Copies of each ordinance are in Appendix N.

The Jan K. Platt Environmental Lands Acquisition and Protection Program *(*ELAPP) was established for the purpose of acquiring, preserving, and protecting endangered and environmentally sensitive lands, beaches, parks, and recreational lands in Hillsborough County. The purpose of acquiring such lands will be for resource protection; however, all lands shall be open for public use and enjoyment to the extent that the County finds such use compatible with the preservation and protection of these lands (Hillsborough County, 2005).

Compliance with Comprehensive Plans

The management of GAS assists Hillsborough County in implementing the goals, objectives, and policies of the Conservation and Aquifer Recharge, Future Land Use, and Recreation and Open Space Elements of the County's Comprehensive Plan (Appendix D). A letter of compliance from the Hillsborough County City-County Planning Commission stating this updated LMP complies with the Hillsborough County Comprehensive Plan also in included in Appendix D.

Proposed Expansion Opportunities

This section of the plan provides information on potential land acquisitions that may improve or enhance the value of GAS with respect to habitat, recreation, or security. Lands that connect GAS to other public land holdings, help protect the preserve's assets, or provide contiguous habitat are most valued. Lands that share a boundary with the preserve need not go through the ELAPP nomination, assessment, and site selection process. Such lands may be purchased and added to existing ELAPP lands through a simple boundary adjustment for the existing property. As described in Section A: General Information, GAS is surrounded by occupied and incompatible land uses; there are no adjacent lands available for acquisition that would expand the preserve.

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SOURCES CITED

Compliance and Review Section Bureau of Historic Preservation Division of Historical Resources (DHR). (2021, June). Management Procedures for Archaeological and Historical Sites and Properties on State-Owned or Controlled Properties. Retrieved from https://dos.myflorida.com/historical/preservation/compliance-and-review/regulations-guidelines/.

Cox, J. R. Kautz, M. MacLaughlin, and T. Gilbert. (1994). Closing the Gaps in Florida's Wildlife Habitat Conservations System. Florida Game and Freshwater Fish Commission, Tallahassee, Florida.

Dames & Moore (2000). Hillsborough County Bullfrog Creek/Wolf Branch Watershed Management Plan [pdf]. Retrieved from http://www.hillsborough.wateratlas.usf.edu/upload/documents/Final_Bullfrog.pdf.

Elzinga, C. L. & Salzer, D. W. (1998). Measuring & monitoring plant populations. US Department of the Interior, Bureau of Land Management.

Fitzpatrick, J. W., G. Woolfenden, and M. Kopeny. (1991). Ecology and development-related habitat requirements of the Florida Scrub Jay (*Aphelocoma coerulescens coerulescens*). Florida Nongame Wildlife Program Technical Report 8. Tallahassee

Florida Fish and Wildlife Conservation Commission (FWC). (2020, July). Gopher Tortoise Permitting Guidelines Gopherus Polyphemus. Retrieved from https://myfwc.com/license/wildlife/gopher-tortoise-permits/permitting-guidelines/.

Florida Fish and Wildlife Conservation Commission (FWC) Wildlife and Habitat Management Section, Habitat Assessment and Restoration Program and Florida Wildlife Research Institute, Upland Habitat Research and Monitoring, Ecosystem Assessment and Restoration Section. (2021, January). Objective-Based Vegetation Management (OBVM) Program Vegetation Monitoring Standard Operating Procedure. Retrieved from https://myfwc.com/conservation/terrestrial/obvm/#:~:text=The%20OBVM%20program%20collects%20data,on%20the%20natural%20community%20attributes.

Florida Natural Areas Inventory (FNAI). (2018). Field Guide Account for Giant Orchid *Pteroglossaspis ecristata* [PDF]. Retrieved from https://www.fnai.org/PDFs/FieldGuides/Pteroglossaspis_ecristata.pdf.

Florida Natural Areas Inventory (FNAI). (January 14, 2022). Field Guide Account for Nodding Pinweed *Lechea cernua* [PDF]. Retrieved from https://www.fnai.org/PDFs/FieldGuides/Lechea_cernua.pdf.

Florida Natural Areas Inventory (FNAI). (2018). Field Guide Account for Redmargin Zephyrlily *Zephyranthes simpsonii* [PDF]. Retrieved from https://www.fnai.org/PDFs/FieldGuides/Zephyranthes_simpsonii.pdf.

Godfrey, R. K. (1981). Aquatic and wetland plants of southeastern United States: Dicotyledons (Vol. 2). University of Georgia Press.

Gridded National Soil Survey Geographic (gNATSGO) Database for Florida. United States Department of Agriculture, Natural Resources Conservation Service. Retrieved from https://nrcs.app.box.com/v/soils. (Released May 10, 2022).

Hardin, J.W. 1954. The vegetation pattern around a Florida sinkhole. Contributions to Science 2:6-17.

Jennings, D. E., & Rohr, J. R. (2011). A review of the conservation threats to carnivorous plants. Biological Conservation, 144(5), 1356-1363.

Karl, B. & Ronald, M. (1994). NatureServe Explorer - Asclepias curtissii. Retrieved from https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.145301/Asclepias_curtissii.

Larson, Barbra C., J. Howard Frank, Ginger M. Allen and Martin B. Main, 2004. Florida's Native (USDA) Bromeliads - Circular 1466. Published by the Department of Wildlife Ecology & Conservation, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences (IFAS), University of Florida. Publication date: September 2004. Revision date: February 2016. Retrieved from https://edis.ifas.ufl.edu/publication/UW205.

Myers, R.L. & Ewel J.J. (1990). Ecosystems of Florida. Orlando: University of Florida Press.

NeSmith, K. & Herring, B. (June 2017). Assessment of Listed and Rare Plant Species at Marjorie Harris Carr Cross Florida Greenway Levy, Citrus, Marion, Putnam Counties, Florida [PDF]. Retrieved from https://www.fnai.org/PDFs/publications/MHCCFG_Rare_Plants_Final_Report_2017_final.pdf.

Noss R, Platt WJ, Sorrie BA, Weakley AS, Means DB, Costanza J, Peet RK (2015) How global biodiversity hotspots may go unrecognized: lessons from the North American Coastal Plain. Divers Distrib 21:236–244

Primer, S., Molano-Flores, B., Zaya, D.N. *et al.* Effect of habitat structure on reproduction and prey capture of a rare carnivorous plant, *Pinguicula lutea*. *Arthropod-Plant Interactions* **12,** 671–683 (2018). https://doi.org/10.1007/s11829-018-9632-y.

Stys, B. (1993). Ecology and habitat protection needs of the southeastern American kestrel (Falco sparverius paulus) on large-scale development sites in Florida.

Stys, B. (1997). Ecology of the Florida Sandhill Crane. Florida Game and Fresh Water Fish Commission (No. 15). Nongame Wildlife Program Technical Report.

United States Department of Agriculture (USDA) Forest Service. National Best Management Practices for Water Quality Management on National Forest System Lands [PDF]. Retrieved from https://www.fs.fed.us/biology/resources/pubs/watershed/FS_National_Core_BMPs_April2012.pdf. (Released April 2012).

U.S. Department of Agriculture (USDA) Forest Service. (n.d.). Wildland Fire. Retrieved from https://www.fs.usda.gov/managing-land/fire.

U.S. Fish & Wildlife Service (USFWS). ECOS Environmental Conservation Online System - Florida golden aster (*Chrysopsis floridana*). Retrieved from https://ecos.fws.gov/ecp/species/Q272.

U.S. Fish & Wildlife Service (USFWS). ECOS Environmental Conservation Online System - Wood stork (*Mycteria americana*). Retrieved from https://ecos.fws.gov/ecp/species/B06O.

U.S. Fish and Wildlife Service (USFWS). (2007, May). National Bald Eagle Management Guidelines [PDF]. Retrieved from https://www.fws.gov/media/national-bald-eagle-management-guidelines.

DRAFT

Vince, S. W., Humphrey, S. R., & Simons, R. W. (1989). The ecology of hydric hammocks: A community profile (Vol. 85, No. 7). US Department of the Interior, Fish and Wildlife Service, Research and Development.

DRAFT

APPENDIX A

LEGAL DOCUMENTS

SEC. 12 TWP. 31 S. RGE. 19 E.
FOLIO # 51501.0000
Trans. NE 31-19

13

(1)
R 19.50
D .70
20.20

EASEMENT

OFF. REC. 7769PG1705

KNOW ALL MEN BY THESE PRESENTS, That EMIL C. MARQUARDT, JR., as Trustee under the provisions of the Land Trust Agreement dated December 10, 1990, herein called Grantor, in consideration of One Dollar and other valuable considerations paid to Grantor by TAMPA ELECTRIC COMPANY, a Florida corporation, P.O. Box 111, Tampa, Florida 33601, herein called Company, receipt whereof is hereby acknowledged, has given and granted unto the Company, its successors and assigns, a perpetual easement over and the right to enter upon the land in Hillsborough County, Florida, described as follows:

See Exhibit "A" attached hereto and by reference made a part hereof.

1995 MAY 26 PM 4:10

together with the right of ingress and egress to and from the same, and all rights therein and all privileges thereon which are or may be necessary or convenient for the full use and enjoyment of such easement, which is for the purposes of placing, constructing, operating, maintaining, replacing on and removing from said land, installations described as follows:

Power poles and guy wires only.

The aforesaid rights and privileges granted shall include the right and privilege to trim and remove any and all trees shrubs upon said land, and the Company shall also have the right and privilege to trim or remove any and all trees or shrubs upon the Grantor's lands adjacent to said land, wherever the Company may deem it necessary or desirable to do so, for the protection of said installations.

The Grantor shall not use said land in any manner or for any purpose that will interfere or conflict with the use of the same by the Company for the purposes enumerated above or which will endanger any person or property, and in no event shall Grantor construct or install any improvement or structure thereon.

The terms "Grantor" and "Company" herein employed shall be construed to include the words "heirs, executors, administrators and assigns" and "successors and assigns" of the respective parties hereto, and the masculine, feminine or neuter gender, and the singular or plural, wherever the context so admits or requires.

IN WITNESS WHEREOF the Grantor has caused this instrument to be executed in due form required by law, this 26th day of May, 1995.

Documentary Tax Pd - F.S. 201.02 $ .70
Documentary Tax Pd - F.S. 201.08 $ -0-
Intangible Tax Pd - F.S. 199 $ _____
Richard Ake, Clerk Hillsborough County
By: J. Mean Deputy Clerk

PREPARED BY:

Mark J. Elbare
Tampa Electric Company
P.O. Box 111
Tampa, FL 33601

~~THE INSTRUMENT PREPARED HERE~~ RETURN TO:
E.D. ARMSTRONG III, ESQ.
SON, BLAKELY, POPE, BOKOR, RUPPEL & BURNS, P.A.
P.O. Box 1368, Clearwater, FL 34617-1368

RICHARD AKE
CLERK OF CIRCUIT COURT
HILLSBOROUGH COUNTY

SIGNED, SEALED AND DELIVERED
IN THE PRESENCE OF:

WITNESSES TO EXECUTION BY GRANTOR:

Cheryl L. Gundry
Signature of First Witness

CHERYL L. GUNDRY
Print or Type Name

Barbara Savery
Signature of Second Witness

BARBARA SAVERY
Print or Type Name

GRANTOR:

By: Emil C. Marquardt

EMIL C. MARQUARDT, JR., Trustee
Print or Type Name

460 CLEVELAND ST, CLW FL 34615
Address City State Zip

STATE OF FLORIDA
COUNTY OF PINELLAS

The foregoing instrument was acknowledged before me this 26 day of MAY, 19 95, by EMIL C. MARQUARDT, JR., as Trustee, who is personally known to me or who has produced N/A as identification. Witness my hand and official seal the date aforesaid,

[Type of Identification]

Barbara Savery
Notary Public, State of Florida at Large

BARBARA SAVERY
Notary: Print or Type Name

1/6/96
My Commission Expires

BARBARA SAVERY
MY COMMISSION # CC 176439
EXPIRES: February 6, 1996
Bonded Thru Notary Public Underwriters

EXHIBIT A

GOLDEN ASTER SCRUB

Proposed Easement (TECO)

Parcel 101.2

A parcel of land lying in the Southwest one quarter of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, described as follows:

Commence at the Northwest corner of said Southwest one quarter; thence S.88°51'24"E. 300.01 feet along the North boundary of said Southwest one quarter to the East boundary of Tampa Electric Company Right-of-Way as recorded in Official Record Book 1097, Page 488; thence along said East boundary S.00°34'46"W. 457.94 feet; thence along the North boundary of said Right-of-Way S.89°55'01"E. 2243.38 feet to the Point of Beginning; thence N.00°04'59"E. 30.00 feet; thence S.89°55'01"E. 75.00 feet; thence S.00°04'59"W. 30.00 feet to the North boundary of said Right-of-Way; thence along said North boundary N.89°55'01"W. 75.00 feet to the Point of Beginning.

0069833.01

SKETCH OF EXHIBIT "A"

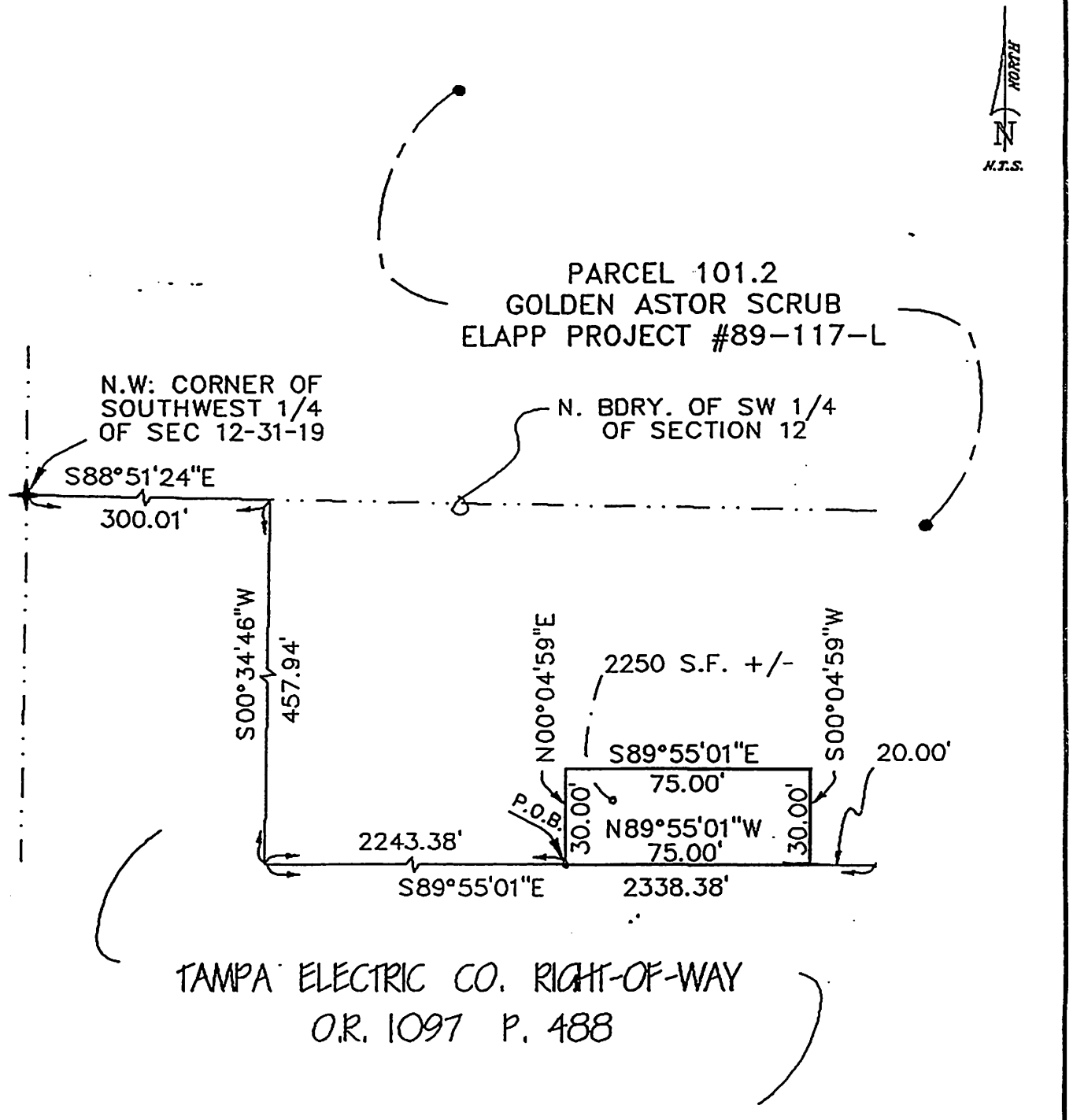
E.L.A.P.P.

OFF. REC. 7769PG1708

PROJECT NAME: GOLDEN ASTOR SCRUB - PROJECT #89-117-L

GRANTOR: EMIL C. MARQUARDT, JR., AS TRUSTEE

SKETCH OF DESCRIPTION
(NOT A SURVEY)



NOTE:
This sketch is not a survey. If there is a discrepancy between the legal description and the sketch, the legal description will control.

COUNTY of HILLSBOROUGH ENGINEERING & CONSTRUCTION SERVICES SURVEY & MAPPING/GIS SECTION FIELD SURVEY OFFICE (813) 744-6619 7220 N. TAYLOR RD., SEFFNER, FL 33584	DATE	SCALE: NOT TO SCALE	SUR. REQ.# 940913
		DRAWN BY: J.PRADO	SEC 12 TWP 31 RGE 19
		CHECKED BY: J.LESTER	FLD. BOOK# 447
	PROJECT # 89117L ELAPP		SHEET 01 of 01

SCHEDULE B

SEC. 12 TWP. 31 S. RGE. 19 E.
FOLIO # 51501.0000
Trans. NE 31-19

(2)
.9.50
.S. .70
20.20

OFF. REC. 7769PG1709

EASEMENT

RICHARD AKE
CLERK OF CIRCUIT COURT
HILLSBOROUGH COUNTY

1995 MAY 26 PM 4:15

95118479

KNOW ALL MEN BY THESE PRESENTS, That EMIL C. MARQUARDT, JR., as Trustee under the provisions of the Land Trust Agreement dated December 10, 1990, herein called Grantor, in consideration of One Dollar and other valuable considerations paid to Grantor by TAMPA ELECTRIC COMPANY, a Florida corporation, P.O. Box 111, Tampa, Florida 33601, herein called Company, receipt whereof is hereby acknowledged, has given and granted unto the Company, its successors and assigns, a perpetual easement over and the right to enter upon the land in Hillsborough County, Florida, described as follows:

See Exhibit "A" attached hereto and by reference made a part hereof.

together with the right of ingress and egress to and from the same, and all rights therein and all privileges thereon which are or may be necessary or convenient for the full use and enjoyment of such easement, which is for the purposes of placing, constructing, operating, maintaining, replacing on and removing from said land, installations described as follows:

Power poles and guy wires only.

The aforesaid rights and privileges granted shall include the right and privilege to trim and remove any and all trees or shrubs upon said land, and the Company shall also have the right and privilege to trim or remove any and all trees or shrubs upon the Grantor's lands adjacent to said land, wherever the Company may deem it necessary or desirable to do so, for the protection of said installations.

The Grantor shall not use said land in any manner or for any purpose that will interfere or conflict with the use of the same by the Company for the purposes enumerated above or which will endanger any person or property, and in no event shall Grantor construct or install any improvement or structure thereon.

The terms "Grantor" and "Company" herein employed shall be construed to include the words "heirs, executors, administrators and assigns" and "successors and assigns" of the respective parties hereto, and the masculine, feminine or neuter gender, and the singular or plural, wherever the context so admits or requires.

IN WITNESS WHEREOF the Grantor has caused this instrument to be executed in due form required by law, this 26th day of May, 1995.

Documentary Tax Pd - F.S. 201.02 $ .70
Documentary Tax Pd - F.S. 201.08 $ -0-
Intangible Tax Pd - F.S. 199 $ -0-
Richard Ake, Clerk Hillsborough County
By: S. Mean Deputy Clerk

[redacted] (& RETURN TO)
E.D. ARMSTRONG III, ESQ.
JOHNSON, BLAKELY, POPE, BOKOR, RUPPEL & BURNS, P.A.
P.O. Box 1368, Clearwater, FL 34617-1368

PREPARED BY:
Mark J. Elbare
Tampa Electric Company
P.O. Box 111
Tampa, FL 33601

G.Astor-102.2

SIGNED, SEALED AND DELIVERED IN THE PRESENCE OF:

WITNESSES TO EXECUTION BY GRANTOR:

Cheryl L. Gundry
Signature of First Witness

CHERYL L. GUNDRY
Print or Type Name

Barbara Savery
Signature of Second Witness

Barbara Savery
Print or Type Name

GRANTOR:

By: _____

EMIL C. MARQUARDT, JR., Trustee
Print or Type Name

400 CLEVELAND ST, CLW FL 34615
Address City State Zip

STATE OF FLORIDA
COUNTY OF PINELLAS

The foregoing instrument was acknowledged before me this 16 day of MAY, 19 96, by EMIL C. MARQUARDT, JR., as Trustee, who is personally known to me or who has produced N/A as identification. Witness my hand and official seal the date aforesaid,
[Type of Identification]

Barbara Savery
Notary Public, State of Florida at Large

BARBARA SAVERY
Notary: Print or Type Name

2/6/96
My Commission Expires

BARBARA SAVERY
MY COMMISSION # CC 178439
EXPIRES: February 6, 1998
Bonded Thru Notary Public Underwriters

EXHIBIT A

GOLDEN ASTER SCRUB

Proposed TECO Easement

Parcel 102.2

Commence at the Southeast corner of Section 12, Township 31 South, Range 19 East, said corner being the same as shown on Florida Department of Transportation Right-of-Way Maps for Interstate 75 (State Road 93-A, Section 10075-2404 dated 10/18/77); thence N.88°53'31"W. 387.32 feet along the South boundary of the Southeast one quarter of said Section 12, said South boundary being the same as shown on said Right-of-Way Maps; thence N.00°16'28"E. 47.18 feet along a line parallel with and 387.28 feet Westerly of the East boundary of the Southeast quarter of said Section 12 to the Northerly Right-of-Way line of Big Bend Road (County Road 672, formerly State Road 672); thence along said Northerly Right-of-Way line the following courses,

N.88°47'40"W.	576.65 feet
N.88°30'40"W.	181.20 feet
N.84°41'49"W.	150.33 feet

to the intersection of said Northerly Right-of-Way line with the Easterly Right-of-Way line of Bullfrog Creek Road (formerly East Bay Road); thence along said Easterly Right-of-Way line N.00°21'24"E. 46.39 feet; thence continuing along said Right-of-Way line N.16°01'48"E. 726.47 feet to the beginning of a curve to the right; thence continuing Northeasterly along said Right-of-Way line 170.30 feet along the arc of a curve to the right having a radius of 946.41 feet, chord of 170.07 feet and chord bearing of N.21°11'06"E. to the Point of Beginning; thence Northeasterly 5.00 feet along the arc of a curve to the right having a radius of 946.41 feet, chord of 5.00 feet and chord bearing of N.26°29'29"E.; thence S.63°21'26"E. 3.00 feet; thence S.26°29'29"W. 4.98 feet; thence N.63°39'36"W. 3.00 feet to the Point of Beginning.

0069831.01

SKETCH OF EXHIBIT "A"

E.L.A.P.P.

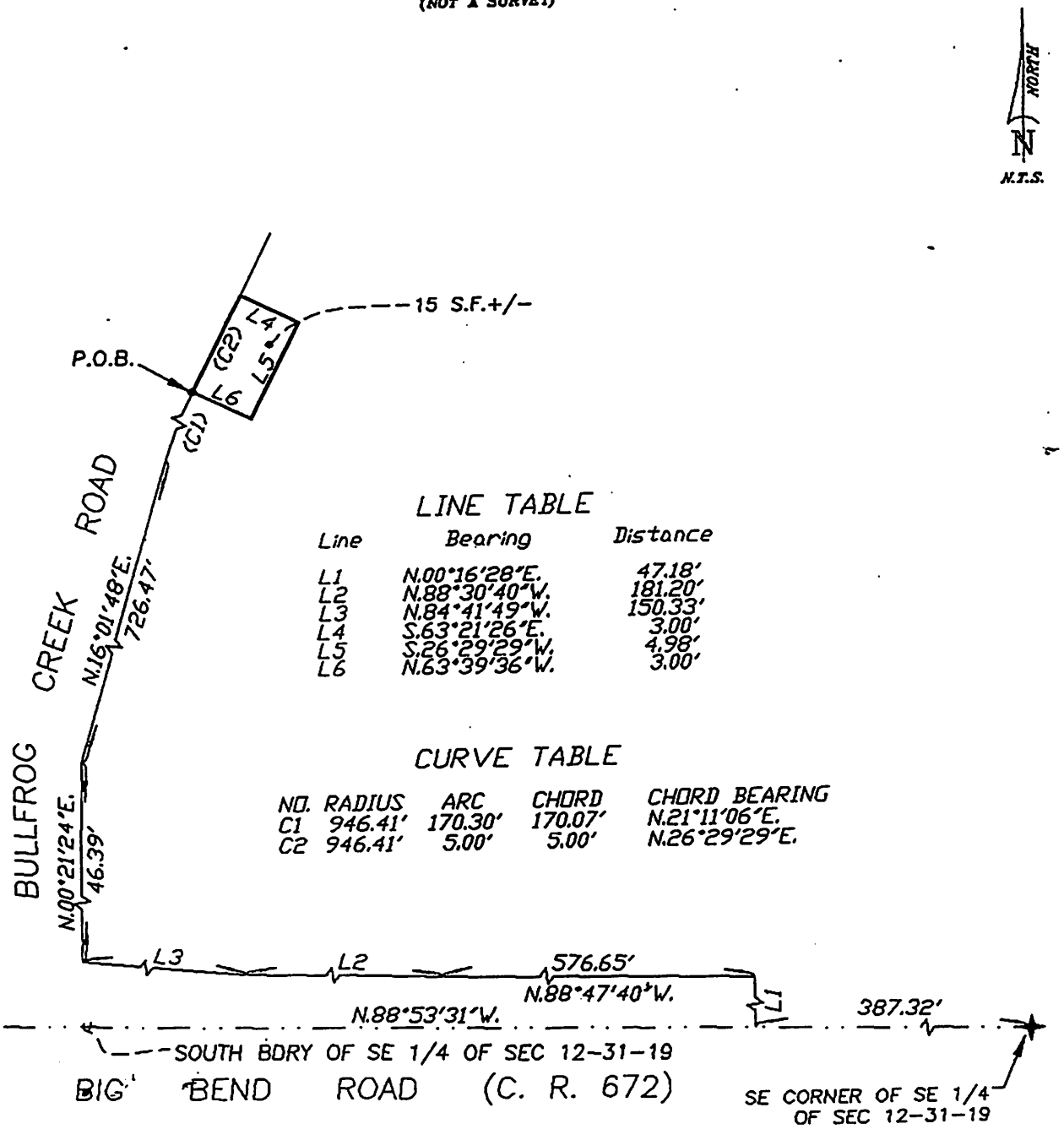
OFF. REC. 7769P1712

PROJECT NAME: GOLDEN ASTOR SCRUB - PROJECT #89-117-L

GRANTOR: EMIL C. MARQUARDT, JR., AS TRUSTEE

SKETCH OF DESCRIPTION

(NOT A SURVEY)



LINE TABLE

Line	Bearing	Distance
L1	N.00°16'28"E.	47.18'
L2	N.88°30'40"W.	181.20'
L3	N.84°41'49"W.	150.33'
L4	S.63°21'26"E.	3.00'
L5	S.26°29'29"W.	4.98'
L6	N.63°39'36"W.	3.00'

CURVE TABLE

NO.	RADIUS	ARC	CHORD	CHORD BEARING
C1	946.41'	170.30'	170.07'	N.21°11'06"E.
C2	946.41'	5.00'	5.00'	N.26°29'29"E.

NOTE:
This sketch is not a survey. If there is a discrepancy between the legal description and the sketch, the legal description will control.

COUNTY of HILLSBOROUGH
ENGINEERING & CONSTRUCTION SERVICES
SURVEY & MAPPING/GIS SECTION
FIELD SURVEY OFFICE (813) 744-6619
7220 N. TAYLOR RD., SEFFNER, FL 33584

DATE	SCALE: NOT TO SCALE	SUR. REQ.# 940913
	DRAWN BY: J.PRADO	SEC 12 TWP 31 RGE 19
	CHECKED BY: J.LESTER	FLD. BOOK# 447
	PROJECT # 89117L ELAPP	SHEET 01 of 01

SCHEDULE B

SEC. 1 TWP. 31 S. RGE. 19 E.
FOLIO #
Trans. NE 31-19

17

EASEMENT

OFF. REC. 7769 PG 1713

KNOW ALL MEN BY THESE PRESENTS, That EMIL C. MARQUARDT, JR., as Trustee under the provisions of the Land Trust Agreement dated December 10, 1990, herein called Grantor, in consideration of One Dollar and other valuable considerations paid to Grantor by TAMPA ELECTRIC COMPANY, a Florida corporation, P.O. Box 111, Tampa, Florida 33601, herein called Company, receipt whereof is hereby acknowledged, has given and granted unto the Company, its successors and assigns, a perpetual easement over and the right to enter upon the land in Hillsborough County, Florida, described as follows:

See Exhibit "A" attached hereto and by reference made a part hereof.

1995 MAY 26 PM 4:16

95-184800

together with the right of ingress and egress to and from the same, and all rights therein and all privileges thereon which are or may be necessary or convenient for the full use and enjoyment of such easement, which is for the purposes of placing, constructing, operating, maintaining, replacing on and removing from said land, installations described as follows:

Lines of wires, cables, data transmission and communication facilities, supporting structures and necessary appurtenances.

The aforesaid rights and privileges granted shall include the right and privilege to trim and remove any and all trees or shrubs upon said land, and the Company shall also have the right and privilege to trim or remove any and all trees or shrubs upon the Grantor's lands adjacent to said land, wherever the Company may deem it necessary or desirable to do so, for the protection of said installations.

The Grantor shall not use said land in any manner or for any purpose that will interfere or conflict with the use of the same by the Company for the purposes enumerated above or which will endanger any person or property, and in no event shall Grantor construct or install any improvement or structure thereon.

The terms "Grantor" and "Company" herein employed shall be construed to include the words "heirs, executors, administrators and assigns" and "successors and assigns" of the respective parties hereto, and the masculine, feminine or neuter gender, and the singular or plural, wherever the context so admits or requires.

IN WITNESS WHEREOF the Grantor has caused this instrument to be executed in due form required by law, this 26th day of May, 1995.

Documentary Tax Pd - F.S. 201.02 $ 1.70
Documentary Tax Pd - F.S. 201.08 $ .70
Intangible Tax Pd - F.S. 199 $ ____
Richard Ake, Clerk Hillsborough County
By: S. Neary Deputy Clerk

RICHARD AKE
CLERK OF CIRCUIT COURT
HILLSBOROUGH COUNTY

~~THIS INSTRUMENT PREPARED BY~~ (& RETURN TO):
E.D. ARMSTRONG III, ESQ.
HNSON, BLAKELY, POPE, BOKOR, RUPPEL & BURNS, P.A.
P.O. Box 1368, Clearwater, FL 34617-1368

PREPARED BY:

Mark J. Elbare
Tampa Electric Company
P.O. Box 111
Tampa, FL 33601

G.Astor-101.2

SIGNED, SEALED AND DELIVERED IN THE PRESENCE OF:

WITNESSES TO EXECUTION BY GRANTOR:

Cheryl L. Gundry
Signature of First Witness

CHERYL L. GUNDRY
Print or Type Name

Barbara Savery
Signature of Second Witness

BARBARA SAVERY
Print or Type Name

GRANTOR:

By: _____

EMIL C. MARQUARDT, JR., Trustee
Print or Type Name

400 CLEVELAND ST, CLW, FL 34615
Address City State Zip

STATE OF FLORIDA
COUNTY OF PINELLAS

The foregoing instrument was acknowledged before me this 25 **day of** MAY, **19**95, **by** EMIL C. MARQUARDT, JR., **as Trustee, who is personally known to me or who has produced** N/A **as identification. Witness my hand and official seal the date aforesaid,**

[Type of Identification]

Barbara Savery
Notary Public, State of Florida at Large

BARBARA SAVERY
Notary: Print or Type Name

2/6/96
My Commission Expires

BARBARA SAVERY
MY COMMISSION # CC 178439
EXPIRES: February 6, 1996
Bonded Thru Notary Public Underwriters

EXHIBIT "A"

GOLDEN ASTER SCRUB

Proposed Tampa Electric Company Easement

A strip of land 15 feet wide lying 7.5 feet on either side of the following described center line.

Commence at the Northeast corner of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida; thence S.00°21'40"W. 832.84 feet along the East boundary of said Section 1; thence N.89°38'18"W. 453.05 feet to a point on the West right-of-way of East Bay Road, said right-of-way as recorded in Official Record Book 786, Page 38, and the POINT OF BEGINNING; thence the following courses;

S.00°44'08"E.	220.27 feet
S.00°15'54"W.	250.87 feet
S.35°40'25"W.	229.73 feet
S.81°35'43"W.	328.65 feet
S.81°45'14"W.	331.47 feet
N.62°35'30"W.	259.49 feet
S.87°01'09"W.	281.72 feet
N.78°19'41"W.	59.39 feet

to the end of said described center line.

Containing 0.67 acres more or less.

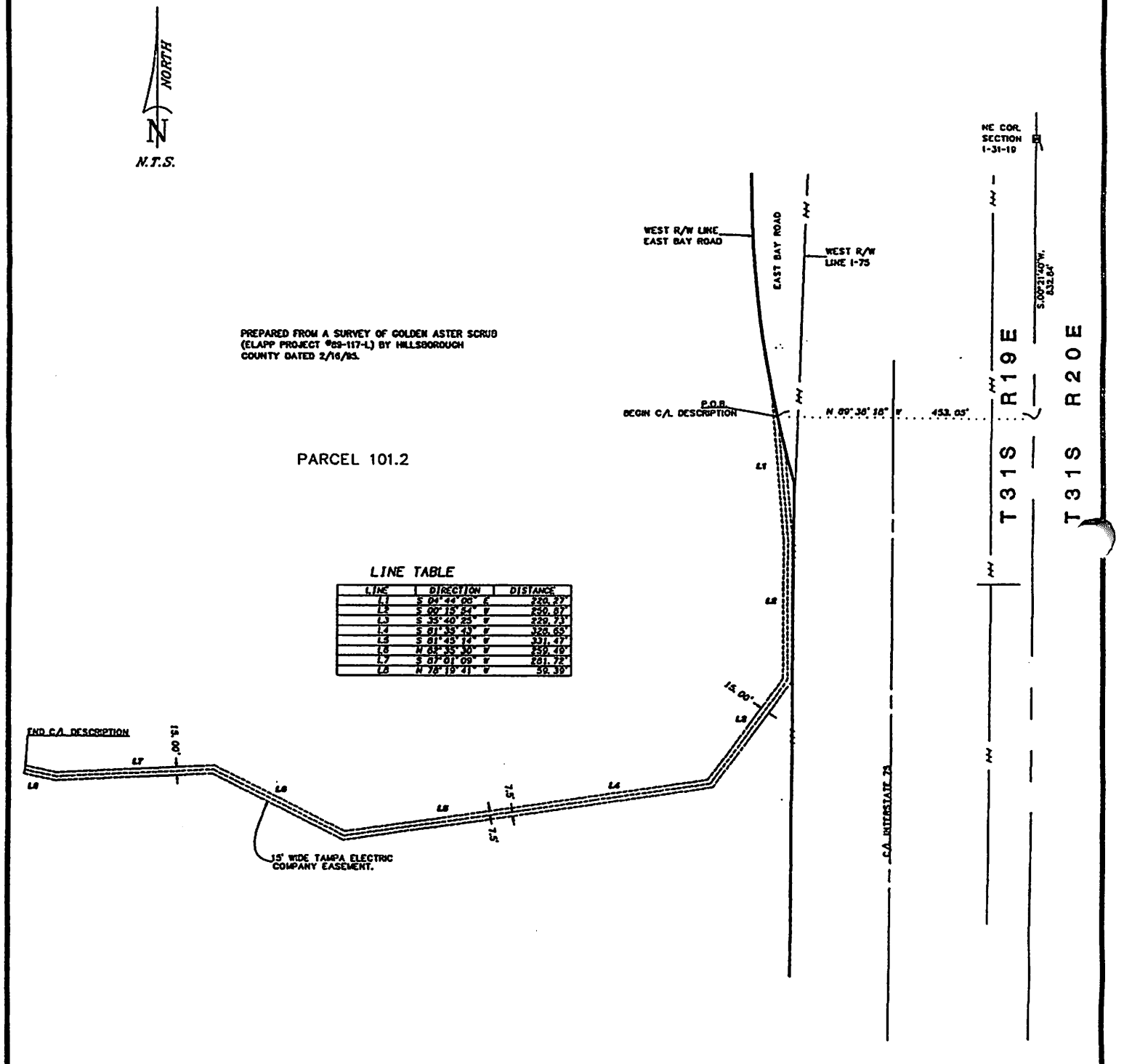
E.L.A.P.P.

PROJECT NAME: GOLDEN ASTER SCRUB - PROJECT #89-117-L

GRANTOR: EMIL C. MARQUARDT, JR., AS TRUSTEE

OFF. REC. 7769 PG 1716

SKETCH OF DESCRIPTION
(NOT A SURVEY)



LINE TABLE

LINE	DIRECTION	DISTANCE
L1	S 04°44'00" E	220.27'
L2	S 00°15'54" W	220.87'
L3	S 35°40'20" W	229.73'
L4	S 81°35'43" W	328.65'
L5	S 81°45'14" W	331.47'
L6	N 63°35'30" W	252.49'
L7	S 87°01'09" W	281.72'
L8	N 78°19'41" W	39.39'

NOTE:
This sketch is not a survey. If there is a discrepancy between the legal description and the sketch, the legal description will control.

COUNTY of HILLSBOROUGH
ENGINEERING & CONSTRUCTION SERVICES
SURVEY & MAPPING/GIS SECTION
FIELD SURVEY OFFICE (813) 744-5619
7220 N. TAYLOR RD., SEFFNER, FL 33584

DATE	SCALE: NOT TO SCALE	SUR. REQ.# 940913
	DRAWN BY: J.PRADO	SEC 1 TWP 31 RGE 19
	CHECKED BY: J.LESTER	FLD. BOOK# 447
	PROJECT # 89117L ELAPP	SHEET 01 of 01

OFF. REC. 7769 PG 1717

April 12, 1995
PROJECT 89-117-L, DONATED
FOR GOLDEN ASTOR SCRUB
FIRE HYDRANT
PARCEL 900.1
FOLIO #: 51501.0000
SEC 12, TWP 31, RGE 19

RICHARD AKE
CLERK OF CIRCUIT COURT
HILLSBOROUGH COUNTY

PERPETUAL UTILITY EASEMENT

THIS EASEMENT made this 26 day of April, A.D. 1995, by and between EMIL C. MARQUARDT, JR., AS TRUSTEE UNDER THE PROVISIONS OF THE LAND TRUST AGREEMENT DATED DECEMBER 10, 1990, whose address is: P.O. BOX 1669, CLEARWATER, FLORIDA 34616, party of the first part, and HILLSBOROUGH COUNTY, a political subdivision of the State of Florida, whose Post Office address is: P.O. Box 1110, Tampa, Florida 33601, party of the second part.

WITNESSETH: That the party of the first part, for and in consideration of the sum of One Dollar and other valuable considerations, paid receipt of which is hereby acknowledged, does grant unto the party of the second part, its successors and assigns, a Perpetual Utility Easement and the right of ingress and egress over, across, on, above and/or below ground level of lands of the first party, in Hillsborough County, Florida, described as follows:

LANDS DESCRIBED IN SCHEDULE "A"
ATTACHED HERETO AND MADE A PART HEREOF.

SKETCHES ATTACHED FOR ILLUSTRATIVE PURPOSES ONLY.

TO HAVE AND TO HOLD the same unto the second party, its successors and assigns, and the party of the first part will defend the title to said lands against all persons claiming by, through or under said party of the first part.

IN WITNESS WHEREOF the first party has hereunto set its hand and seal this 26th day of April, A.D., 1995

Signed, sealed and delivered
in the presence of:

Witness: Alyssa D Johnson

Print Name: Alyssa D Johnson

Witness: Barb Savery

Print Name: Barb Savery

Documentary Tax Pd - F.S. 201.02 $ .70

Documentary Tax Pd - F.S. 201.08 $ .00

Intangible Tax Pd - F.S. 199 $ .00

Richard Ake, Clerk Hillsborough County

By: S. McCoy Deputy Clerk

Sign: [signature] (SEAL)

EMIL C. MARQUARDT, JR., as Trustee
under the provisions of the Land Trust
Agreement dated December 10, 1990

THIS INSTRUMENT WAS PREPARED BY:
HILLSBOROUGH COUNTY
REAL ESTATE DEPARTMENT
P.O. BOX 1110, TAMPA, FLORIDA
LOU ANN GILLIGAN

1995 MAY 26 PM 4:16

95118481

P. O. BOX 1368, CLEARWATER, FLORIDA 34617

STATE OF FLORIDA)

COUNTY OF PINELLAS)

The foregoing instrument was acknowledged before me this 26 day of April, 1995, by **EMIL C. MARQUARDT, JR., AS TRUSTEE UNDER THE PROVISIONS OF THE LAND TRUST AGREEMENT, DATED DECEMBER 10, 1990, with full power and authority to protect, conserve, sell, lease, encumber, or otherwise to manage and dispose of the real property described above,** who [is personally known to me] OR [has produced N/A as identification].

Barbara Savery

Notary Public

Print Name: BARBARA SAVERY

My Commission Expires: 2/6/96

BARBARA SAVERY
MY COMMISSION # CC 178439
EXPIRES: February 6, 1996
Bonded Thru Notary Public Underwriters

APPROVED
Board of County Commissioners
DATE 05-03-95
MICHAEL KELLY
Director
Real Estate Department

(id:pue)

SCHEDULE "A"

GOLDEN ASTOR SCRUB

OFF. REC. 7769 PG 1719

Proposed Fire Hydrant Easement

Commence at the Southeast corner of Section 12, Township 31 South, Range 19 East, said corner being the same as shown on Florida Department of Transportation Right-of-Way Maps for Interstate 75 (State Road 93-A, Section 10075-2404 dated 10/18/77); thence N.88°53'31"W. 387.32 feet along the South boundary of the Southeast one quarter of said Section 12, said South boundary being the same as shown on said Right-of-Way Maps; thence N.00°16'28"E. 47.18 feet along a line parallel with and 387.28 feet Westerly of the East boundary of the Southeast quarter of said Section 12 to the Northerly Right-of-Way line of Big Bend Road (County Road 672, formerly State Road 672); thence along said Northerly Right-of-Way line the following courses,

N.88°47'40"W.	576.65 feet
N.88°30'40"W.	181.20 feet
N.84°41'49"W.	150.33 feet

to the intersection of said Northerly Right-of-Way line with the Easterly Right-of-Way line of Bullfrog Creek Road (formerly East Bay Road) and the Point of Beginning; thence along said Easterly Right-of-Way line N.00°21'24"E. 12.00 feet; thence S.89°38'36"E. 10.0 feet; thence S.00°21'24"W. 12.86 feet to said Northerly Right-of-Way line of Big Bend Road; thence along said Northerly Right-of-Way line N.84°41'49"W. 10.04 feet to the Point of Beginning.

E.L.A.P.P.

PROJECT NAME: GOLDEN ASTOR SCRUB - PROJECT #89-117-L

GRANTOR: EMIL C. MARQUARDT, JR., AS TRUSTEE

OFF. REC. 7769 PG 1720

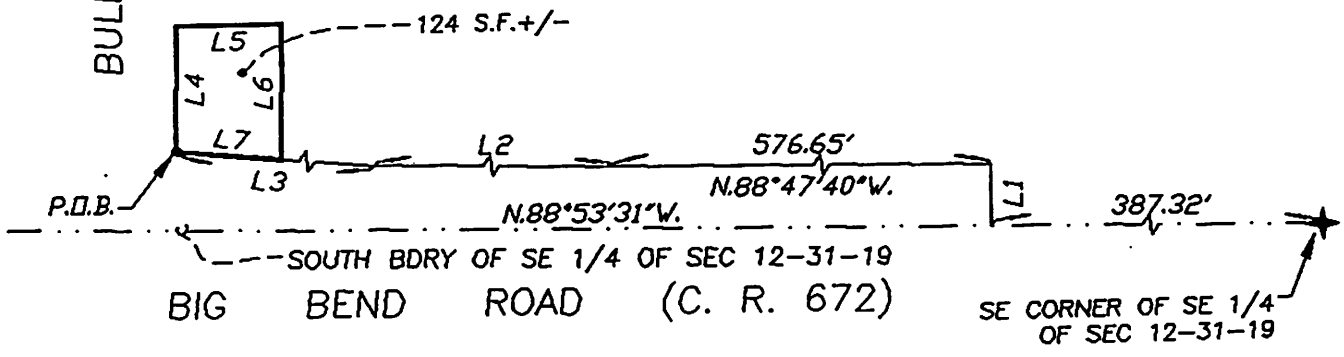
SKETCH OF DESCRIPTION
(NOT A SURVEY)



BULLFROG CREEK ROAD

LINE TABLE

Line	Bearing	Distance
L1	N.00°16'28"E.	47.18'
L2	N.88°30'40"W.	181.20'
L3	N.84°41'49"W.	150.33'
L4	N.00°21'24"E.	12.00'
L5	S.89°38'36"E.	10.00'
L6	S.00°21'24"W.	12.86'
L7	N.84°41'49"W.	10.04'



NOTE:
This sketch is not a survey. If there is a discrepancy between the legal description and the sketch, the legal description will control.

COUNTY of HILLSBOROUGH
ENGINEERING & CONSTRUCTION SERVICES
SURVEY & MAPPING/GIS SECTION
FIELD SURVEY OFFICE (813) 744-6619
7220 N. TAYLOR RD., SEFFNER, FL 33584

DATE	SCALE: NOT TO SCALE	SUR. REQ.# 940913
	DRAWN BY: J.PRADO	SEC 12 TWP 31 RGE 19
	CHECKED BY: J.LESTER	FLD. BOOK# 447
	PROJECT # 89117L ELAPP	SHEET 01 of 01

OFF. REC. 7769 PG 1721

EASEMENT

KNOW ALL MEN BY THESE PRESENTS, that TAMPA ELECTRIC COMPANY, a Florida corporation, whose principal place of business is located at 702 North Franklin Street, Tampa, Florida 33602 (herein "Grantor"), in consideration of One Dollar and other valuable considerations paid to EMIL C. MARQUARDT, JR., as Trustee under the provisions of the Land Trust Agreement, dated December 10, 1990 (herein "Grantee"), receipt whereof is hereby acknowledged, has given and granted unto Grantee, its successors and assigns, a non-exclusive easement over and the right to enter upon the land in Hillsborough County, Florida, more particularly described on Exhibit "A" attached hereto and made a part hereof (the "Easement Area"), together with the right of ingress and egress to and from the same, which is for the purposes of providing legal access from other lands owned by Grantee to that certain parcel of real property owned by Grantee described at Exhibit "B" and constructing, operating and maintaining within the Easement Area fire lanes and fire breaks.

The aforesaid rights and privileges granted shall include the right and privilege to trim or remove any and all trees or shrubs upon said land and to construct unpaved access roads.

Grantor covenants and agrees that its activity with the Easement Area will be conducted as set forth at Exhibit "C" and in such a manner so as not to interfere with the safe and efficient operation and maintenance of Grantor's installations and future maintenance, repair, replacement and expansion of Grantor's electric power transmission facilities over and across the Easement Area.

By acceptance and use of this easement, Grantee agrees that Grantor shall have no responsibility for any claims for personal injuries, death or property damage, or any other losses, damages, charges or expenses including, but not limited to attorney's fees, which arise out of, in connection with or by reason of Grantee's use of and activity on the Easement Area.

The terms "Grantor" and "Grantee" herein employed shall be construed to include the words "heirs, executors, administrators and assigns" and "successors and assigns" of the respective parties hereto, and the masculine, feminine or neuter gender, and the singular or plural, wherever the context so admits or requires.

THIS INSTRUMENT PREPARED BY: JAMES L. ESTES, JR., P. O. Box 111, Tampa, Florida 33601

RETURN TO: E. D. Armstrong III, Esq., Johnson, Blakely, et al., P. O. Box 1368, Clearwater, Florida 34617

1995 MAY 26 PM 4:16

511848 2

RICHARD AKE
CLERK OF CIRCUIT COURT
HILLSBOROUGH COUNTY

Documentary Tax Pd - F.S. 201.02 $ 70

Documentary Tax Pd - F.S. 201.08 $ 8

Intangible Tax Pd - F.S. 199 $ _____

Richard Ake, Clerk Hillsborough County

By: S. Means Deputy Clerk

IN WITNESS WHEREOF, Grantor and Grantee have caused this instrument to be executed in due form required by law, this ____ day of May, 1995.

Witness
Print Name: JERRY C. COLLINS

Witness
Print Name: Joey A. Hicklter

Witness
Print Name: Barbara Savery

Witness
Print Name: KATHLEEN A O'HEARN

GRANTOR:

TAMPA ELECTRIC COMPANY
a Florida corporation

M.F. Wadsworth
Vice President - Corporate and
Operating Services

(SEAL)

GRANTEE:

EMIL C. MARQUARDT, ~~JR., as~~ Trustee
under the provisions of the Land Trust
dated December 10, 1990

Post Office Box 1669
Clearwater, Florida 34616

STATE OF FLORIDA

COUNTY OF HILLSBOROUGH

The foregoing instrument was prepared before me this 18 day of MAY, 1995, by M.F. WADSWORTH, as Vice President - Corporate and Operating Services of TAMPA ELECTRIC COMPANY, who is personally known to me or who has produced _____, as identification.

Joey A Kicklitter

Notary Public
Print Name: Joey A. Kicklitter
Commission Number: _____
My Commission Expires: _____

JOEY A. KICKLITER
Notary Public, State of Florida
My comm. expires Apr. 16, 1997
No. CC270151

STATE OF FLORIDA

COUNTY OF Pinellas

The foregoing instrument was prepared before me this 10 day of MAY, 1995, by EMIL C. MARQUARDT, JR., as Trustee under the provisions of the Land Trust dated December 10, 1990, who is personally known to me or who has produced _____, as identification.

Barbara Savery

Notary Public
Print Name: Barbara Savery
Commission Number: _____
My Commission Expires: 2/6/96

BARBARA SAVERY
MY COMMISSION # CC 176439
EXPIRES: February 6, 1996
Bonded Thru Notary Public Underwriters

H:\BAJLE\E'ment.1

Parcel No. 1 (Fire Lane and Access)

Commence at the Northwest corner of Section 1, Township 31 South, Range 19 East, thence S.00°30'01"W. 40.00 feet along the West boundary of said Section 1 to the POINT OF BEGINNING; thence S.89°38'44"E. parallel with the North boundary of said Section 1 325.00 feet; thence S.00°30'01"W. parallel with the West boundary of said Section 1 40.00 feet; thence N.89°38'44"W. 325.00 feet to the West boundary of said Section 1; thence N.00°30'01"E. 40.00 feet to the POINT OF BEGINNING.

Parcel No. 2 (Fire Lane and Access)

Commence at the Southwest corner of Section 1, Township 31 South, Range 19 East, thence N.00°30'01"E. 99.25 feet along the West boundary of said Section 1 to the POINT OF BEGINNING; thence N.00°30'01"E. 40.00 feet along the West boundary of said Section 1; thence S.89°29'59"E. 325.00 feet; thence S.00°30'01"W. parallel with the West boundary of said Section 1 40.00 feet; thence N.89°29'59"W. 325.00 feet to the West boundary of said Section 1 and the POINT OF BEGINNING.

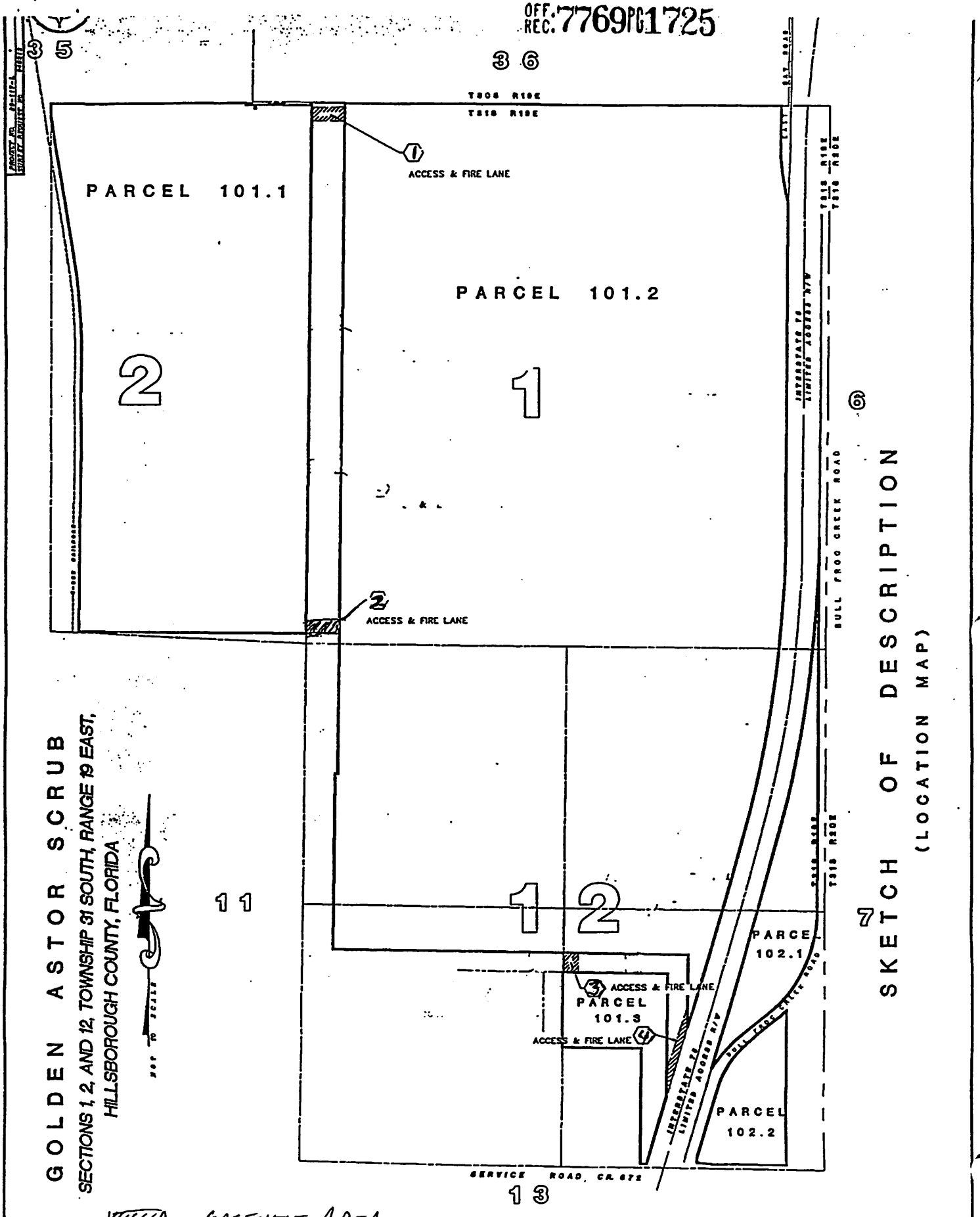
Parcel No. 3 (Fire Lane and Access)

For a POINT OF BEGINNING, commence at a Hillsborough County 4-inch square concrete monument marking the intersection of the South line of a Tampa Electric Company 200.00 feet Right-of-Way recorded in Official Record Book 1097, Page 488, Public Records of Hillsborough County, Florida, and the West boundary of the Southeast one quarter of Section 12, Township 31 South, Range 19 East; thence N.00°25'26"E. 200.00 feet along said West boundary; thence S.88°40'29"E. 40.00 feet; thence S.00°25'26"W. 200.00 feet to the South boundary of said Right-of-Way; thence N.88°40'29"W. 40.00 feet to the POINT OF BEGINNING.

Parcel No. 4 (Fire Lane and Access)

For a POINT OF BEGINNING, commence at a Hillsborough County 4-inch square concrete monument marking the intersection of the West line of a Tampa Electric Company 200.00 feet Right-of-Way recorded in Official Record Book 1097, Page 488, Public Records of Hillsborough County, Florida, and the Northwesterly Right-of-Way of Interstate 75; thence N.00°20'08"E. 147.87 feet along the West line of said Tampa Electric Company Right-of-Way; thence N.16°01'48"E. 739.35 feet parallel with said Northwesterly Right-of-Way of Interstate 75 to the East line of said Tampa Electric Company Right-of-Way; thence S.00°20'08"W. 147.87 feet along said East line to said Northwesterly Right-of-Way of Interstate 75; thence S.16°01'48"W. 739.35 feet to the POINT OF BEGINNING.

OFF. REC. 7769PG1725



GOLDEN ASTOR SCRUB

SECTIONS 1, 2, AND 12, TOWNSHIP 31 SOUTH, RANGE 19 EAST, HILLSBOROUGH COUNTY, FLORIDA

SKETCH OF DESCRIPTION

(LOCATION MAP)

= EASEMENT AREA

EXHIBIT A-1 TO EASEMENT

EXHIBIT "B"

PARCEL 101.1

All that part of the East 1/2 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida. Lying East of the railroad right-of-way.

LESS

The North 20 feet of the East 650 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 10 feet of the East 560 feet of the South 35 feet of the North 55 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract beginning at the Southwest corner of the Southeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East 2,615.63 feet to the Southeast corner of Section 2, Township 31 South, Range 19 East, thence North 99.25 feet and Westerly to beginning.

FIRE LANES AND ACCESS EASEMENTS

(1) The purpose of these crossings is to provide access for ingress and egress, parties performing work on Grantee's adjacent lands, and designated invitees as part of the management of the property as a preserve, maintenance of fences, creating and maintenance of fire lanes, and other associates activities for habitat management on Grantee's property.

(2) The following will be posted on alternate sides of the Easement Areas at intervals of not more than one hundred (100) feet along the boundaries of the Easement Area.

DANGER: HIGH VOLTAGE ELECTRICAL TRANSMISSION LINES -- NO TRESPASSING.

All signs will have letters at least one inch high.

(3) The exterior fencing will be a "hog wire fence and with the existing gate. In the event this gate is damaged or destroyed, Grantee will provide a replacement gate acceptable to Grantor.

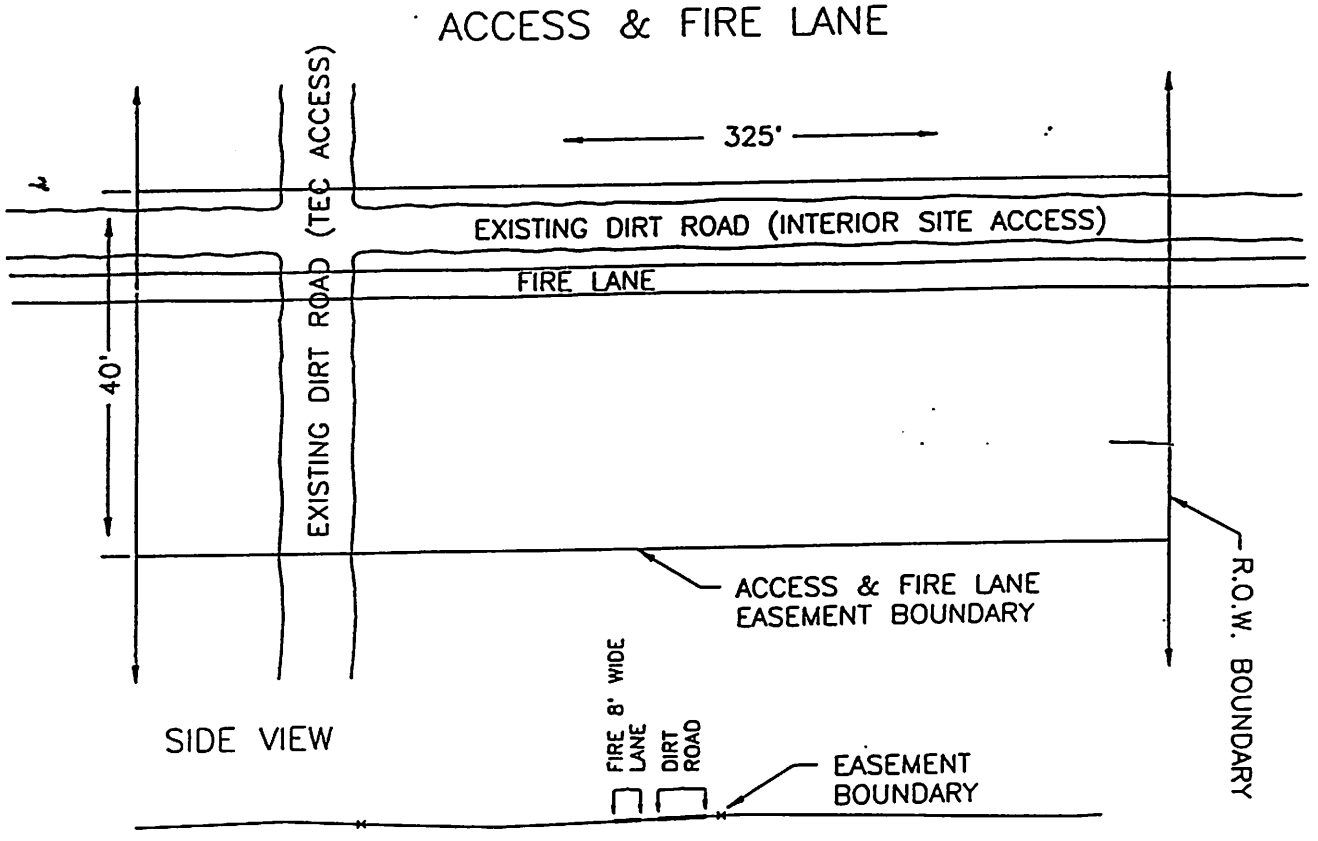


Exhibit "C"

RICHARD AKE
CLERK OF CIRCUIT COURT
HILLSBOROUGH COUNTY

OFF. REC. 7769 PG 1728

22

Documentary Tax Pd - F.S. 201.02 $ 21,621.60
Documentary Tax Pd - F.S. 201.08 $ 0
Intangible Tax Pd - F.S. 199 $ _____
Richard Ake, Clerk Hillsborough County
By: S. Neem Deputy Clerk

37 50
21,621.60
21,659.10

1995 MAY 26 PM 4:16

95118483

TRUSTEE'S DEED

THIS INDENTURE is made on the 26th day of May, 1995, between **EMIL C. MARQUARDT, JR., AS TRUSTEE UNDER THE PROVISIONS OF THE LAND TRUST AGREEMENT DATED DECEMBER 10, 1990**, with full power and authority to protect, conserve, sell, lease, encumber, or otherwise manage and dispose of the property, whose post office address is: P. O. Box 1669, Clearwater, Florida 34616, ("Grantor") and **HILLSBOROUGH COUNTY, a political subdivision of the State of Florida**, whose address is: P. O. Box 1110, Tampa, Florida 33601 ("Grantee").

W I T N E S S E T H:

GRANTOR, in consideration of the sum of Ten and 00/100 Dollars ($10.00) and other valuable consideration, the receipt of which is hereby acknowledged, does hereby grant, bargain, sell, convey, transfer and assign to Grantee, its, successors and assigns, all that certain real property located in Hillsborough County, Florida, more particularly described as follows:

SEE EXHIBIT "A" ATTACHED HERETO AND MADE A PART HEREOF

Folio Numbers: 51431.0000, 51426.0000, 51428.0000, and 51501.0000.

Grantees' Tax Identification Number: 59-6000661.

THE PROPERTY DESCRIBED HEREIN IS NOT THE HOMESTEAD OF THE GRANTOR.

SUBJECT TO:

(a) Real Estates Taxes for the year 1995 and all subsequent years, which are not yet due and payable;

(b) Restrictions and limited easement recorded in O. R. Book 887, Page 778, of the Public Records of Hillsborough County, Florida, which reserves to Tampa Electric Company the right to approve the plans for roads, utilities and drainage facilities before construction commences;

THIS INSTRUMENT PREPARED BY (& RETURN TO):
E.D. ARMSTRONG III, ESQ.
JOHNSON, BLAKELY, POPE, BOKOR, RUPPEL & BURNS, P.A.
P.O. Box 1368, Clearwater, FL 34617

(c) Restrictions and limited easement recorded in O.R. Book 1658, Page 832, of the Public Records of Hillsborough County, Florida, which reserves to Tampa Electric Company the right to approve the plans for roads, utilities and drainage facilities before construction commences; and

(d) Restrictions and limited easement recorded in O.R. Book 1097, Page 488, of the Public Records of Hillsborough County, Florida, which reserves to Tampa Electric Company the right to approve the plans for roads, utilities and drainage facilities before construction commences.

NONE OF WHICH SHALL BE REIMPOSED HEREBY.

TO HAVE and to hold the same in fee simple forever.

AND GRANTOR does hereby fully warrant the title to said land and will defend the same against the lawful claims of all persons whomsoever claiming or to claim the same by, through and under Grantor.

IN WITNESS WHEREOF, Grantor has executed this deed the day and year first above written.

WITNESSES:

Print Name: CHERYL L. GUNDRY

Print Name

EMIL C. MARQUARDT, JR., as Trustee
under the provisions of the Land Trust
dated December 10, 1990

P. O. Box 1669
Clearwater, Florida 34616

STATE OF FLORIDA)

COUNTY OF PINELLAS)

The foregoing instrument was acknowledged before me this 16 day of May, 1995, by **EMIL C. MARQUARDT, JR., AS TRUSTEE UNDER THE PROVISIONS OF THE LAND TRUST AGREEMENT DATED DECEMBER 10, 1990,** with full power and authority to protect, conserve, sell, lease, encumber, or otherwise

manage and dispose of the property, who [is personally known to me] OR [has produced a Florida Driver's License as identification].

Notary Public
Print Name

My Commission Expires: 2/6/96

05/11/95 2:11 PM (d-1)
32896.87225;CLG
69747.01

BARBARA SAVERY
MY COMMISSION # CC 178439
EXPIRES: February 6, 1996
Bonded Thru Notary Public Underwriters

APPROVED
Board of County Commissioners
DATE 11-16-94
MICHAEL KELLY
Director
Real Estate Department

EXHIBIT "A"

All Property above the ordinary high water line within the following:

PARCEL 101.1

All that part of the East 1/2 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida. Lying East of the railroad right-of-way.

LESS

The North 20 feet of the East 650 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 10 feet of the East 560 feet of the South 35 feet of the North 55 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract beginning at the Southwest corner of the Southeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East 2,615.63 feet to the Southeast corner of Section 2, Township 31 South, Range 19 East, thence North 99.25 feet and Westerly to beginning.

PARCEL 101.2

The part of the East 1/2 of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida, lying West of East Bay Road, and lying West of land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

AND

The West 1/2 of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida, LESS the West 325.0 feet, thereof.

AND

All that part of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying West of land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

LESS

The South 1,216 feet of the West 816 feet of the Southeast 1/4 of said Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Portion deeded to State Road Department for State Road 672.

ALSO LESS

The South 3/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 325 feet of the Northwest 1/4 of the Northwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 300 feet of the Southwest 1/4 of the Northwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 300 feet of the North 1/2 of the Northwest 1/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract beginning 300 feet East of the Southwest corner of the North 1/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East to the East boundary of the Southwest 1/4, thence North 200 feet, thence West to point 200 feet, north of beginning and South 200 feet to beginning.

ALSO LESS

Tract beginning 1,378.6 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 200.04 feet; thence North 1,984.4 feet; thence West 1,067.05 feet; thence North 200.01 feet; thence East 1,266.80 feet; thence South 2,185 feet to beginning.

ALSO LESS

Tract beginning 1,578.64 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 254.37 feet; thence North 1,216 feet; thence West 815.44 feet; thence North 774.55 feet; thence East 1,067.05 feet; thence South 1,984.4 feet to beginning.

ALSO LESS

Right of way for State Road 672.

ALSO LESS

Less lands taken by Tampa Electric Company in Case Number 79-13223, in the Circuit Court in and for Hillsborough County, Florida.

ALSO LESS

Land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

PARCEL 101.3

A tract beginning 1,578.64 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 254.37 feet; thence North 1,216 feet; thence West 815.44 feet; thence North 774.55 feet; thence East 1,067.05 feet; thence South 1,984.4 feet to beginning.

LESS

Right-of-way for State Road 672.

ALSO LESS

Lands taken by Division of Administration, State of Florida, Department of Transportation in Case Number 78-15387, in the Circuit Court of Hillsborough County, Florida.

PARCEL 102.1

That part of Section 1 and the East 1/2 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying Westerly of East Bay Road and lying East of land taken by Division of Administration, State of Florida, Department of Transportation in case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

More particularly described as follows:

Commence at the Southeast corner of Section 12, Township 31 South, Range 19 East, said corner being the same as shown on Florida Department of Transportation Right-of-Way Maps for Interstate 75 (State Road 93-A, Section 10075-2404 dated 10/18/77); thence N.00°16'28"E. 2659.80 feet along the East boundary of the Southeast one quarter of said Section 12 to the Northeast corner of said Southeast one quarter; thence N.89°38'36"W. 75.00 feet to the Westerly Right-of-Way line of Bullfrog Creek Road (formerly East Bay Road) and the Point of Beginning; thence along said Westerly Right-of-Way line Southwesterly 1202.38 feet along the arc of a curve to the right having a radius of 1357.47 feet, chord of 1163.46 feet and chord bearing of S.25°43'54"W.; thence continuing along said Westerly Right-of-Way line S.51°06'24"W. 340.65 feet to the beginning of a curve to the left; thence continuing along said Westerly Right-of-Way line Southwesterly 468.80 feet along the arc of said curve having a radius of 1507.47 feet, chord of 466.92 feet and chord bearing of S.42°11'51"W. to the Easterly Right-of-Way line of Interstate 75 (State Road 93-A); thence along said Easterly Right-of-Way line N.16°01'48"E. 2373.25 feet to the beginning of a curve to the left; thence continuing along said Easterly Right-of-Way line Northeasterly 3149.90 feet along the arc of said curve having a radius of 11632.67 feet, chord of 3140.28 feet and chord bearing of N.08°16'22"E.; thence S.89°29'04"E. 0.32 feet to said Westerly Right-of-Way line of Bullfrog Creek Road; thence along said Westerly Right-of-Way line S.00°21'39"W. 1119.70 feet; thence continuing along said Westerly Right-of-Way line S.00°21'24"W. 2661.06 feet to the Point of Beginning.

PARCEL 102.2

That part of Southeast 1/4, Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying Easterly of East Bay Road, LESS Right-of-ways for Big Bend Road (672 State Road), LESS the East 387.28 feet thereof.

ALSO LESS

Land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

More particularly described as follows:

Commence at the Southeast corner of Section 12, Township 31 South, Range 19 East, said corner being the same as shown on Florida Department of Transportation Right-of-Way Maps for Interstate 75 (State Road 93-A, Section 10075-2404 dated 10/18/77); thence N.88°53'31"W. 387.32 feet along the South boundary of the Southeast one quarter of said Section 12, said South boundary being the same as shown on said Right-of-Way Maps; thence N.00°16'28"E. 47.18 feet along a line parallel with and 387.28 feet Westerly of the East boundary of the Southeast quarter of said Section 12 to the Northerly Right-of-Way line of Big Bend Road (County Road 672, formerly State Road 672) and the Point of Beginning; thence along said Northerly Right-of-Way line the following courses,

N.88°47'40"W.	576.65 feet
N.88°30'40"W.	181.20 feet
N.84°41'49"W.	150.33 feet

to the intersection of said Northerly Right-of-Way line with the Easterly Right-of-Way line of Bullfrog Creek Road (formerly East Bay Road); thence along said Easterly Right-of-Way line N.00°21'24"E. 46.39 feet; thence continuing along said Right-of-Way line N.16°01'48"E. 726.47 feet to the beginning of a curve to the right; thence continuing Northeasterly along said Right-of-Way line 571.72 feet along the arc of said curve having a radius of 946.41 feet, chord of 563.06 feet and chord bearing of N.33°20'09"E.; thence continuing along said Right-of-Way line N.48°43'59"E. 158.40 feet; thence continuing along said Right-of-Way line N.51°06'24"E. 206.08 feet to the beginning of a curve to the left; thence continuing along said Right-of-Way line Northeasterly 169.15 feet along the arc of said curve having a radius of 1457.47 feet, chord of 169.06 feet and chord bearing of N.47°46'55"E. to a point on a line parallel with and 387.28 feet Westerly of the East boundary of the Southeast one quarter of said Section 12; thence S.00°16'28"W. 1593.26 feet to the Point of Beginning.

24

OFF. REC. 7769PG1736

RICHARD AKE
CLERK OF CIRCUIT COURT
HILLSBOROUGH COUNTY

Documentary Tax Pd - F.S. 201.02 $ .70
Documentary Tax Pd - F.S. 201.08 $ -0-
Intangible Tax Pd - F.S. 199 $ -0-
Richard Ake, Clerk Hillsborough County
By: S. Neary Deputy Clerk

42.00
.70
42.70

1995 MAY 26 PM 4:16

95118484

QUIT CLAIM DEED

THIS INDENTURE, MADE THIS 26th day of May, 1995, between EMIL C. MARQUARDT, JR., AS TRUSTEE UNDER THE PROVISIONS OF THE LAND TRUST AGREEMENT DATED DECEMBER 10, 1990, with full power and authority to protect, conserve, sell, lease, encumber , or otherwise manage and dispose of the property, whose post office address is: P. O. Box 1669, Clearwater, Florida 34616 ("Grantor"), and HILLSBOROUGH COUNTY, a political subdivision of the State of Florida, whose address is: P. O. Box 1110, Tampa, Florida 33601 ("Grantee").

W I T N E S S E T H:

That said Grantor, for and in consideration of the sum of Ten and no/100 Dollars ($10.00), and other good and valuable considerations to said Grantor in hand paid by said Grantee, the receipt whereof is hereby acknowledged, has remised, released and quitclaimed, and by these presents does remise, release and quitclaim unto the said Grantee, all the right, title, interest, claim and demand which Grantor has in and to the following described land, situate, lying and being in Hillsborough County, Florida, to wit:

SEE EXHIBIT "A" ATTACHED HERETO AND MADE A PART HEREOF

SUBJECT TO:

(a) Real Estates Taxes for the year 1995 and all subsequent years, which are not yet due and payable;

(b) Restrictions and limited easement recorded in O. R. Book 887, Page 778, of the Public Records of Hillsborough County, Florida, which reserves to Tampa Electric Company the right to approve the plans for roads, utilities and drainage facilities before construction commences;

(c) Restrictions and limited easement recorded in O.R. Book 1658, Page 832, of the Public Records of Hillsborough County, Florida, which reserves to Tampa Electric Company the right to approve the plans for roads, utilities and drainage facilities before construction commences; and

(d) Restrictions and limited easement recorded in O.R. Book 1097, Page 488, of the Public Records of Hillsborough County, Florida, which reserves to Tampa Electric

JOHNSON, BLAKELY, POPE, SOKOR, RUPPEL & BURNS, P.A.
P.O. Box 1368, Clearwater, FL 34617-1368

Company the right to approve the plans for roads, utilities and drainage facilities before construction commences.

NONE OF WHICH SHALL BE REIMPOSED HEREBY.

Folio Numbers: 51431.0000, 51426.0000, 51428.0000, and 51501.0000.

Tax Identification No. of Grantee: 59-6000661.

THIS PROPERTY IS NOT THE HOMESTEAD OF THE GRANTOR.

THE GRANTOR ACKNOWLEDGES THAT THIS CONVEYANCE IS BEING GRANTED AT NO ADDITIONAL COST TO THE GRANTEE, AND THAT THIS CONVEYANCE IS TO ASSURE THAT ANY AND ALL OWNERSHIP, CURRENT OR POTENTIAL, THAT THE GRANTOR MAY HAVE IN THE ABOVE DESCRIBED PROPERTY HAS BEEN CONVEYED TO THE GRANTEE.

TO HAVE AND TO HOLD the same, together with all and singular the appurtenances thereunto belonging or in anywise appertaining, and all the estate, right, title, interest and claim whatsoever of the Grantor, either in law or equity, to the only proper use, benefit and behoof of the Grantee.

IN WITNESS WHEREOF, Grantor has hereunto set Grantor's hand and seal the day and year first above written.

Signed, Sealed and Delivered
in Our Presence:

Print Name: CHERYLL. SUNDRY

Print Name:

EMIL C. MARQUARDT, Jr., as
Trustee under the provisions of the
Land Trust dated December 10, 1990

P. O. Box 1669
Clearwater, Florida 34616

STATE OF FLORIDA)

COUNTY OF PINELLAS)

The foregoing instrument was acknowledged before me this 26 day of _____, 1995, by EMIL C. MARQUARDT, JR., AS TRUSTEE UNDER THE PROVISIONS OF THE LAND TRUST AGREEMENT DATED DECEMBER 10, 1990, with full power and authority to protect, conserve, sell, lease, encumber, or otherwise manage

and dispose of the property, who [is personally known to me] OR [has produced a Florida Driver's License as identification].

Notary Public

Print Name

My Commission Expires: 2/4/96

05/24/95 4:56 PM (d-2)
32896.87225;CLG
69755.01

BARBARA SAVERY
MY COMMISSION # CC 178439
EXPIRES: February 6, 1996
Bonded Thru Notary Public Underwriters

APPROVED
Board of County Commissioners
DATE 11-16-94
MICHAEL KELLY
Director
Real Estate Department

EXHIBIT "A"

Any and all interest, current or future, in the following property, above or below the ordinary high water line including, but not limited to, mineral interests, permit rights, submerged lands, sovereign lands, and riparian rights:

PARCEL 101.1

All that part of the East 1/2 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida. Lying East of the railroad right-of-way.

LESS

The North 20 feet of the East 650 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 10 feet of the East 560 feet of the South 35 feet of the North 55 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract beginning at the Southwest corner of the Southeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East 2,615.63 feet to the Southeast corner of Section 2, Township 31 South, Range 19 East, thence North 99.25 feet and Westerly to beginning.

PARCEL 101.2

The part of the East 1/2 of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida, lying West of East Bay Road, and lying West of land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

AND

The West 1/2 of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida, LESS the West 325.0 feet, thereof.

AND

All that part of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying West of land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

LESS

The South 1,216 feet of the West 816 feet of the Southeast 1/4 of said Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Portion deeded to State Road Department for State Road 672.

ALSO LESS

The South 3/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 325 feet of the Northwest 1/4 of the Northwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 300 feet of the Southwest 1/4 of the Northwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 300 feet of the North 1/2 of the Northwest 1/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract beginning 300 feet East of the Southwest corner of the North 1/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East to the East boundary of the Southwest 1/4, thence North 200 feet, thence West to point 200 feet, north of beginning and South 200 feet to beginning.

ALSO LESS

Tract beginning 1,378.6 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 200.04 feet; thence North 1,984.4 feet; thence West 1,067.05 feet; thence North 200.01 feet; thence East 1,266.80 feet; thence South 2,185 feet to beginning.

ALSO LESS

Tract beginning 1,578.64 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 254.37 feet; thence North 1,216 feet; thence West 815.44 feet; thence North 774.55 feet; thence East 1,067.05 feet; thence South 1,984.4 feet to beginning.

ALSO LESS

Right of way for State Road 672.

ALSO LESS

Less lands taken by Tampa Electric Company in Case Number 79-13223, in the Circuit Court in and for Hillsborough County, Florida.

ALSO LESS

Land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

PARCEL 101.3

A tract beginning 1,578.64 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West

254.37 feet; thence North 1,216 feet; thence West 815.44 feet; thence North 774.55 feet; thence East 1,067.05 feet; thence South 1,984.4 feet to beginning.

LESS

Right-of-way for State Road 672.

ALSO LESS

Lands taken by Division of Administration, State of Florida, Department of Transportation in Case Number 78-15387, in the Circuit Court of Hillsborough County, Florida.

PARCEL 102.1

That part of Section 1 and the East 1/2 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying Westerly of East Bay Road and lying East of land taken by Division of Administration, State of Florida, Department of Transportation in case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

More particularly described as follows:

Commence at the Southeast corner of Section 12, Township 31 South, Range 19 East, said corner being the same as shown on Florida Department of Transportation Right-of-Way Maps for Interstate 75 (State Road 93-A, Section 10075-2404 dated 10/18/77); thence N.00°16'28"E. 2659.80 feet along the East boundary of the Southeast one quarter of said Section 12 to the Northeast corner of said Southeast one quarter; thence N.89°38'36"W. 75.00 feet to the Westerly Right-of-Way line of Bullfrog Creek Road (formerly East Bay Road) and the Point of Beginning; thence along said Westerly Right-of-Way line Southwesterly 1202.38 feet along the arc of a curve to the right having a radius of 1357.47 feet, chord of 1163.46 feet and chord bearing of S.25°43'54"W.; thence continuing along said Westerly Right-of-Way line S.51°06'24"W. 340.65 feet to the beginning of a curve to the left; thence continuing along said Westerly Right-of-Way line Southwesterly 468.80 feet along the arc of said curve having a radius of 1507.47 feet, chord of 466.92 feet and chord bearing of S.42°11'51"W. to the Easterly Right-of-Way line of Interstate 75 (State Road 93-A); thence along said Easterly Right-of-Way line N.16°01'48"E. 2373.25 feet to the beginning of a curve to the left; thence continuing along said Easterly Right-of-Way line Northeasterly 3149.90 feet along the arc of said curve having a radius of 11632.67 feet, chord of 3140.28 feet and chord bearing of N.08°16'22"E.; thence S.89°29'04"E. 0.32 feet to said Westerly Right-of-Way line of Bullfrog Creek Road; thence along said Westerly Right-of-Way line S.00°21'39"W. 1119.70 feet; thence

continuing along said Westerly Right-of-Way line S.00°21'24"W. 2661.06 feet to the Point of Beginning.

PARCEL 102.2

That part of Southeast 1/4, Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying Easterly of East Bay Road, LESS Right-of-ways for Big Bend Road (672 State Road), LESS the East 387.28 feet thereof.

ALSO LESS

Land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

More particularly described as follows:

Commence at the Southeast corner of Section 12, Township 31 South, Range 19 East, said corner being the same as shown on Florida Department of Transportation Right-of-Way Maps for Interstate 75 (State Road 93-A, Section 10075-2404 dated 10/18/77); thence N.88°53'31"W. 387.32 feet along the South boundary of the Southeast one quarter of said Section 12, said South boundary being the same as shown on said Right-of-Way Maps; thence N.00°16'28"E. 47.18 feet along a line parallel with and 387.28 feet Westerly of the East boundary of the Southeast quarter of said Section 12 to the Northerly Right-of-Way line of Big Bend Road (County Road 672, formerly State Road 672) and the Point of Beginning; thence along said Northerly Right-of-Way line the following courses,

N.88°47'40"W.	576.65 feet
N.88°30'40"W.	181.20 feet
N.84°41'49"W.	150.33 feet

to the intersection of said Northerly Right-of-Way line with the Easterly Right-of-Way line of Bullfrog Creek Road (formerly East Bay Road); thence along said Easterly Right-of-Way line N.00°21'24"E. 46.39 feet; thence continuing along said Right-of-Way line N.16°01'48"E. 726.47 feet to the beginning of a curve to the right; thence continuing Northeasterly along said Right-of-Way line 571.72 feet along the arc of said curve having a radius of 946.41 feet, chord of 563.06 feet and chord bearing of N.33°20'09"E.; thence continuing along said Right-of-Way line N.48°43'59"E. 158.40 feet; thence continuing along said Right-of-Way line N.51°06'24"E. 206.08 feet to the beginning of a curve to the left; thence continuing along said Right-of-Way line Northeasterly 169.15 feet along the arc of said curve having a radius of 1457.47 feet, chord of 169.06 feet and chord bearing of N.47°46'55"E. to a point on

a line parallel with and 387.28 feet Westerly of the East boundary of the Southeast one quarter of said Section 12; thence S.00°16'28"W. 1593.26 feet to the Point of Beginning.

THE PURPOSE OF THIS CONVEYANCE IS TO TRANSFER ANY AND ALL INTEREST IN THE ABOVE DESCRIBED PROPERTY FROM THE GRANTOR TO THE GRANTEE THAT IS NOT BEING CONVEYED BY ANY OTHER INSTRUMENT.

OFF. REC. 7769 PG 1749

RICHARD AKE
CLERK OF CIRCUIT COURT
HILLSBOROUGH COUNTY

Documentary Tax Pd - F.S. 201.02 $ 1.70
Documentary Tax Pd - F.S. 201.08 $ .70
Intangible Tax Pd - F.S. 199 $
Richard Ake, Clerk Hillsborough County
By: S. Neem Deputy Clerk

(9)
c. 19.50
s .70
20 20

QUIT CLAIM DEED

THIS INDENTURE, MADE THIS 26th day of May, 1995, between **EMIL C. MARQUARDT, JR., AS TRUSTEE UNDER THE PROVISIONS OF THE LAND TRUST AGREEMENT DATED DECEMBER 10, 1990, with full power and authority to protect, conserve, sell, lease, encumber, or otherwise to manage and dispose of the real property described below** ("Grantor"), whose address is; P. O. Box 1669, County of Pinellas, State of Florida 34616, and **HILLSBOROUGH COUNTY, a political subdivision of the State of Florida** ("Grantee"), whose address is: P. O. Box 1110, Hillsborough County, Tampa, Florida 33601

THIS INSTRUMENT PREPARED BY (& RETURN TO):
E.D. ARMSTRONG III, ESQ.
JOHNSON, BLAKELY, POPE, BOKOR, RUPPEL & BURNS, P.A.
P.O. Box 1368, Clearwater, FL 34617-1368

1995 MAY 26 PM 4:17

95118486

W I T N E S S E T H:

That said Grantor, for and in consideration of the sum of Ten and no/100 Dollars ($10.00), and other good and valuable considerations to said Grantor in hand paid by said Grantee, the receipt whereof is hereby acknowledged, has remised, released and quitclaimed, and by these presents does remise, release and quitclaim unto the said Grantee, all the right, title, interest, claim and demand which Grantor has in and to the following described land, situate, lying and being in Hillsborough County, Florida, to wit:

See Exhibits "A" attached hereto and made a part hereof.

SUBJECT TO: Easements, restrictions, reservations of record, and real estate taxes for the year 1995 and all subsequent years. **NONE OF WHICH SHALL BE REIMPOSED HEREBY.**

Parcel Identification No: _____

Tax Identification Nos. of Grantee: 59-6000661

THIS PROPERTY IS NOT THE HOMESTEAD OF THE GRANTOR.

THIS QUIT CLAIM DEED WAS PREPARED WITHOUT THE BENEFIT OF A TITLE SEARCH.

THIS QUIT CLAIM DEED IS GIVEN TO RESOLVE ANY INTEREST GRANTOR MAY HAVE IN THE HIATUS PARCEL DESCRIBED IN EXHIBIT "A" ("HIATUS"), WHICH HIATUS WAS BROUGHT ABOUT BASED UPON THE USE OF DIFFERENT SECTION CORNERS FOR DESCRIBING PROPERTY LOCATED ADJACENT TO THE HIATUS PROPERTY.

TO HAVE AND TO HOLD the same, together with all and singular the appurtenances thereunto belonging or in anywise appertaining, and all the estate, right, title, interest and claim whatsoever of the Grantor, either in law or equity, to the only proper use, benefit and behoof of the Grantee.

IN WITNESS WHEREOF, Grantor has hereunto set Grantor's hand and seal the day and year first above written.

Signed, Sealed and Delivered
in Our Presence:

Print Name: CHERYL L. GUNDRY

Print Name: BARBARA SAVERY

Emil C. Marquardt, Jr., as Trustee
under the provisions of the Land Trust
Agreement dated December 10, 1990

STATE OF FLORIDA)

COUNTY OF PINELLAS)

The foregoing instrument was acknowledged before me this 22 day of April, 1995, by **EMIL C. MARQUARDT, JR., AS TRUSTEE UNDER THE PROVISIONS OF THE LAND TRUST AGREEMENT DATED DECEMBER 10, 1990, with full power and authority to protect, conserve, sell, lease, encumber, or otherwise to manage and dispose of the real property described above,** who [is personally known to me] OR [has produced _____ as identification].

Notary Public
Print Name: BARBARA SAVERY

My Commission Expires: 2/6/96

BARBARA SAVERY
MY COMMISSION # CC 178499
EXPIRES: February 6, 1996
Bonded Thru Notary Public Underwriters

Exhibit "A" - Legal Description (hiatus along north boundary - Parcel 101.1)
32896.87225;CLG;04/12/95 10:39 AM
67339.01

APPROVED
Board of County Commissioners
DATE 11-14-94
MICHAEL KELLY
Director
Real Estate Department

GOLDEN ASTER SCRUB

Hiatus Along North Boundary

Parcel 101.1

An apparent hiatus lying between the North boundary of the Northeast one quarter of Section 2, Township 31 South, Range 19 East and the South boundary of GIBSONS ARTESIAN LANDS, SECTION NO.4, as recorded in Plat Book 29, Page 45, Public Records of Hillsborough County, Florida as shown on the attached sketch (Schedule B). All also shown on a survey for Golden Aster Scrub by Hillsborough County, Environmental Lands Acquisition and Protection Program, Project No. 89-117-L, dated 2/16/95.

0069824.01

EXHIBIT A

E.L.A.P.P.

OFF. REC. 7769 PG 1752

PROJECT NAME: GOLDEN ASTOR SCRUB - PROJECT #89-117-L

GRANTOR: EMIL C. MARQUARDT, JR., AS TRUSTEE

SKETCH OF DESCRIPTION
(NOT A SURVEY)

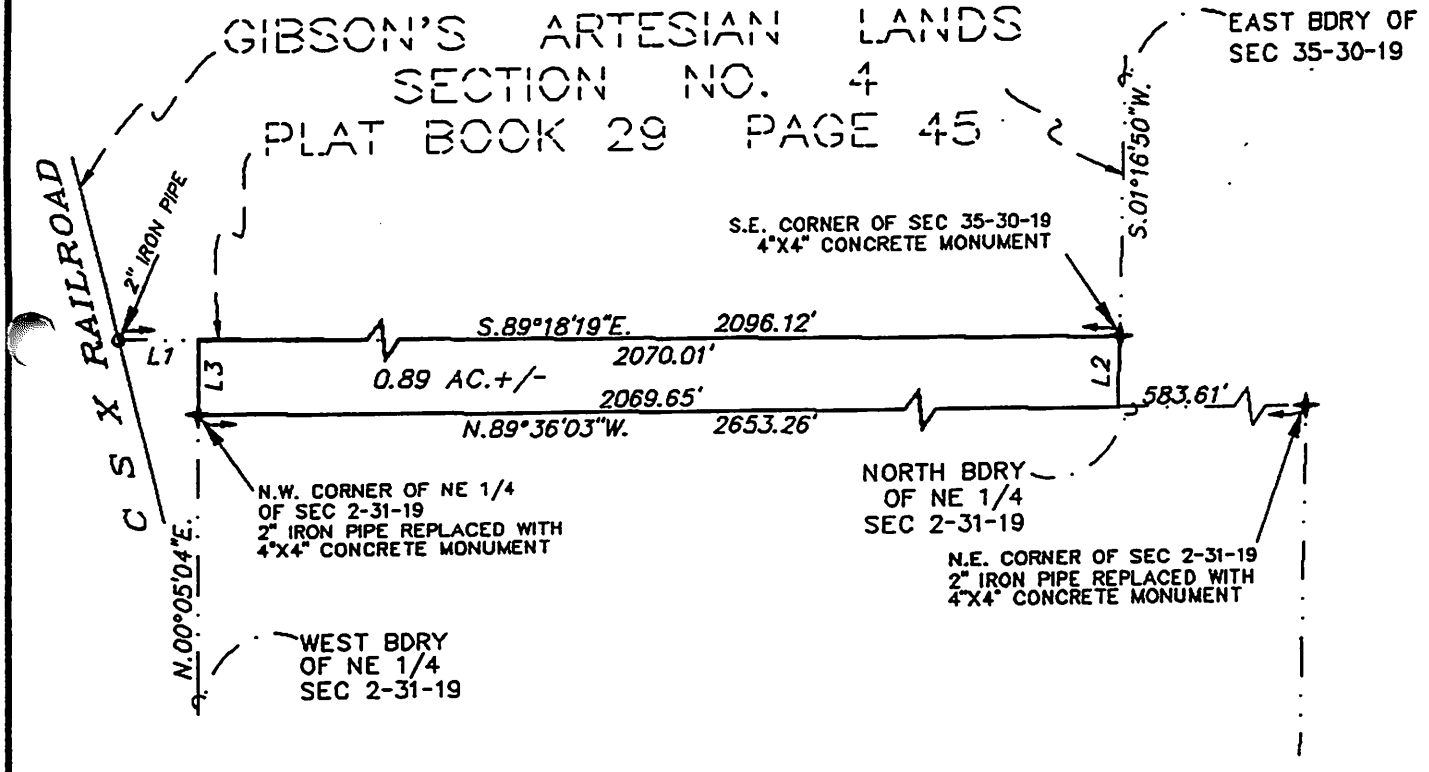
NORTH

N

N.T.S.

LINE TABLE

Line	Bearing	Distance
L1	S.89°18'19"E.	26.11'
L2	S.01°16'50"W.	13.50'
L3	N.00°05'04"E.	24.17'



PREPARED FROM A SURVEY OF GOLDEN ASTOR SCRUB (ELAPP PROJECT #89-117-L) BY HILLSBOROUGH COUNTY DATED 2/16/95.

NOTE:
This sketch is not a survey. If there is a discrepancy between the legal description and the sketch, the legal description will control.

COUNTY of HILLSBOROUGH
ENGINEERING & CONSTRUCTION SERVICES
SURVEY & MAPPING/GIS SECTION
FIELD SURVEY OFFICE (813) 744-6619
7220 N. TAYLOR RD., SEFFNER, FL 33584

DATE	SCALE: NOT TO SCALE	SUR. REQ.# 940913
	DRAWN BY: J.PRADO	SEC 12 TWP 31 RGE 19
	CHECKED BY: J.LESTER	FLD. BOOK# 447
PROJECT # 89117L ELAPP		SHEET 01 of 01

SCHEDULE B

4AD
26

OFF. REC. 7769 PG 1745

RICHARD AKE
CLERK OF CIRCUIT COURT
HILLSBOROUGH COUNTY

Documentary Tax Pd - F.S. 201.02 $ .70
Documentary Tax Pd - F.S. 201.08 $ -0-
Intangible Tax Pd - F.S. 199 $ -0-
Richard Ake, Clerk Hillsborough County
By: S. Mean Deputy Clerk

19.50
.70
20.20

QUIT CLAIM DEED

THIS INDENTURE, MADE THIS 26th day of May, 1995, between **EMIL C. MARQUARDT, JR., AS TRUSTEE UNDER THE PROVISIONS OF THE LAND TRUST AGREEMENT DATED DECEMBER 10, 1990, with full power and authority to protect, conserve, sell, lease, encumber, or otherwise to manage and dispose of the real property described below** ("Grantor"), whose address is: P. O. Box 1669, County of Pinellas, State of Florida 34616, and **HILLSBOROUGH COUNTY, a political subdivision of the State of Florida** ("Grantee"), whose address is: P. O. Box 1110, Hillsborough County, Tampa, Florida 33601

1995 MAY 26 PM 4:17

95118485

INSTRUMENT PREPARED BY (& RETURN TO):
E.D. ARMSTRONG III, ESQ.
JOHNSON, BLAKELY, POPE, BOKOR, RUPPEL & BURNS, P.A.
P.O. Box 1368, Clearwater, FL 34617-1368

WITNESSETH:

That said Grantor, for and in consideration of the sum of Ten and no/100 Dollars ($10.00), and other good and valuable considerations to said Grantor in hand paid by said Grantee, the receipt whereof is hereby acknowledged, has remised, released and quitclaimed, and by these presents does remise, release and quitclaim unto the said Grantee, all the right, title, interest, claim and demand which Grantor has in and to the following described land, situate, lying and being in Hillsborough County, Florida, to wit:

See Exhibits "A" attached hereto and made a part hereof.

SUBJECT TO: Easements, restrictions, reservations of record, and real estate taxes for the year 1995 and all subsequent years. **NONE OF WHICH SHALL BE REIMPOSED HEREBY.**

Parcel Identification No: _____

Tax Identification Nos. of Grantee: 59-6000661

THIS PROPERTY IS NOT THE HOMESTEAD OF THE GRANTOR.

THIS QUIT CLAIM DEED WAS PREPARED WITHOUT THE BENEFIT OF A TITLE SEARCH.

THIS QUIT CLAIM DEED IS GIVEN TO RESOLVE ANY INTEREST GRANTOR MAY HAVE IN THE HIATUS PARCEL DESCRIBED IN EXHIBIT "A" ("HIATUS"), WHICH HIATUS WAS BROUGHT ABOUT BASED UPON THE USE OF DIFFERENT SECTION CORNERS FOR DESCRIBING PROPERTY LOCATED ADJACENT TO THE HIATUS PROPERTY.

TO HAVE AND TO HOLD the same, together with all and singular the appurtenances thereunto belonging or in anywise appertaining, and all the estate, right, title, interest and claim whatsoever of the Grantor, either in law or equity, to the only proper use, benefit and behoof of the Grantee.

IN WITNESS WHEREOF, Grantor has hereunto set Grantor's hand and seal the day and year first above written.

Signed, Sealed and Delivered
in Our Presence:

Print Name: CHERYL L. GUNDRY

Print Name: BARBARA SAVERY

Emil C. Marquardt, Jr., as Trustee
under the provisions of the Land Trust
Agreement dated December 10, 1990

STATE OF FLORIDA)

COUNTY OF PINELLAS)

The foregoing instrument was acknowledged before me this 26 day of May, 1995, by **EMIL C. MARQUARDT, JR., AS TRUSTEE UNDER THE PROVISIONS OF THE LAND TRUST AGREEMENT DATED DECEMBER 10, 1990, with full power and authority to protect, conserve, sell, lease, encumber, or otherwise to manage and dispose of the real property described above,** who [is personally known to me] OR [has produced N/A as identification].

Notary Public
Print Name: Barbara Savery

BARBARA SAVERY
MY COMMISSION # CC 178439
EXPIRES: February 6, 1996
Bonded Thru Notary Public Underwriters

My Commission Expires: 2/6/96

Exhibit "A" - Legal Description (hiatus along north boundary - Parcels 101.1 and 101.2))
32896.87225;CLG;04/12/95 11:01 AM
67347.01

APPROVED
Board of County Commissioners
DATE 11-14-94
MICHAEL KELLY
Director
Real Estate Department

GOLDEN ASTER SCRUB

Hiatus Along North Boundary

Parcel 101.1 and 101.2

An apparent hiatus lying between the North boundary of Section 1, Township 31 South, Range 19 East and the South boundary of Section 36, Township 30 South, Range 19 East as shown on the attached sketch (Schedule B),

LESS

Lands owned by Tampa Electric Company.

ALSO LESS

Right-of-Way for East Bay Road.

TOGETHER WITH

An apparent haitus lying between the North boundary of the Northeast one quarter of Section 2, Township 31 South, Range 19 East and the South boundary of Section 36, Township 31 South, Range 19 East as shown on the attached sketch (Schedule B).

All also shown on a survey for Golden Aster Scrub by Hillsborough County, Environmental Land Acquisition and Protection Program, Project No. 89-117-L, dated 2/16/95.

0069828.01

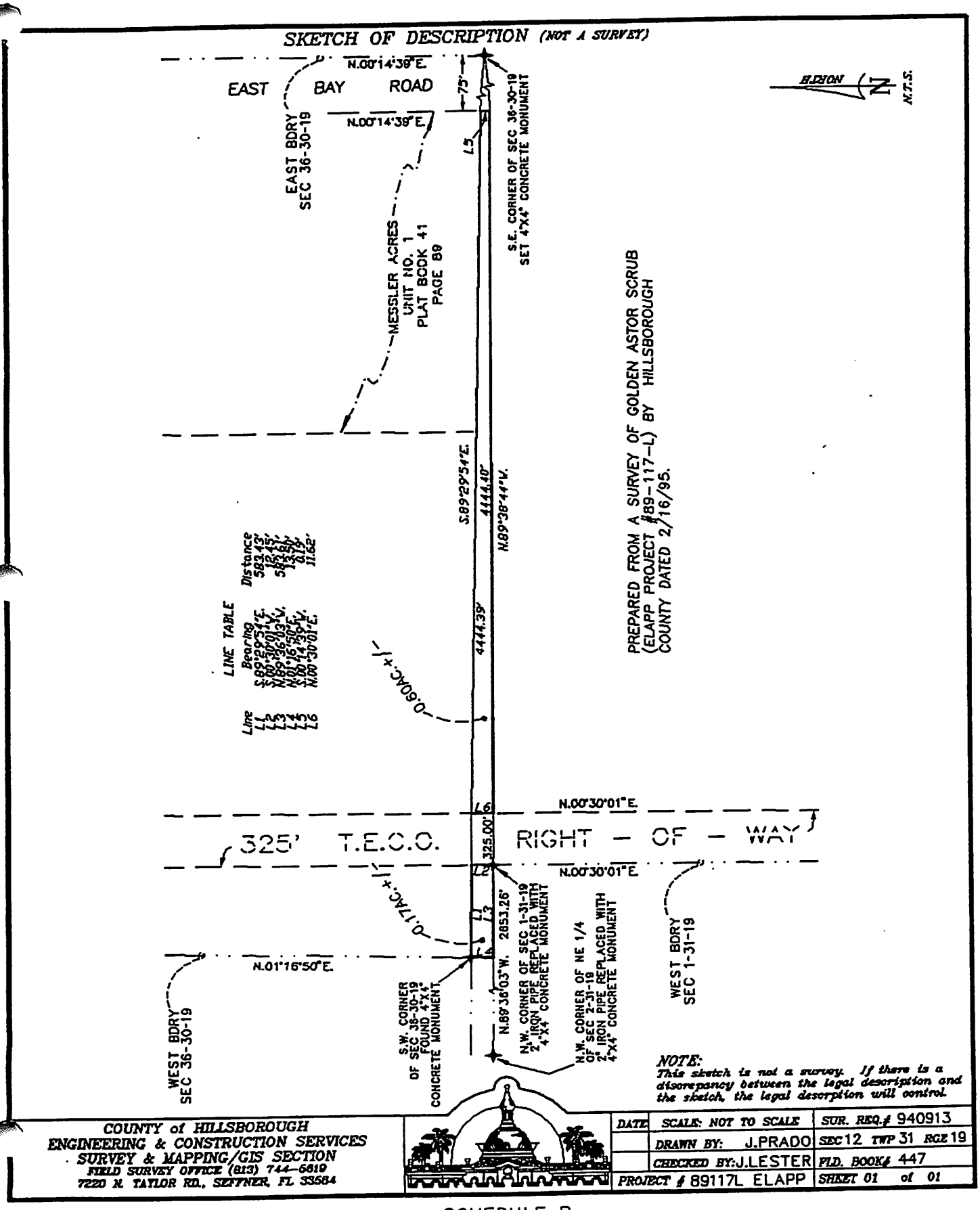
EXHIBIT A

E.L.A.P.P.

OFF. REC. 7769PG1748

PROJECT NAME: GOLDEN ASTOR SCRUB - PROJECT #89-117-L

GRANTOR: EMIL C. MARQUARDT, JR., AS TRUSTEE



SCHEDULE B

RICHARD AKE
CLERK OF CIRCUIT COURT
HILLSBOROUGH COUNTY

OFF. REC. 7769 PG 1753

8

LEASE AGREEMENT FOR CROSSINGS

This lease agreement ("Lease"), made and entered into this 25th day of May, 95, by and between **TAMPA ELECTRIC COMPANY**, ("Lessor") and **HILLSBOROUGH COUNTY**, a political subdivision of the State of Florida ("Lessee") (Lessor and Lessee collectively, the "Parties").

For valuable consideration, Lessor hereby leases on a non-exclusive basis to Lessee those certain parcels of real property Hillsborough County, Florida, described at Exhibit "A", hereof (the "Crossings"), upon the terms and conditions and for the purpose set forth below. In connection therewith, the parties agree as follows:

1. Lease Term. The term of this Lease shall be for a 99 year term commencing on the date hereof and may be terminated if:

(a) The parties reach other agreement in writing; or

(b) Lessee fails, following written notice from Lessor, to cure or correct any material violation or breach of the terms of this Lease.

No termination or expiration of this Lease shall affect the rights of the parties pursuant to the Restrictions (defined below). Upon expiration of the term, this Lease shall be automatically renewed for successive 99 year terms unless earlier terminated as provided above.

2. Consideration. Lessee's agreements as made in this Lease shall constitute full and adequate consideration for this Lease and no charge shall be made by Lessor of Lessee for use of the Crossings pursuant to this Lease.

3. Intent and Purpose. The parties intend that the Crossings be used as a perpendicular trail crossing pursuant to the crossing rights reserved to Lessee, as successor to the grantor, and the approval rights reserved to Lessor, as grantee (the rights, collectively, "Restrictions"), in those certain deeds and indentures from various predecessors to Lessee, as grantors therein, to Lessor, as grantee therein, dated and filed for record in the Public Records of Hillsborough County, Florida as follows:

Date of Instrument	Official Record Book	Page
December 27, 1961	887	778-782
January 30, 1963	1097	488-492
June 20, 1966	1658	832-835

THIS INSTRUMENT PREPARED BY: JAMES L. ESTES, JR., TECO, P. O. Box 111, Tampa, Florida 33601

RETURN TO: Hillsborough County Real Estate Department, P. O. Box 1110, Tampa, Florida 33601

1995 MAY 26 PM 4:17

95118187

H:\BAJLE\ASTOR3.LSE

and that this lease afford to Lessor the full protection of Section 375.251(3)(a) and (b), Florida Statutes (1994). Lessee agrees to adequately post the Crossings to the reasonable satisfaction of Lessor and will use reasonable efforts as to restrict trespass on the adjacent lands of Grantor. It is the parties' intent that pursuant to Section 375.251, Florida Statutes, Lessor shall owe no duty of care to keep the Crossings safe for entry or use by others and that Lessor shall not by giving this lease:

(a) Be presumed to extend any assurance that such land is safe for any purpose,

(b) Incur any duty of care toward a person who goes on the Crossings, or

(c) Become liable or responsible for any injury to persons or property caused by the act or omission of a person who goes on the Crossings.

4. Lessee's Use. Lessee agrees that the Crossings shall be used by Lessee only as set forth on Exhibit "B" for perpendicular trail crossings to serve as recreational and/or conservation access or fire breaks by Lessee and that each crossing shall be maintained by Lessee in a manner generally consistent with Lessor's requirements so as to accommodate Lessor's design, construction, operation and maintenance of electric power transmission facilities and Lessor's agricultural activities on Lessor's lands adjacent to the Crossings. Lessee's access shall be limited to pedestrian traffic, with vehicular use limited strictly to Lessee, Lessee's agents and contractors for maintenance of the Crossings. Prior to performing any site preparation for the Crossings, Lessee shall provide Lessor with no less than thirty (30) days notice following which Lessee shall coordinate the construction activity schedule with Lessor to avoid interference with Lessor's facilities. Lessee acknowledges and agrees that each trail crossing must be located, designed, constructed and maintained in accordance with the National Electrical Safety Code and, as Tampa Electric Company may reasonably specify from time to time, with Tampa Electric Company's maintenance, safety procedures and guidelines. Lessor reserves the right freely to cross, enter upon and traverse the Crossings as part of Lessor's management, maintenance, operation, and future expansion of Lessor's electric transmission facilities and other Lessor activities.

5. Plan Approval. Pursuant to the Restrictions, Lessee has provided to Lessor and Lessor has reviewed Lessee's construction drawings and access location as depicted at Exhibit "A" (the "Crossing Facilities"). Lessor hereby consents to these Crossing Facilities for the use described in this Agreement.

6. Captions. The captions used in this Lease are for convenience only and do not in any way limit or amplify the terms and provisions hereof.

7. Applicable Law. The laws of the State of Florida shall govern the interpretation, validity, performance and enforcement of this Lease.

8. Execution. This Lease may be executed in any number of counterparts, each of which shall be deemed an original and any of which shall be deemed to be complete in itself and may be introduced into evidence or used for any purpose without the production of the other counterparts. No modification or amendment of this Lease shall be binding upon the parties unless such modification or amendment is in writing and signed by Lessor and Lessee.

9. Relationship of Parties. Nothing contained in this Lease shall be deemed or construed by the parties or by a third party to create the relationship of principal and agent, a partnership or a joint venture between the parties. No provision contained herein and no acts of the parties shall be deemed to create any relationship between them other than the relationship of Lessor and Lessee pursuant to the term of this Lease.

IN WITNESS WHEREOF, the Parties hereto have executed this AGREEMENT for the purposes herein expressed, the day and year first written above.

ATTEST:
Richard Ake,
Clerk of the Circuit Court
By: _____
Deputy Clerk

LESSEE:
BOARD OF COUNTY COMMISSIONERS
OF HILLSBOROUGH COUNTY

By: _____
Chairman, Board of County
Commissioners

(SEAL)

_____
Witness
Print Name: Shelley Tortarelli

LESSOR:
TAMPA ELECTRIC COMPANY

By: _____
M.F. Wadsworth
Vice President -
Corporate and Operating Services

_____
Witness
Print Name: Joey A. Ickliter

(SEAL)

BOARD OF COUNTY COMMISSIONERS
HILLSBOROUGH COUNTY FLORIDA
DOCUMENT No. 95-0899

Approved as to form
and legal sufficiency
By: _____

STATE OF FLORIDA

COUNTY OF HILLSBOROUGH

The foregoing instrument was prepared before me this 24 day of MAY, 1995, by M.F. Wadsworth, Vice President - Corporate and Operating Services, Tampa Electric Company, who is personally known to me or who has produced _____, as identification.

Joey A. Kicklighter

Notary Public
Print Name: Joey A. Kicklighter
Commission Number: _____
My Commission Expires: _____

JOEY A. KICKLITER
Notary Public, State of Florida
My comm. expires Apr. 16, 1997
No. CC270151

STATE OF FLORIDA

COUNTY OF HILLSBOROUGH

The foregoing instrument was prepared before me this 31st day of May, 1995, by Jim Norman, Chairman, Boee, who is personally known to me ~~or who has produced~~ _____, ~~as identification~~.

Gary Munk

Notary Public
Print Name: _____
Commission Number: _____
My Commission Expires: _____

Lease Parcel No. 1 (Trail and Access)

Commence at the Southwest corner of Section 1, Township 31 South, Range 19 East; thence N.00°30'01"E. 3297.00 feet along the West boundary of said Section 1 to the POINT OF BEGINNING; thence N.00°30'01"E. 40.00 feet along the West boundary of said Section 1, thence S.89°29'59"E. 325.00 feet; thence S.00°30'01"W. parallel with the West boundary of said Section 1 40.00 feet; thence N.89°29'59"W. 325.00 feet to the West boundary of said Section 1 and the POINT OF BEGINNING.

Lease Parcel No. 2 (Trail and Access)

Commence at the Southwest corner of Section 1, Township 31 South, Range 19 East; thence N.00°30'01"E. 2238.39 feet along the West boundary of said Section 1 to the POINT OF BEGINNING; thence N.00°30'01"E. 40.00 feet along the West boundary of said Section 1; thence S.89°29'59"E. 325.00 feet; thence S.00°30'01"W. parallel with the West boundary of said Section 1 40.00 feet; thence N.89°29'59"W. 325.00 feet to the West boundary of said Section 1 and the POINT OF BEGINNING.

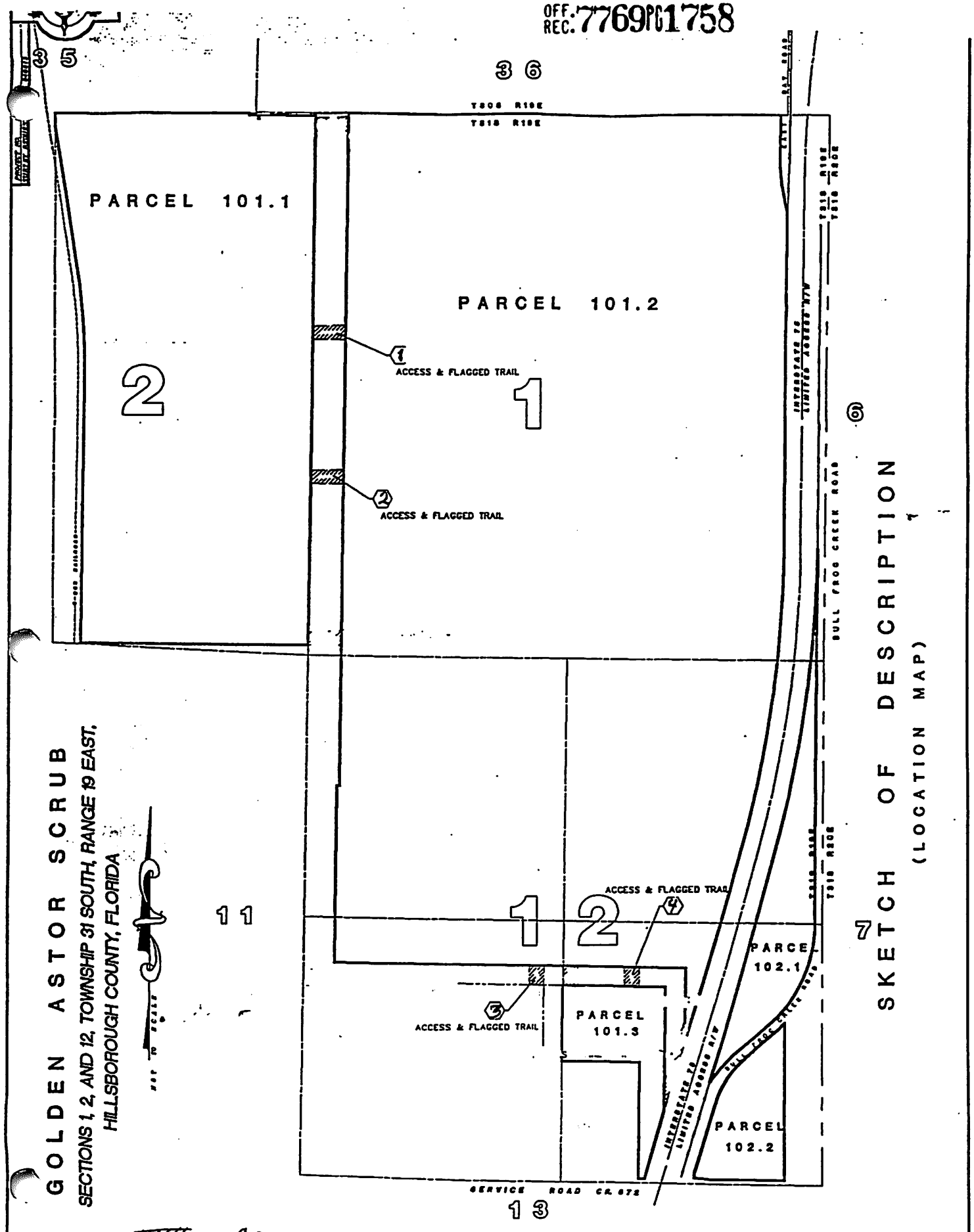
Lease Parcel No. 3 (Trail and Access)

Commence at a Hillsborough County 4-inch square concrete monument marking the intersection of the South line of a Tampa Electric Company 200.00 feet Right-of-Way recorded in Official Record Book 1097, Page 488, Public Records of Hillsborough County, Florida, and the West boundary of the Southeast one quarter of Section 12, Township 31 South, Range 19 East; thence N.88°55'01"W. 250.00 feet along the South boundary of said Right-of-Way to the POINT OF BEGINNING; thence N.88°55'01"W. 40.00 feet along said South boundary; thence N.01°04'59"E. 200.00 feet; thence S.88°55'01"E. 40.00 feet; thence S.01°04'59"W. 200.00 feet to the POINT OF BEGINNING.

Lease Parcel No. 4(Trail and Access)

Commence at a Hillsborough County 4-inch square concrete monument marking the intersection of the South line of a Tampa Electric Company 200.00 feet Right-of-Way recorded in Official Record Book 1097, Page 488, Public Records of Hillsborough County, Florida, and the West boundary of the Southeast one quarter of Section 12, Township 31 South, Range 19 East; thence S.88°40'29"E. 593.49 feet along the South boundary of said Right-of-Way of the POINT OF BEGINNING; thence N.01°19'31"E. 200.00 feet; thence S.88°40'29"E. 40.00 feet; thence S.01°19'31"E. 200.00 feet to the South boundary of said Right-of-Way; thence N.88°40'29"W. 40.00 feet to the POINT OF BEGINNING.

OFF. REC. 7769 PG 1758



GOLDEN ASTOR SCRUB

SECTIONS 1, 2, AND 12, TOWNSHIP 31 SOUTH, RANGE 19 EAST, HILLSBOROUGH COUNTY, FLORIDA

SKETCH OF DESCRIPTION

(LOCATION MAP)

= CROSSINGS

EXHIBIT A-1 TO LEASE

CONSTRUCTION SPECIFICATIONS

NOTE: These specifications are to provide reasonable identification and effectively represent the nature of the improvements envisioned within the specified easements. It is expected that there will be minor variations from these drawings and the final improvements.

ACCESS AND TRAIL CROSSINGS

(1) These specifications relate to the Crossings as defined in the Lease.

(2) The purpose of these Crossings is to provide trail access to Lessee's property as set forth in the Lease.

(3) In addition to Signs "A" and "B", an additional sign stating the following will be posted on alternate sides of the trail at intervals of not more than one hundred (100) feet within Lessor's property along the boundaries of the Crossings:

DANGER: HIGH VOLTAGE ELECTRICAL TRANSMISSION LINES -- NO TRESPASSING.

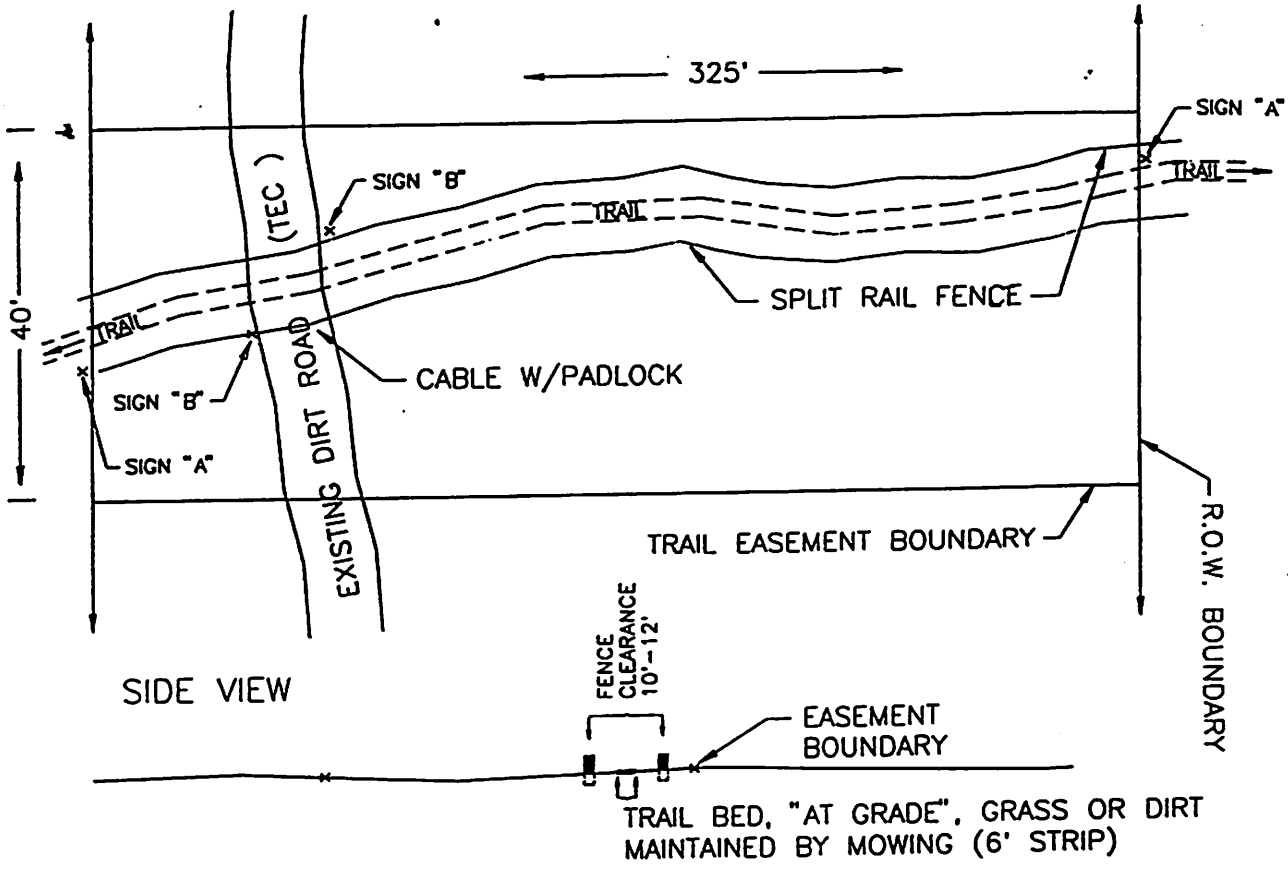
All signs will have letters at least one inch high.

(4) Fencing will be "split rail" or similar rustic/natural fencing with an approximate minimum height of three (3) feet. At the crossing point with Grantor's maintenance road a cable with a padlock will be used in lieu of gate.

In the event that this type of fencing proves to be ineffective, it will be replaced by Lessee with a hog wire fence and a gate acceptable to Grantor.

Exhibit "B"

ACCESS & TRAIL



SIGN "A" (TYPICAL)

NOTICE:
PRIVATE PROPERTY
OF TAMPA ELECTRIC
COMPANY NEXT 325'
REMAIN ON TRAIL

SIGN "B" (TYPICAL)

CAUTION
VEHICLE TRAFFIC

EXHIBIT "B-1"

(15)

LEASE AGREEMENT FOR CROSSINGS

This lease agreement ("Lease"), made and entered into this 25th day of May, 95, by and between **TAMPA ELECTRIC COMPANY**, ("Lessor") and **HILLSBOROUGH COUNTY**, a political subdivision of the State of Florida ("Lessee") (Lessor and Lessee collectively, the "Parties").

For valuable consideration, Lessor hereby leases on a non-exclusive basis to Lessee those certain parcels of real property Hillsborough County, Florida, described at Exhibit "A", hereof (the "Crossings"), upon the terms and conditions and for the purpose set forth below. In connection therewith, the parties agree as follows:

1. Lease Term. The term of this Lease shall be for a 99 year term commencing on the date hereof and may be terminated if:

(a) The parties reach other agreement in writing; or

(b) Lessee fails, following written notice from Lessor, to cure or correct any material violation or breach of the terms of this Lease.

No termination or expiration of this Lease shall affect the rights of the parties pursuant to the Restrictions (defined below). Upon expiration of the term, this Lease shall be automatically renewed for successive 99 year terms unless earlier terminated as provided above.

2. Consideration. Lessee's agreements as made in this Lease shall constitute full and adequate consideration for this Lease and no charge shall be made by Lessor of Lessee for use of the Crossings pursuant to this Lease.

3. Intent and Purpose. The parties intend that the Crossings be used as a perpendicular trail crossing pursuant to the crossing rights reserved to Lessee, as successor to the grantor, and the approval rights reserved to Lessor, as grantee (the rights, collectively, "Restrictions"), in those certain deeds and indentures from various predecessors to Lessee, as grantors therein, to Lessor, as grantee therein, dated and filed for record in the Public Records of Hillsborough County, Florida as follows:

Date of Instrument	Official Record Book	Page
December 27, 1961	887	778-782
January 30, 1963	1097	488-492
June 20, 1966	1658	832-835

THIS INSTRUMENT PREPARED BY: JAMES L. ESTES, JR., TECO, P. O. Box 111, Tampa, Florida 33601

RETURN TO: Hillsborough County Real Estate Department, P. O. Box 1110, Tampa, Florida 33601

and that this lease afford to Lessor the full protection of Section 375.251(3)(a) and (b), Florida Statutes (1994). Lessee agrees to adequately post the Crossings to the reasonable satisfaction of Lessor and will use reasonable efforts as to restrict trespass on the adjacent lands of Grantor. It is the parties' intent that pursuant to Section 375.251, Florida Statutes, Lessor shall owe no duty of care to keep the Crossings safe for entry or use by others and that Lessor shall not by giving this lease:

(a) Be presumed to extend any assurance that such land is safe for any purpose,

(b) Incur any duty of care toward a person who goes on the Crossings, or

(c) Become liable or responsible for any injury to persons or property caused by the act or omission of a person who goes on the Crossings.

4. Lessee's Use. Lessee agrees that the Crossings shall be used by Lessee only as set forth on Exhibit "B" for perpendicular trail crossings to serve as recreational and/or conservation access or fire breaks by Lessee and that each crossing shall be maintained by Lessee in a manner generally consistent with Lessor's requirements so as to accommodate Lessor's design, construction, operation and maintenance of electric power transmission facilities and Lessor's agricultural activities on Lessor's lands adjacent to the Crossings. Lessee's access shall be limited to pedestrian traffic, with vehicular use limited strictly to Lessee, Lessee's agents and contractors for maintenance of the Crossings. Prior to performing any site preparation for the Crossings, Lessee shall provide Lessor with no less than thirty (30) days notice following which Lessee shall coordinate the construction activity schedule with Lessor to avoid interference with Lessor's facilities. Lessee acknowledges and agrees that each trail crossing must be located, designed, constructed and maintained in accordance with the National Electrical Safety Code and, as Tampa Electric Company may reasonably specify from time to time, with Tampa Electric Company's maintenance, safety procedures and guidelines. Lessor reserves the right freely to cross, enter upon and traverse the Crossings as part of Lessor's management, maintenance, operation, and future expansion of Lessor's electric transmission facilities and other Lessor activities.

5. Plan Approval. Pursuant to the Restrictions, Lessee has provided to Lessor and Lessor has reviewed Lessee's construction drawings and access location as depicted at Exhibit "A" (the "Crossing Facilities"). Lessor hereby consents to these Crossing Facilities for the use described in this Agreement.

6. Captions. The captions used in this Lease are for convenience only and do not in any way limit or amplify the terms and provisions hereof.

7. Applicable Law. The laws of the State of Florida shall govern the interpretation, validity, performance and enforcement of this Lease.

8. Execution. This Lease may be executed in any number of counterparts, each of which shall be deemed an original and any of which shall be deemed to be complete in itself and may be introduced into evidence or used for any purpose without the production of the other counterparts. No modification or amendment of this Lease shall be binding upon the parties unless such modification or amendment is in writing and signed by Lessor and Lessee.

9. Relationship of Parties. Nothing contained in this Lease shall be deemed or construed by the parties or by a third party to create the relationship of principal and agent, a partnership or a joint venture between the parties. No provision contained herein and no acts of the parties shall be deemed to create any relationship between them other than the relationship of Lessor and Lessee pursuant to the term of this Lease.

IN WITNESS WHEREOF, the Parties hereto have executed this AGREEMENT for the purposes herein expressed, the day and year first written above.

ATTEST:
Richard Ake,
Clerk of the Circuit Court
By: _____
Deputy Clerk

LESSEE:
BOARD OF COUNTY COMMISSIONERS
OF HILLSBOROUGH COUNTY

By: _____
Chairman, Board of County
Commissioners

(SEAL)

_____
Witness
Print Name: Shelley Tortarelli

LESSOR:
TAMPA ELECTRIC COMPANY

By: _____
M.F. Wadsworth
Vice President -
Corporate and Operating Services

_____
Witness
Print Name: Joey A. Hicklitter

(SEAL)

BOARD OF COUNTY COMMISSIONERS
HILLSBOROUGH COUNTY FLORIDA
DOCUMENT No. 95-0899

Approved as to form
and legal sufficiency
By: _____

STATE OF FLORIDA

COUNTY OF HILLSBOROUGH

The foregoing instrument was prepared before me this 24 day of MAY, 1995, by M.F. Wadsworth, Vice President - Corporate and Operating Services, Tampa Electric Company, who is personally known to me or who has produced _____, as identification.

Joey A. Kicklighter

Notary Public
Print Name: Joey A. Kicklighter
Commission Number: _____
My Commission Expires: _____

JOEY A. KICKLITER
Notary Public, State of Florida
My comm. expires Apr. 16, 1997
No. CC270151

STATE OF FLORIDA

COUNTY OF HILLSBOROUGH

The foregoing instrument was prepared before me this 25th day of May, 1995, by Jim Norman, Chairman, BOCC who is personally known to me ~~or who has produced~~ _____, ~~as identification~~.

Gary J Klunk

OFFICIAL NOTARY SEAL
GARY J KLUNK
NOTARY PUBLIC STATE OF FLORIDA
COMMISSION NO. CC233696
MY COMMISSION EXP. OCT. 6,1996

Notary Public
Print Name: _____
Commission Number: _____
My Commission Expires: _____

Lease Parcel No. 1 (Trail and Access)

Commence at the Southwest corner of Section 1, Township 31 South, Range 19 East; thence N.00°30'01"E. 3297.00 feet along the West boundary of said Section 1 to the POINT OF BEGINNING; thence N.00°30'01"E. 40.00 feet along the West boundary of said Section 1, thence S.89°29'59"E. 325.00 feet; thence S.00°30'01"W. parallel with the West boundary of said Section 1 40.00 feet; thence N.89°29'59"W. 325.00 feet to the West boundary of said Section 1 and the POINT OF BEGINNING.

Lease Parcel No. 2 (Trail and Access)

Commence at the Southwest corner of Section 1, Township 31 South, Range 19 East; thence N.00°30'01"E. 2238.39 feet along the West boundary of said Section 1 to the POINT OF BEGINNING; thence N.00°30'01"E. 40.00 feet along the West boundary of said Section 1; thence S.89°29'59"E. 325.00 feet; thence S.00°30'01"W. parallel with the West boundary of said Section 1 40.00 feet; thence N.89°29'59"W. 325.00 feet to the West boundary of said Section 1 and the POINT OF BEGINNING.

Lease Parcel No. 3 (Trail and Access)

Commence at a Hillsborough County 4-inch square concrete monument marking the intersection of the South line of a Tampa Electric Company 200.00 feet Right-of-Way recorded in Official Record Book 1097, Page 488, Public Records of Hillsborough County, Florida, and the West boundary of the Southeast one quarter of Section 12, Township 31 South, Range 19 East; thence N.88°55'01"W. 250.00 feet along the South boundary of said Right-of-Way to the POINT OF BEGINNING; thence N.88°55'01"W. 40.00 feet along said South boundary; thence N.01°04'59"E. 200.00 feet; thence S.88°55'01"E. 40.00 feet; thence S.01°04'59"W. 200.00 feet to the POINT OF BEGINNING.

Lease Parcel No. 4(Trail and Access)

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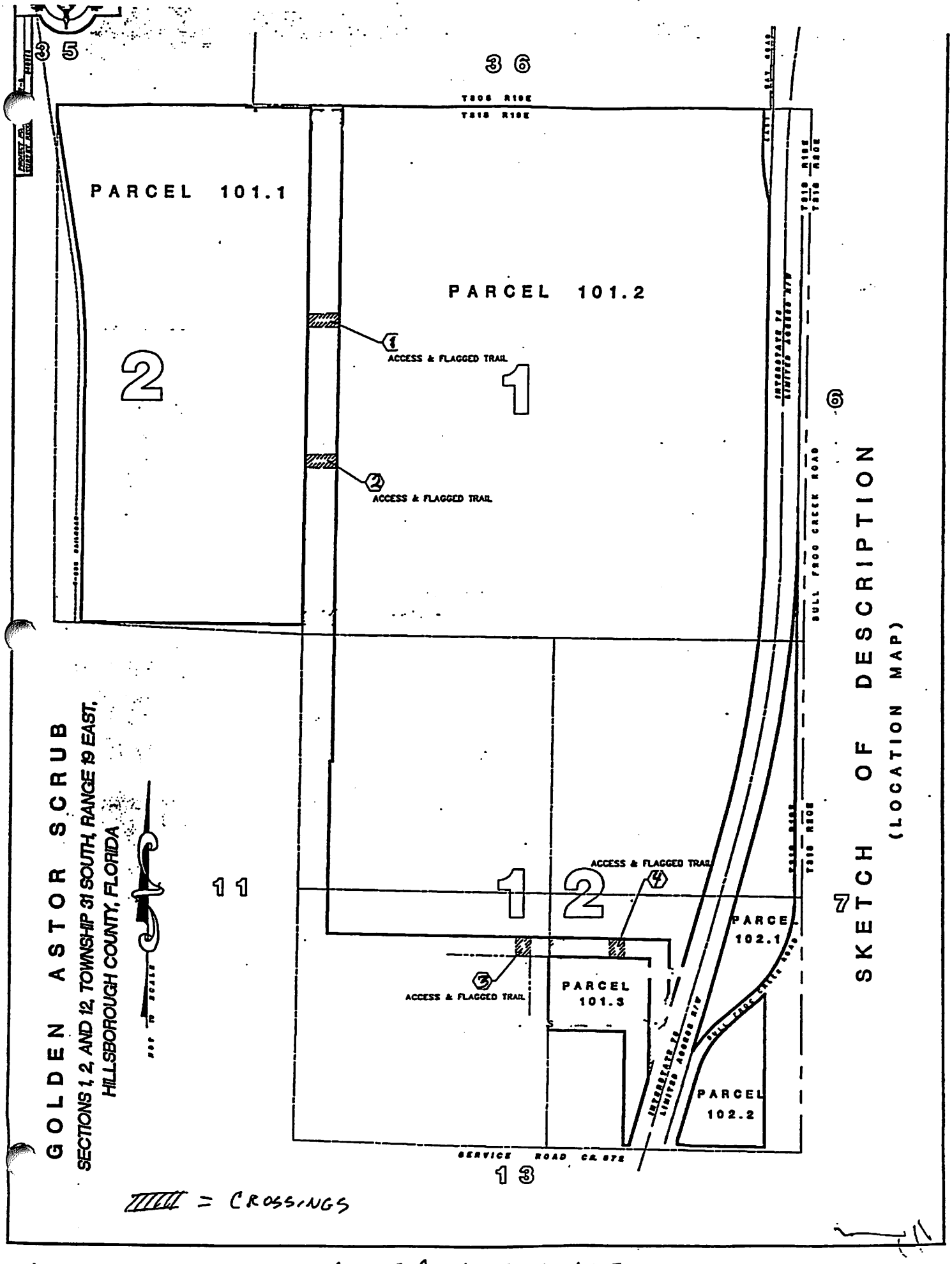


EXHIBIT A-1 TO LEASE

CONSTRUCTION SPECIFICATIONS

NOTE: These specifications are to provide reasonable identification and effectively represent the nature of the improvements envisioned within the specified easements. It is expected that there will be minor variations from these drawings and the final improvements.

ACCESS AND TRAIL CROSSINGS

(1) These specifications relate to the Crossings as defined in the Lease.

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(3) In addition to Signs "A" and "B", an additional sign stating the following will be posted on alternate sides of the trail at intervals of not more than one hundred (100) feet within Lessor's property along the boundaries of the Crossings:

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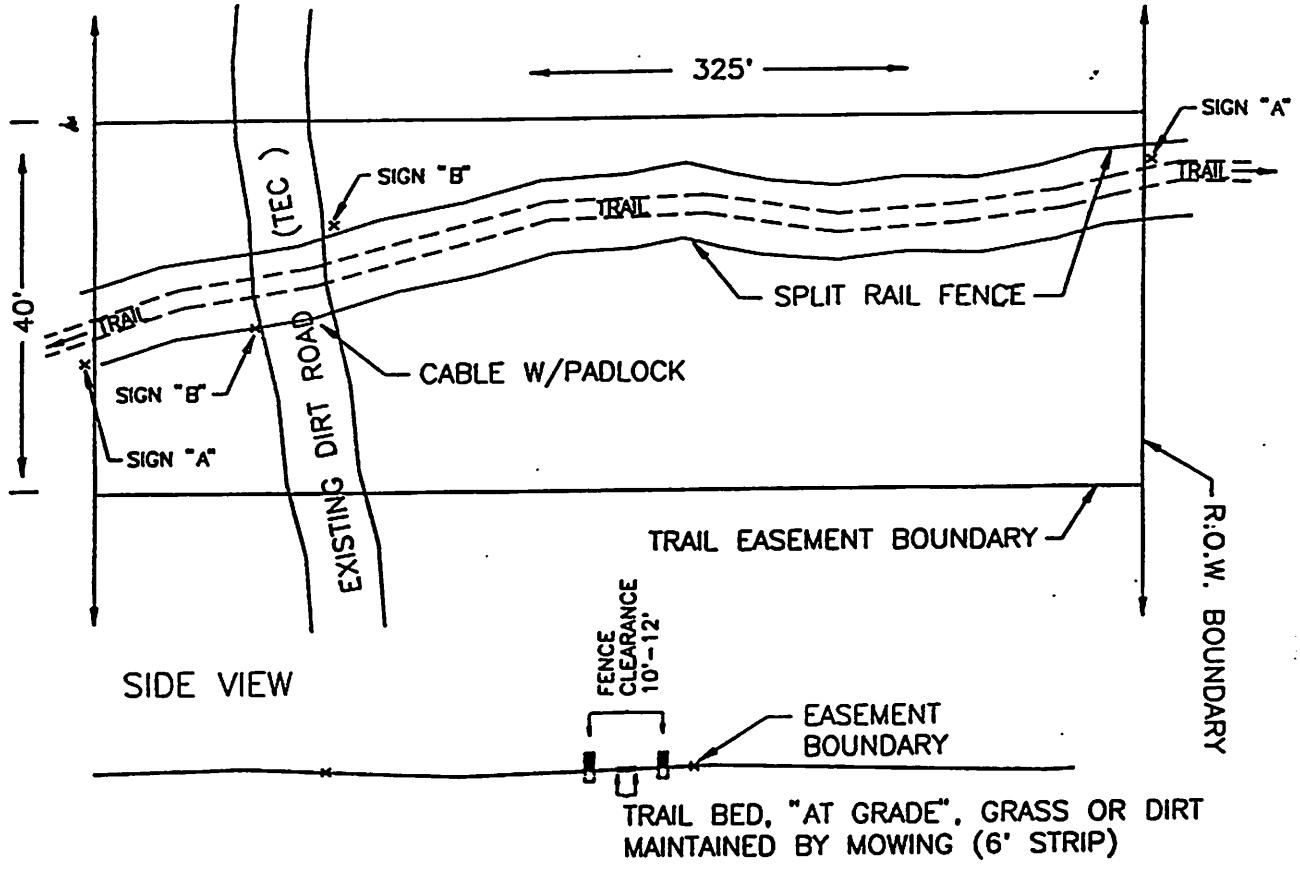
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In the event that this type of fencing proves to be ineffective, it will be replaced by Lessee with a hog wire fence and a gate acceptable to Grantor.

Exhibit "B"

ACCESS & TRAIL



SIGN "A" (TYPICAL)

NOTICE:
PRIVATE PROPERTY
OF TAMPA ELECTRIC
COMPANY NEXT 325'
REMAIN ON TRAIL

SIGN "B" (TYPICAL)

CAUTION
VEHICLE TRAFFIC

EXHIBIT "B-1"

PROJECT 89-117-L
GOLDEN ASTER SCRUB
2-31-19
1-31-19
31-19

APPROVED
Board of County Commissioners
DATE ~~FEB~~ 20 APRIL 5, 1995
MICHAEL KELLY
Director
Real Estate Department

RICHARD AKE
CLERK OF CIRCUIT COURT
HILLSBOROUGH COUNTY

7A

COUNTY DEED

THIS DEED MADE THIS 5TH DAY OF FEBRUARY, 1996, by HILLSBOROUGH COUNTY, a political subdivision of the State of Florida, hereinafter, "GRANTOR" and the BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND OF THE STATE OF FLORIDA, a public body existing under the laws of the State of Florida, whose address is Department of Environmental Protection, Division of State Lands, Marjory Stoneman Douglas Building, 3900 Commonwealth Boulevard, Mail Station 115, Tallahassee, Florida 32399-3000, hereinafter, "GRANTEE";

WITNESSETH:

That said GRANTOR for and in consideration of the sum of Ten Dollars ($10.00) and other good and valuable considerations to said GRANTOR in hand paid by GRANTEE, the receipt whereof is hereby acknowledged, has granted, bargained, and sold to said GRANTEE, its successors and assigns forever, all of its right, title and interest in the following described land, situate, lying and being in Hillsborough County, Florida, to-wit:

SEE EXHIBIT "A"

See sketch of description attached hereto as Exhibit "B" and by reference made a part hereof.

IT IS EXPRESSLY UNDERSTOOD and acknowledged by the GRANTOR and by the GRANTEE, by acceptance of this deed, that, in accordance with Section 270.11(3), Florida Statutes, the GRANTEE has petitioned the GRANTOR for the release of the undivided three-fourths interest in, and title in and to the undivided three-fourths interest in, all the phosphate, minerals, and metals that are or may be in, on or under the said land and the undivided one-half interest in all the petroleum that is or may be in, on or under the said land, all as set forth in Section 270.11(1), Florida Statutes, and that the GRANTOR by this deed includes the conveyance of the GRANTOR'S interest in all phosphate, minerals, and metals that are or may be in, on or under the said land and interest in all petroleum that is or may be in on or under the said land.

OFF REC 8044 PG 1194 2:07PM 7/10/96

Please return to: OLD REPUBLIC NATIONAL TITLE
INSURANCE CO.
ATTN: DONNA ROBERTS
100 S. ASHLEY DR., STE. 700
TAMPA, FL 33602

APPROVED AS TO FORM AND LEGALITY
By: DEP Attorney
Date: 6-27-95

4133
EXHIBIT A

This conveyance is subject to easements, restrictions, limitations and conditions of record if any now exist, but any such interest that may have been terminated are not hereby re-imposed.

THE GRANTEE, by acceptance of this deed, intends that all reservations in favor of the GRANTEE in prior deeds of record be merged in the fee simple title vested in GRANTEE and thereby extinguished by this conveyance.

IN WITNESS WHEREOF, the GRANTOR has caused these presents to be executed in its name by its Board of County Commissioners acting by the Chairman or Vice-Chairman of said Board, and its seal affixed on the day and year first above written.

(OFFICIAL SEAL)

HILLSBOROUGH COUNTY, FLORIDA
BY ITS BOARD OF COUNTY COMMISSIONERS

BY: Dottie Berger
Print Name Dottie Berger
~~Chairman (or~~ Vice Chairman)

ATTEST: Richard L. Ake
Clerk of Circuit Court

Print Name GARY J. KLUNK
Deputy Clerk

THIS INSTRUMENT PREPARED BY:

VINCENT MARCHETTI
ASSISTANT COUNTY ATTORNEY

NOTE: Pursuant to Section 125.411(2), Florida Statutes, a county deed of conveyance is not required to be witnessed or acknowledged and can be recorded for record when properly executed.

G:BBS.DIR\CNTYDED6.BBS

APPROVED AS TO FORM AND LEGALITY
By:
DEP Attorney
Date: 6-24-96

BOARD OF COUNTY COMMISSIONERS
HILLSBOROUGH COUNTY FLORIDA
DOCUMENT No. 96-0449

NO. 4133
EXHIBIT A

CARL PROJECT

PARCEL 101.1

All that part of the East 1/2 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida, lying East of the railroad right-of-way,

LESS

The North 20 feet of the East 650 feet, AND the West 10 feet of the East 560 feet of the South 35 feet of the North 55 feet, all lying in and being a part of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract beginning at the Southwest corner of the Southeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East 2,615.63 feet to the Southeast corner of Section 2, Township 31 South, Range 19 East, thence North 99.25 feet and Westerly to beginning,

PARCEL 101.2

That part of the East 1/2 of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida, lying West of East Bay Road, and lying West of land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

AND

The West 1/2 of Section 1, Township 31, South, Range 19 East, Hillsborough County, Florida, LESS the West 325.0 feet, thereof.

AND

All of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying West of land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida,

LESS

The South 1,216 feet of the West 816 feet of the Southeast 1/4 of said Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Portion deeded to State Road Department for State Road 672.

ALSO LESS

The South 3/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 325 feet of the Northwest 1/4 of the Northwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 300 feet of the Southwest 1/4 of the Northwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 300 feet of the North 1/2 of the Northwest 1/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract BEGINNING 300 feet East of the Southwest corner of the North 1/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East to the East boundary of the Southwest 1/4, thence North 200 feet, thence West to point 200 feet north of beginning, thence South 200 feet to BEGINNING.

ALSO LESS

Tract BEGINNING 1,378.6 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida; said corner being 16.4 feet more or less West of, and 31.9 feet more or less South of another corner reported to be the Southeast corner of said Section 12 in Florida Department of Environmental Protection Certified Corner Record Document number 51425; thence North 31.61 feet to a point on the North boundary of the 50-foot right-of-way

OFF REC 04407 Pg 1907

NO. 4133
EXHIBIT A

of Big Bend Road and the POINT OF BEGINNING, said POINT OF BEGINNING being within the right-of-way for Interstate 75; thence West along said right-of-way of Big Bend Road 200.04 feet; thence North 718.09 feet to a point on the Westerly right-of-way line of said Interstate Highway 75, said point being monumented by a 4 inch square concrete monument bearing the inscription "Hills. Co."; thence continue North 1266.31 feet to a 4 inch square concrete monument bearing no inscription; thence West 1,067.08 feet to a 4 inch square concrete monument bearing the inscription "Hills. Co."; thence North 200.01 feet to a 4 inch square concrete monument bearing the inscription "Hills. Co."; thence East 1,266.82 feet to a 4 inch square concrete monument bearing the inscription "Hills. Co."; thence South 751.10 feet to a point on said Westerly right-of-way line of Interstate Highway 75, said point being monumented by a 4 inch square concrete monument bearing the inscription "Hills. Co."; thence continue South 1433.90 feet to the POINT OF BEGINNING.

ALSO LESS

Tract BEGINNING 1,578.64 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, said corner being 16.4 feet more or less West of, another corner reported to be the Southeast corner of said Section 12 in Florida Department of Environmental Protection Certified Corner Record Document number 51425, said POINT OF BEGINNING being within the right-of-way for State Road 672; thence run West 254.37 feet; thence North 33.47 feet to a point on the Northerly right-of-way line of said State Road 672, said point being monumented by a 4 inch square concrete monument bearing the inscription "Bay Area Eng. #2012"; thence continue North 1182.53 feet to a 4 inch square concrete monument bearing the inscription "Hills. Co."; thence West 815.44 feet to a point which is witnessed by a 4 inch square concrete monument bearing the inscription "Hills. Co.", said monument being 0.42 feet North of and 0.44 feet West of said point; thence North 774.55 feet to a 4 inch square concrete monument bearing the inscription "Hills. Co."; thence East 1,067.05 feet to a 4 inch square concrete monument bearing no inscription; thence South 1266.31 feet to a point on said Westerly right-of-way line of Interstate Highway 75, said point being monumented by a 4 inch square concrete monument bearing the inscription "Hills. Co."; thence continue South, 718.09 feet to the POINT OF BEGINNING.

ALSO LESS

Less lands taken by Tampa Electric Company in Case Number 79-13223, in the Circuit Court in and for Hillsborough County, Florida.

ALSO LESS

Right-of-way for County Road (formerly State Road) 672.

NO. 4133
EXHIBIT A

ALSO LESS

Tract beginning 1,378.6 feet West of the Southeast corner of stated Section 12, and run West 200.04 feet; thence North 1,984.4 feet; thence West 1,067.05 feet; thence North 200.01 feet; thence East 1,266.80 feet; thence South 2,185.00 to beginning.

PARCEL 101.3

Tract BEGINNING 1,578.64 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, said corner being 16.4 feet more or less West of, another corner reported to be the Southeast corner of said Section 12 in Florida Department of Environmental Protection Certified Corner Record Document number 51425, said POINT OF BEGINNING being within the right-of-way for State Road 672; thence run West 254.37 feet; thence North 33.47 feet to a point on the Northerly right-of-way line of said State Road 672, said point being monumented by a 4 inch square concrete monument bearing the inscription "Bay Area Eng. #2012"; thence continue North 1182.53 feet to a 4 inch square concrete monument bearing the inscription "Hills. Co."; thence West 815.44 feet to a point which is witnessed by a 4 inch square concrete monument bearing the inscription "Hills. Co.", said monument being 0.42 feet North of and 0.44 feet West of said point; thence North 774.55 feet to a 4 inch square concrete monument bearing the inscription "Hills. Co."; thence East 1,067.05 feet to a 4 inch square concrete monument bearing no inscription; thence South 1266.31 feet to a point on said Westerly right-of-way line of Interstate Highway 75, said point being monumented by a 4 inch square concrete monument bearing the inscription "Hills. Co."; thence continue South, 718.09 feet to the POINT OF BEGINNING.

LESS

Right-of-way for State Road 672.

ALSO LESS

Lands taken by Division of Administration, State of Florida, Department of Transportation in Case Number 78-15387, in the Circuit Court of Hillsborough County, Florida.

ALSO LESS

Tract beginning 1,378.6 feet West of the Southeast corner of stated Section 12, and run West 200.04 feet; thence North 1,984.4 feet; thence West 1,067.05 feet; thence North 200.01 feet; thence East 1,266.80 feet; thence South 2,185.00 to beginning.

e:\bestor_11.22

1-25-96
DATE

NO. 4133
EXHIBIT A

EXHIBIT "B"

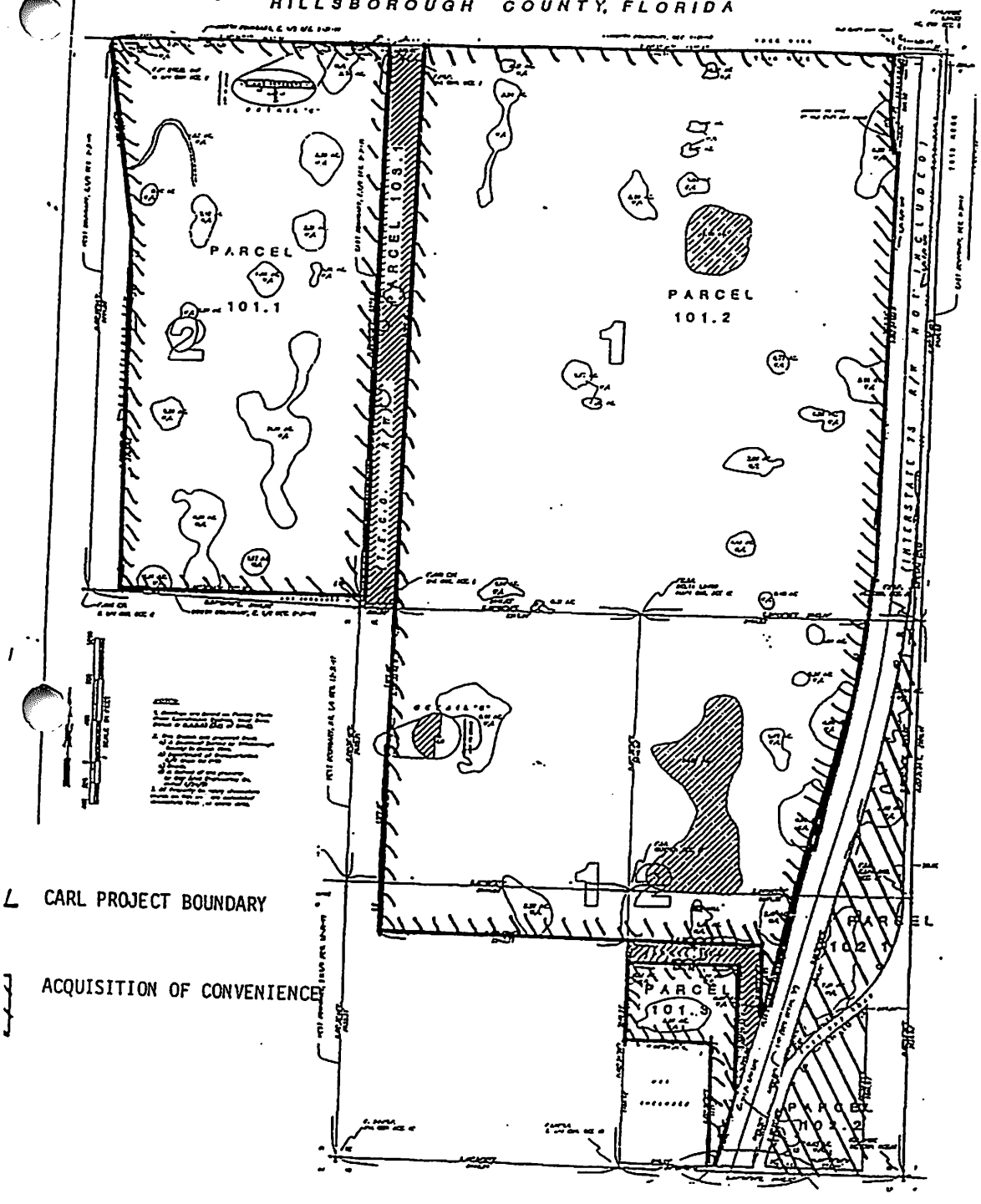
APPRAISAL MAP

GOLDEN ASTOR SCRUB

A CARL PROJECT

SECTIONS 12 AND 13 TOWNSHIP 31 SOUTH, RANGE 18 EAST

HILLSBOROUGH COUNTY, FLORIDA



01/11 14:35

NO. 4133
EXHIBIT A
PAGE 30 OF 30

OAL2

BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND OF THE STATE OF FLORIDA

LEASE AGREEMENT

GOLDEN ASTER SCRUB

Lease No. 4133

THIS LEASE AGREEMENT, made and entered into this 14th day of November 1996, by and between the BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND OF THE STATE OF FLORIDA hereinafter referred to as "LESSOR," and HILLSBOROUGH COUNTY, hereinafter referred to as "LESSEE."

LESSOR, for and in consideration of mutual covenants and agreements hereinafter contained, does hereby lease to said LESSEE, the lands described in Paragraph 2 below, together with the improvements thereon, and subject to the following terms and conditions:

1. DELEGATIONS OF AUTHORITY: LESSOR'S responsibilities and obligations herein shall be exercised by the Division of State Lands, Department of Environmental Protection.

2. DESCRIPTION OF PREMISES: The property subject to this lease, is situated in the County of Hillsborough, State of Florida and is more particularly described in Exhibit "A" attached hereto and hereinafter called the "leased premises".

3. TERM: The term of this lease shall be for a period of 50 years commencing on October 1, 1996 and ending on September 30, 2046 unless sooner terminated pursuant to the provisions of this lease.

4. PURPOSE: LESSEE shall manage the leased premises only for the conservation and protection of natural and historical resources and for resource based public outdoor activities and education which are compatible with the conservation and protection of these public lands, as set forth in subsection 259.032(11), Florida Statutes, along with other related uses necessary for the accomplishment of this purpose as designated in the Management Plan required by Paragraph 8 of this lease.

5. QUIET ENJOYMENT AND RIGHT OF USE: LESSEE shall have the right of ingress and egress to, from and upon the leased premises for all purposes necessary to the full quiet enjoyment by said LESSEE of the rights conveyed herein.

6. UNAUTHORIZED USE: LESSEE shall, through its agents and employees, prevent the unauthorized use of the leased premises or any use thereof not in conformity with this lease.

7. ASSIGNMENT: This lease shall not be assigned in whole or in part without the prior written consent of LESSOR, which consent shall not be unreasonably withheld. Any assignment made either in whole or in part without the prior written consent of LESSOR shall be void and without legal effect.

8. MANAGEMENT PLAN: LESSEE shall prepare and submit a Management Plan for the leased premises in accordance with Chapters 18-2 and 18-4, Florida Administrative Code, within 12 months of the effective date of this lease. The Management Plan shall be submitted to LESSOR for approval through the Division of State Lands, Department of Environmental Protection. The leased premises shall not be developed or physically altered in any way other than what is necessary for security and maintenance of the leased premises without the prior written approval of LESSOR until the Management Plan is approved. LESSEE shall provide LESSOR with an opportunity to participate in all phases of preparing and developing the Management Plan for the leased premises. The Management Plan shall be submitted to LESSOR in draft form for review and comments within ten months of the effective date of this lease. LESSEE shall give LESSOR reasonable notice of the application for and receipt of any state, federal or local permits as well as any public hearings or meetings relating to the development or use of the leased premises. LESSEE shall not proceed with development of said leased premises including, but not limited to, funding, permit applications, design or building contracts until the Management Plan required herein has been submitted and approved. Any financial commitments made by LESSEE which are not in compliance with the terms of this lease shall be done at LESSEE'S own risk.

The Management Plan shall emphasize the original management concept as approved by LESSOR at the time of acquisition which established the primary public purpose for which the leased premises were acquired. The approved Management Plan shall provide the basic guidance for all management activities and shall be reviewed jointly by LESSEE and LESSOR at least every five years. LESSEE shall not use or alter the leased premises except as provided for in the approved Management Plan without the prior written approval of LESSOR. The Management Plan prepared under this lease shall identify management strategies for exotic species, if present. The introduction of exotic species is prohibited, except when specifically authorized by the approved Management Plan.

9. EASEMENTS: All easements including, but not limited to, utility easements are expressly prohibited without the prior written approval of LESSOR. Any easement not approved in writing by LESSOR shall be void and without legal effect.

10. SUBLEASES: This lease is for the purposes specified herein and subleases of any nature are prohibited without the prior written approval of LESSOR, which approval shall not be unreasonably withheld. Any sublease not approved in writing by LESSOR shall be void and without legal effect.

11. RIGHT OF INSPECTION: LESSOR or its duly authorized agents, representatives or employees shall have the right to reasonably inspect the leased premises and the works and operations of LESSEE in any matter pertaining to this lease.

12. PLACEMENT AND REMOVAL OF IMPROVEMENTS: All buildings, structures and improvements shall be constructed in accordance with plans that are in accordance with the approved Management Plan or shall require the prior written approval of LESSOR as to purpose, location and design which approval shall not be unreasonably withheld. Further, no trees, other than non-native species, shall be removed or major land alterations done without the prior written approval of LESSOR. Removable equipment and removable improvements placed on the leased premises by LESSEE which do not become a permanent part of the leased premises will

remain the property of LESSEE and may be removed by LESSEE before or upon termination of this lease.

13. INSURANCE REQUIREMENTS: During the term of this lease LESSEE shall procure and maintain policies of fire, extended risk, and liability insurance coverage. The extended risk and fire insurance coverage shall be in an amount equal to the full insurable replacement value of any improvements or fixtures located on the leased premises. The liability insurance coverage shall be in amounts not less than $100,000 per occurrence and $200,000 per accident for personal injury, death, and property damage on the leased premises. Such policies of insurance shall name LESSOR, the State of Florida and LESSEE as co-insureds. LESSEE shall submit written evidence of having procured all insurance policies required herein prior to the effective date of this lease and shall submit annually thereafter, written evidence of maintaining such insurance to the Bureau of Land Management Services, Division of State Lands, Department of Environmental Protection, Mail Station 130, 3900 Commonwealth Boulevard, Tallahassee, Florida 32399. LESSEE shall purchase all policies of insurance from a financially-responsible insurer duly authorized to do business in the State of Florida. Any certificate of self-insurance shall be issued or approved by the Insurance Commissioner, State of Florida. The certificate of self-insurance shall provide for casualty and liability coverage. LESSEE shall immediately notify LESSOR and the insurer of any erection or removal of any building or other improvement on the leased premises and any changes affecting the value of any improvements and shall request the insurer to make adequate changes in the coverage to reflect the changes in value. LESSEE shall be financially responsible for any loss due to failure to obtain adequate insurance coverage, and the failure to maintain such policies or certificate in the amounts set forth shall constitute a breach of this lease.

14. LIABILITY: Each party is responsible for all personal injury and property damage attributable to the negligent acts or omissions of that party and the officers, employees and agents

thereof. Nothing herein shall be construed as an indemnity or a waiver of sovereign immunity enjoyed by any party hereto, as provided in Section 768.28, Florida Statutes, as amended from time to time, or any other law providing limitations on claims.

15. PAYMENT OF TAXES AND ASSESSMENTS: LESSEE shall assume full responsibility for and shall pay all taxes, assessments, liens or other similar liabilities that accrue to the leased premises or to the improvements thereon arising after this lease commences including any and all ad valorem taxes and drainage and special assessments or personal property taxes of every kind and all construction or materialman's liens which may be hereafter lawfully assessed and levied against the leased premises subsequent to the effective date of this lease. In no event shall the LESSEE be held liable for such liabilities which arose prior to the effective date of this lease.

16. NO WAIVER OF BREACH: The failure of LESSOR to insist in any one or more instances upon strict performance of any one or more of the covenants, terms and conditions of this lease shall not be construed as a waiver of such covenants, terms or conditions, but the same shall continue in full force and effect, and no waiver of LESSOR of any of the provisions hereof shall in any event be deemed to have been made unless the waiver is set forth in writing, signed by LESSOR.

17. TIME: Time is expressly declared to be of the essence of this lease.

18. NON-DISCRIMINATION: LESSEE shall not discriminate against any individual because of that individual's race, color, religion, sex, national origin, age, handicap, or marital status with respect to any activity occurring within the leased premises or upon lands adjacent to and used as an adjunct of the leased premises.

19. UTILITY FEES: LESSEE shall be responsible for the payment of all charges for the furnishing of gas, electricity, water and other public utilities to the leased premises and for having the utilities turned off when the leased premises are surrendered.

20. MINERAL RIGHTS: This lease does not cover petroleum or petroleum products or minerals and does not give the right to LESSEE to drill for or develop the same.

21. RIGHT OF AUDIT: LESSEE shall make available to LESSOR all financial and other records relating to this lease, and LESSOR shall have the right to audit such records at any reasonable time during the term of this lease. This right shall be continuous until this lease expires or is terminated. This lease may be terminated by LESSOR should LESSEE fail to allow public access to all documents, papers, letters or other materials made or received in conjunction with this lease, pursuant to the provisions of Chapter 119, Florida Statutes.

22. CONDITION OF PREMISES: LESSOR assumes no liability or obligation to LESSEE with reference to the conditions of the leased premises. The leased premises herein are leased by LESSOR to LESSEE in an "as is" condition, with LESSOR assuming no responsibility for the care, repair, maintenance or improvement of the leased premises for the benefit of LESSEE.

23. COMPLIANCE WITH LAWS: LESSEE agrees that this lease is contingent upon and subject to LESSEE obtaining all applicable permits and complying with all applicable permits, regulations, ordinances, rules, and laws of the State of Florida or the United States or of any political subdivision or agency of either.

24. NOTICE: All notices given under this lease shall be in writing and shall be served by certified mail including, but not limited to, notice of any violation served pursuant to Section 253.04, Florida Statutes, to the last address of the party to whom notice is to be given, as designated by such party in writing. LESSOR and LESSEE hereby designate their address as follows:

LESSOR: Department of Environmental Protection
Division of State Lands
Bureau of Land Management Services, M. S. 130
3900 Commonwealth Boulevard,
Tallahassee, Florida 32399-3000

LESSEE: Hillsborough County
Parks and Recreation Department
1101 East Rivercove Avenue
Tampa, Florida 33604

25. BREACH OF COVENANTS, TERMS, OR CONDITIONS: Should LESSEE breach any of the covenants, terms, or conditions of this lease, LESSOR shall give written notice to LESSEE to remedy such breach within sixty days of such notice. In the event LESSEE fails to remedy the breach to the satisfaction of LESSOR within sixty days of receipt of written notice, LESSOR may either terminate this lease and recover from LESSEE all damages LESSOR may incur by reason of the breach including, but not limited to, the cost of recovering the leased premises and attorneys' fees or maintain this lease in full force and effect and exercise all rights and remedies herein conferred upon LESSOR.

26. DAMAGE TO THE PREMISES: (A) LESSEE shall not do, or suffer to be done, in, on or upon the leased premises or as affecting said leased premises or adjacent properties, any act which may result in damage or depreciation of value to the leased premises or adjacent properties, or any part thereof. (B) LESSEE shall not generate, store, produce, place, treat, release or discharge any contaminants, pollutants, or pollution, including, but not limited to, hazardous or toxic substances, chemicals or other agents on, into, or from the leased premises or any adjacent lands or waters in any manner not permitted by law. For the purposes of this lease, "hazardous substances" shall mean and include those elements or compounds defined in 42 USC Section 9601 or which are contained in the list of hazardous substances adopted by the United States Environmental Protection Agency (EPA) and the list of toxic pollutants designated by the United States Congress or the EPA or defined by any other federal, state or local statute, law, ordinance, code, rule, regulation, order or decree regulating, relating to, or imposing liability or standards of conduct concerning any hazardous, toxic or dangerous waste, substance, material, pollutant or contaminant. "Pollutants" and "pollution" shall mean those products or substances defined in Chapters 376 and 403, Florida Statutes, and the rules promulgated thereunder, all as amended or updated from time to time. In the event of LESSEE's failure to comply with

this paragraph, LESSEE shall, at its sole cost and expense, promptly commence and diligently pursue any legally required closure, investigation, assessment, cleanup, decontamination, remediation, restoration and monitoring of (1) the leased premises, and (2) all off-site ground and surface waters and lands affected by LESSEE's such failure to comply, as may be necessary to bring the leased premises and affected off-site waters and lands into full compliance with all applicable federal, state or local statutes, laws, ordinances, codes, rules, regulations, orders and decrees, and to restore the damaged property to the condition existing immediately prior to the occurrence which caused the damage. LESSEE's obligations set forth in this paragraph shall survive the termination or expiration of this lease. This paragraph shall not be construed as a limitation upon LESSEE's obligations as set forth in Paragraph 14 of this lease, nor upon any other obligations or responsibilities of LESSEE as set forth herein. Nothing herein shall relieve LESSEE of any responsibility or liability prescribed by law for fines, penalties and damages levied by governmental agencies, and the cost of cleaning up any contamination caused directly or indirectly by LESSEE's activities or facilities. Upon discovery of a release of a hazardous substance or pollutant, or any other violation of local, state or federal law, ordinance, code, rule, regulation, order or decree relating to the generation, storage, production, placement, treatment, release or discharge of any contaminant, LESSEE shall report such violation to all applicable governmental agencies having jurisdiction, and to LESSOR, all within the reporting periods of the applicable governmental agencies. This paragraph shall not be deemed to apply to any conditions existing prior to the effective date of this lease.

27. SURRENDER OF PREMISES: Upon termination or expiration of this lease, LESSEE shall surrender the leased premises to LESSOR. In the event no further use of the leased premises or any part thereof is needed, LESSEE shall give written notification to the Bureau of Land Management Services, Division of State Lands,

Department of Environmental Protection, Mail Station 130, 3900 Commonwealth Boulevard, Tallahassee, Florida 32399-3000, at least six months prior to the release of any or all of the leased premises. Notification shall include a legal description, this lease number, and an explanation of the release. The release shall only be valid if approved by LESSOR through the execution of a release of lease instrument with the same formality as this lease. Upon release of all or any part of the leased premises or upon termination or expiration of this lease, all permanent/capital improvements, including both physical structures and modifications to the leased premises, shall become the property of LESSOR, unless LESSOR gives written notice to LESSEE to remove any or all such improvements at the expense of LESSEE. The decision to retain any improvements upon termination of this lease shall be at LESSOR'S sole discretion. Prior to surrender of all or any part of the leased premises a representative of the Division of State Lands, Department of Environmental Protection, shall perform an on-site inspection and the keys to any building on the leased premises shall be turned over to the Division.

28. BEST MANAGEMENT PRACTICES: LESSEE shall implement applicable Best Management Practices for all activities conducted under this lease in compliance with Paragraph 18-2.004(1)(d), Florida Administrative Code, which have been selected, developed, or approved by LESSOR or other land managing agencies for the protection and enhancement of the leased premises. If the improvements do not meet all conditions as set forth in Paragraphs 19 and 35 herein, LESSEE shall pay all costs necessary to meet the prescribed conditions.

29. PUBLIC LANDS ARTHROPOD CONTROL PLAN: LESSEE shall identify and subsequently designate to the respective arthropod control district or districts within one year of the effective date of this lease all of the environmentally sensitive and biologically highly productive lands contained within the leased premises, in accordance with Section 388.4111, Florida Statutes and Chapter

5E-13, Florida Administrative Code, for the purpose of obtaining a public lands arthropod control plan for such lands.

30. PROHIBITIONS AGAINST LIENS OR OTHER ENCUMBRANCES: Fee title to the leased premises is held by LESSOR. LESSEE shall not do or permit anything to be done which purports to create a lien or encumbrance of any nature against the real property contained in the leased premises including, but not limited to, mortgages or construction liens against the leased premises or against any interest of LESSOR therein.

31. PARTIAL INVALIDITY: If any term, covenant, condition or provision of this lease shall be ruled by a court of competent jurisdiction to be invalid, void, or unenforceable, the remainder of the provisions shall remain in full force and effect and shall in no way be affected, impaired or invalidated.

32. ARCHAEOLOGICAL AND HISTORIC SITES: Execution of this lease in no way affects any of the parties' obligations pursuant to Chapter 267, Florida Statutes. The collection of artifacts or the disturbance of archaeological and historic sites on state-owned lands is prohibited unless prior authorization has been obtained from the Department of State, Division of Historical Resources. The Management Plan prepared pursuant to Chapters 18-2 and 18-4, Florida Administrative Code, shall be reviewed by the Division of Historical Resources to insure that adequate measures have been planned to locate, identify, protect and preserve the archaeological and historic sites and properties on the leased premises.

33. SOVEREIGNTY SUBMERGED LANDS: This lease does not authorize the use of any lands located waterward of the mean or ordinary high water line of any lake, river, stream, creek, bay, estuary, or other water body or the waters or the air space thereabove.

34. ENTIRE UNDERSTANDING: This lease sets forth the entire understanding between the parties and shall only be amended with the prior written approval of LESSOR.

35. MAINTENANCE OF IMPROVEMENTS: LESSEE shall maintain the real property contained within the leased premises and the improvements located thereon, in a state of good condition,

working order and repair including, but not limited to, keeping the leased premises free of trash or litter, meeting all building and safety codes for the location situated, maintaining the planned improvements as set forth in the approved Management Plan and maintaining any and all existing roads, canals, ditches, culverts, risers and the like in as good condition as the same may be on the effective date of this lease, reasonable wear and tear excepted; provided, however, that any removal, closure, etc, of the above improvements shall be acceptable when the proposed activity is consistent with the goals of conservation, protection, enhancement, or safety of the natural and historical resources within the leased premises and with the approved Management Plan.

36. GOVERNING LAW: This lease shall be governed by and interpreted according to the laws of the State of Florida.

37. SIGNS: LESSEE shall ensure that the area is identified as being publicly owned and operated as a public facility in all signs, literature and advertising. If federal grants or funds are used by LESSEE for any project on the leased premises LESSEE shall erect signs identifying the leased premises as a federally assisted project.

38. SECTION CAPTIONS: Articles, subsections and other captions contained in this lease are for reference purposes only and are in no way intended to describe, interpret, define or limit the scope, extent or intent of this lease or any provisions thereof.

IN WITNESS WHEREOF, the parties have caused this lease to be executed on the day and year first above written.

BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND OF THE STATE OF FLORIDA

Witness

By: _____ (SEAL)
CHIEF, BUREAU OF LAND MANAGEMENT SERVICES, DIVISION OF STATE LANDS, DEPARTMENT OF ENVIRONMENTAL PROTECTION

Print/Type Witness Name

Witness

"LESSOR"

Print/Type Witness Name

STATE OF FLORIDA
COUNTY OF LEON

The foregoing instrument was acknowledged before me this 15th day of November 1996, by Daniel T. Crabb, as Chief, Bureau of Land Management Services, Division of State Lands, Department of Environmental Protection, as agent for and on behalf of the Board of Trustees of the Internal Improvement Trust Fund of the State of Florida, who is personally known to me or who has produced N/A as identification.

Notary Public, State of Florida

(SEAL)

Print/Type Notary Name

Commission Number:

Commission Expires:

OFFICIAL NOTARY SEAL
PATRICIA TOLODAY
COMMISSION NUMBER
CC545665
MY COMMISSION EXPIRES
APR. 18,2000

Approved as to Form and Legality

By: _____
DEP Attorney

COUNTY

ATTEST: Richard Ake,
Clerk of Circuit Court

HILLSBOROUGH COUNTY, through its BOARD OF COUNTY COMMISSIONERS

By: Dottie Berger

~~Jim Norman~~ Dottie Berger
Print/Type Name

Its: Vice Chairman
~~Chairman or Vice Chairman~~

Ex-Officio Clerk of
the Board of County
Commissioners of Hillsborough
County, Florida

(SEAL)

Approved as to form by
Office of County Attorney
Hillsborough County, Florida

County Attorney, or Assistant

Telephone: (813) 272-5670

Telecopier: (813) 272-5231

By

(Official Seal)

LESSEE

STATE OF FLORIDA
COUNTY OF HILLSBOROUGH

The foregoing instrument was acknowledged before me this 20th day of September 1996, by Dottie Berger, as Vice Chairman, Board of County Commissioners of Hillsborough County, Florida, who is/~~are~~ personally known to me ~~or who has produced as identification.~~

(SEAL)

OFFICIAL NOTARY SEAL
GARY J KLUNK
NOTARY PUBLIC STATE OF FLORIDA
COMMISSION NO. CC233696
MY COMMISSION EXP. OCT. 6,1996

Notary Public, State of Florida

Type Notary Name

Commission Number:

Commission Expires:

BOARD OF COUNTY COMMISSIONERS
HILLSBOROUGH COUNTY FLORIDA
DOCUMENT No. 96-1800

PROJECT 89-117-L
GOLDEN ASTER SCRUB
2-31-19
1-31-19
-31-19

APPROVED
Board of County Commissioners
DATE ~~FEB~~ APRIL 5, 1995
MICHAEL KELLY
Director
Real Estate Department

RICHARD AKE
CLERK OF CIRCUIT COURT
HILLSBOROUGH COUNTY

7A

COUNTY DEED

THIS DEED MADE THIS 5TH DAY OF FEBRUARY, 1996, by HILLSBOROUGH COUNTY, a political subdivision of the State of Florida, hereinafter, "GRANTOR" and the BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND OF THE STATE OF FLORIDA, a public body existing under the laws of the State of Florida, whose address is Department of Environmental Protection, Division of State Lands, Marjory Stoneman Douglas Building, 3900 Commonwealth Boulevard, Mail Station 115, Tallahassee, Florida 32399-3000, hereinafter, "GRANTEE";

WITNESSETH:

That said GRANTOR for and in consideration of the sum of Ten Dollars ($10.00) and other good and valuable considerations to said GRANTOR in hand paid by GRANTEE, the receipt whereof is hereby acknowledged, has granted, bargained, and sold to said GRANTEE, its successors and assigns forever, all of its right, title and interest in the following described land, situate, lying and being in Hillsborough County, Florida, to-wit:

SEE EXHIBIT "A"

See sketch of description attached hereto as Exhibit "B" and by reference made a part hereof.

IT IS EXPRESSLY UNDERSTOOD and acknowledged by the GRANTOR and by the GRANTEE, by acceptance of this deed, that, in accordance with Section 270.11(3), Florida Statutes, the GRANTEE has petitioned the GRANTOR for the release of the undivided three-fourths interest in, and title in and to the undivided three-fourths interest in, all the phosphate, minerals, and metals that are or may be in, on or under the said land and the undivided one-half interest in all the petroleum that is or may be in, on or under the said land, all as set forth in Section 270.11(1), Florida Statutes, and that the GRANTOR by this deed includes the conveyance of the GRANTOR'S interest in all phosphate, minerals, and metals that are or may be in, on or under the said land and interest in all petroleum that is or may be in on or under the said land.

RECORDED 2/7/96 OR 6404 PG 1404

Please return to: OLD REPUBLIC NATIONAL TITLE INSURANCE CO.
ATTN: DONNA ROBERTS
100 S. ASHLEY DR., STE. 700
TAMPA, FL 33602

APPROVED AS TO FORM AND LEGALITY
By DEP Attorney
Date 6-27-95

10. 4133
EXHIBIT A
PAGE 14 OF 20

This conveyance is subject to easements, restrictions, limitations and conditions of record if any now exist, but any such interest that may have been terminated are not hereby re-imposed.

THE GRANTEE, by acceptance of this deed, intends that all reservations in favor of the GRANTEE in prior deeds of record be merged in the fee simple title vested in GRANTEE and thereby extinguished by this conveyance.

IN WITNESS WHEREOF, the GRANTOR has caused these presents to be executed in its name by its Board of County Commissioners acting by the Chairman or Vice-Chairman of said Board, and its seal affixed on the day and year first above written.

(OFFICIAL SEAL)

HILLSBOROUGH COUNTY, FLORIDA
BY ITS BOARD OF COUNTY COMMISSIONERS

BY: Dottie Berger
Print Name Dottie Berger
~~Chairman (or~~ Vice Chairman)

ATTEST: Richard L. Ake
Clerk of Circuit Court

Print Name GARY J. KLUNK
Deputy Clerk

THIS INSTRUMENT PREPARED BY:

VINCENT MARCHETTI
ASSISTANT COUNTY ATTORNEY

NOTE: Pursuant to Section 125.411(2), Florida Statutes, a county deed of conveyance is not required to be witnessed or acknowledged and can be recorded for record when properly executed.

G:BBS.DIR\CNTYDED6.BBS

APPROVED AS TO FORM AND LEGALITY
By:
DEP Attorney
Date: 6-24-96

BOARD OF COUNTY COMMISSIONERS
HILLSBOROUGH COUNTY FLORIDA
DOCUMENT No. 96-0449

O. 4133
XHIBIT A
AGE 15 OF 20

EXHIBIT "A"

CARL PROJECT

PARCEL 101.1

All that part of the East 1/2 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida, lying East of the railroad right-of-way,

LESS

The North 20 feet of the East 650 feet, AND the West 10 feet of the East 560 feet of the South 35 feet of the North 55 feet, all lying in and being a part of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract beginning at the Southwest corner of the Southeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East 2,615.63 feet to the Southeast corner of Section 2, Township 31 South, Range 19 East, thence North 99.25 feet and Westerly to beginning,

PARCEL 101.2

That part of the East 1/2 of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida, lying West of East Bay Road, and lying West of land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

AND

The West 1/2 of Section 1, Township 31, South, Range 19 East, Hillsborough County, Florida, LESS the West 325.0 feet, thereof.

AND

All of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying West of land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida,

4133
HIBIT 20
GE 16 OF 20

LESS

The South 1,216 feet of the West 816 feet of the Southeast 1/4 of said Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Portion deeded to State Road Department for State Road 672.

ALSO LESS

The South 3/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 325 feet of the Northwest 1/4 of the Northwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 300 feet of the Southwest 1/4 of the Northwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 300 feet of the North 1/2 of the Northwest 1/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract BEGINNING 300 feet East of the Southwest corner of the North 1/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East to the East boundary of the Southwest 1/4, thence North 200 feet, thence West to point 200 feet north of beginning, thence South 200 feet to BEGINNING.

ALSO LESS

Tract BEGINNING 1,378.6 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, said corner being 16.4 feet more or less West of, and 31.9 feet more or less South of another corner reported to be the Southeast corner of said Section 12 in Florida Department of Environmental Protection Certified Corner Record Document number 51425; thence North 31.61 feet to a point on the North boundary of the 50-foot right-of-way

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NO. 4133
EXHIBIT A

of Big Bend Road and the POINT OF BEGINNING, said POINT OF BEGINNING being within the right-of-way for Interstate 75; thence West along said right-of-way of Big Bend Road 200.04 feet; thence North 718.09 feet to a point on the Westerly right-of-way line of said Interstate Highway 75, said point being monumented by a 4 inch square concrete monument bearing the inscription "Hills. Co."; thence continue North 1266.31 feet to a 4 inch square concrete monument bearing no inscription; thence West 1,067.08 feet to a 4 inch square concrete monument bearing the inscription "Hills. Co."; thence North 200.01 feet to a 4 inch square concrete monument bearing the inscription "Hills. Co."; thence East 1,266.82 feet to a 4 inch square concrete monument bearing the inscription "Hills. Co."; thence South 751.10 feet to a point on said Westerly right-of-way line of Interstate Highway 75, said point being monumented by a 4 inch square concrete monument bearing the inscription "Hills. Co."; thence continue South 1433.90 feet to the POINT OF BEGINNING.

ALSO LESS

Tract BEGINNING 1,578.64 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, said corner being 16.4 feet more or less West of, another corner reported to be the Southeast corner of said Section 12 in Florida Department of Environmental Protection Certified Corner Record Document number 51425, said POINT OF BEGINNING being within the right-of-way for State Road 672; thence run West 254.37 feet; thence North 33.47 feet to a point on the Northerly right-of-way line of said State Road 672, said point being monumented by a 4 inch square concrete monument bearing the inscription "Bay Area Eng. #2012"; thence continue North 1182.53 feet to a 4 inch square concrete monument bearing the inscription "Hills. Co."; thence West 815.44 feet to a point which is witnessed by a 4 inch square concrete monument bearing the inscription "Hills. Co.", said monument being 0.42 feet North of and 0.44 feet West of said point; thence North 774.55 feet to a 4 inch square concrete monument bearing the inscription "Hills. Co."; thence East 1,067.05 feet to a 4 inch square concrete monument bearing no inscription; thence South 1266.31 feet to a point on said Westerly right-of-way line of Interstate Highway 75, said point being monumented by a 4 inch square concrete monument bearing the inscription "Hills. Co."; thence continue South, 718.09 feet to the POINT OF BEGINNING.

ALSO LESS

Less lands taken by Tampa Electric Company in Case Number 79-13223, in the Circuit Court in and for Hillsborough County, Florida.

ALSO LESS

Right-of-way for County Road (formerly State Road) 672.

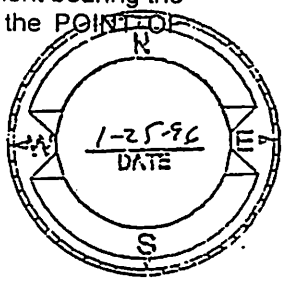
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XHIBIT A

ALSO LESS

Tract beginning 1,378.6 feet West of the Southeast corner of stated Section 12, and run West 200.04 feet; thence North 1,984.4 feet; thence West 1,067.05 feet; thence North 200.01 feet; thence East 1,266.80 feet; thence South 2,185.00 to beginning.

PARCEL 101.3

Tract BEGINNING 1,578.64 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, said corner being 16.4 feet more or less West of, another corner reported to be the Southeast corner of said Section 12 in Florida Department of Environmental Protection Certified Corner Record Document number 51425, said POINT OF BEGINNING being within the right-of-way for State Road 672; thence run West 254.37 feet; thence North 33.47 feet to a point on the Northerly right-of-way line of said State Road 672, said point being monumented by a 4 inch square concrete monument bearing the inscription "Bay Area Eng. #2012"; thence continue North 1182.53 feet to a 4 inch square concrete monument bearing the inscription "Hills. Co."; thence West 815.44 feet to a point which is witnessed by a 4 inch square concrete monument bearing the inscription "Hills. Co.", said monument being 0.42 feet North of and 0.44 feet West of said point; thence North 774.55 feet to a 4 inch square concrete monument bearing the inscription "Hills. Co."; thence East 1,067.05 feet to a 4 inch square concrete monument bearing no inscription; thence South 1266.31 feet to a point on said Westerly right-of-way line of Interstate Highway 75, said point being monumented by a 4 inch square concrete monument bearing the inscription "Hills. Co."; thence continue South, 718.09 feet to the POINT OF BEGINNING.



LESS

Right-of-way for State Road 672.

ALSO LESS

Lands taken by Division of Administration, State of Florida, Department of Transportation in Case Number 78-15387, in the Circuit Court of Hillsborough County, Florida.

ALSO LESS

Tract beginning 1,378.6 feet West of the Southeast corner of stated Section 12, and run West 200.04 feet; thence North 1,984.4 feet; thence West 1,067.05 feet; thence North 200.01 feet; thence East 1,266.80 feet; thence South 2,185.00 to beginning.

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O. 4133
XHIBIT A
AGE 19 OF 20

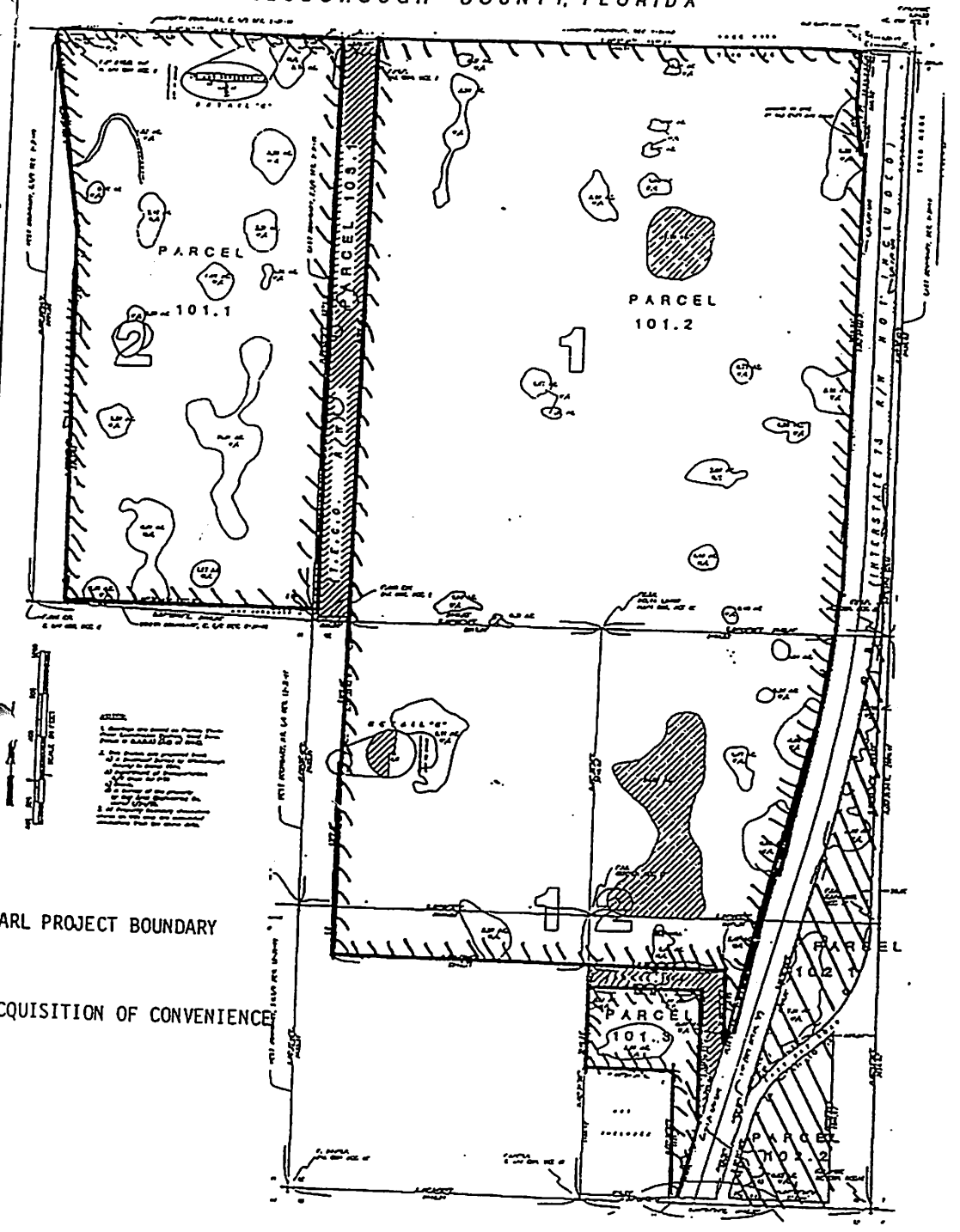
APPRAISAL MAP

GOLDEN ASTOR SCRUB

A CARL PROJECT

SECTIONS 12 AND 12 TOWNSHIP 31 SOUTH, RANGE 18 EAST

HILLSBOROUGH COUNTY, FLORIDA



CARL PROJECT BOUNDARY

ACQUISITION OF CONVENIENCE

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NO. 4133
EXHIBIT A
PAGE 20 OF 20

GA Scrub

Owner's Policy

American Land Title Association Owner's Policy (4-6-90)
with Florida modifications

Policy Number **SD** 200866

SUBJECT TO THE EXCLUSIONS FROM COVERAGE, THE EXCEPTIONS FROM COVERAGE CONTAINED IN SCHEDULE B AND THE CONDITIONS AND STIPULATIONS,

OLD REPUBLIC NATIONAL TITLE INSURANCE COMPANY, a Minnesota corporation, herein called the Company, insures, as of Date of Policy shown in Schedule A, against loss or damage, not exceeding the Amount of Insurance stated in Schedule A, sustained or incurred by the insured by reason of:

1. Title to the estate or interest described in Schedule A being vested other than as stated therein;
2. Any defect in or lien or encumbrance on the title;
3. Unmarketability of the title;
4. Lack of a right of access to and from the land.

The Company will also pay the costs, attorneys' fees and expenses incurred in defense of the title, as insured, but only to the extent provided in the Conditions and Stipulations.

IN WITNESS WHEREOF, the said Old Republic National Title Insurance Company has caused its corporate name and seal to be hereunder affixed by its duly authorized officers as of the date shown in Schedule A, the policy to be valid when countersigned by an authorized officer or agent of the Company.

Issued through the Office of:
Johnson, Blakely, Pope, Bokor, Ruppel & Burns, P.A.

Authorized Signatory
E. D. Armstrong III

ORT Form 326 ALTA Owner's Policy (4-6-90)
with Florida modifications

OLD REPUBLIC NATIONAL TITLE INSURANCE COMPANY
A Stock Company
400 Second Avenue South, Minneapolis, Minnesota 55401
(612) 371-1111

By _____ *President*

Attest _____ *Secretary*

(b) The Company shall have the right, at its own cost, to institute and prosecute any action or proceeding or to do any other act which in its opinion may be necessary or desirable to establish the title to the estate or interest, as insured, or to prevent or reduce loss or damage to the insured. The Company may take any appropriate action under the terms of this policy, whether or not it shall be liable hereunder, and shall not thereby concede liability or waive any provision of this policy. If the Company shall exercise its rights under this paragraph, it shall do so diligently.

(c) Whenever the Company shall have brought an action or interposed a defense as required or permitted by the provisions of this policy, the Company may pursue any litigation to final determination by a court of competent jurisdiction and expressly reserves the right, in its sole discretion, to appeal from any adverse judgment or order.

(d) In all cases where this policy permits or requires the Company to prosecute or provide for the defense of any action or proceeding, the insured shall secure to the Company the right to so prosecute or provide defense in the action or proceeding, and all appeals therein, and permit the Company to use, at its option, the name of the insured for this purpose. Whenever requested by the Company, the insured, at the Company's expense, shall give the Company all reasonable aid (i) in any action or proceeding, securing evidence, obtaining witnesses, prosecuting or defending the action or proceeding, or effecting settlement, and (ii) in any other lawful act which in the opinion of the Company may be necessary or desirable to establish the title to the estate or interest as insured. If the Company is prejudiced by the failure of the insured to furnish the required cooperation, the Company's obligations to the insured under the policy shall terminate, including any liability or obligation to defend, prosecute, or continue any litigation, with regard to the matter or matters requiring such cooperation.

5. *Proof of Loss or Damage.*

In addition to and after the notices required under Section 3 of these Conditions and Stipulations have been provided the Company, a proof of loss or damage signed and sworn to by the insured claimant shall be furnished to the Company within 90 days after the insured claimant shall ascertain the facts giving rise to the loss or damage. The proof of loss or damage shall describe the defect in, or lien or encumbrance on the title, or other matter insured against by this policy which constitutes the basis of loss or damage and shall state, to the extent possible, the basis of calculating the amount of the loss or damage. If the Company is prejudiced by the failure of the insured claimant to provide the required proof of loss or damage, the Company's obligations to the insured under the policy shall terminate, including any liability or obligation to defend, prosecute, or continue any litigation, with regard to the matter or matters requiring such proof of loss or damage.

In addition, the insured claimant may reasonably be required to submit to examination under oath by any authorized representative of the Company and shall produce for examination, inspection and copying, at such reasonable times and places as may be designated by any authorized representative of the Company, all records, books, ledgers, checks, correspondence and memoranda, whether bearing a date before or after Date of Policy, which reasonably pertain to the loss or damage. Further, if requested by any authorized representative of the Company, the insured claimant shall grant its permission, in writing, for any authorized representative of the Company to examine, inspect and copy all records, books, ledgers, checks, correspondence and memoranda in the custody or control of a third party, which reasonably pertain to the loss or damage. All information designated as confidential by the insured claimant provided to the Company pursuant to this Section shall not be disclosed to others unless, in the reasonable judgment of the Company, it is necessary in the administration of the claim. Failure of the insured claimant to submit for examination under oath, produce other reasonably requested information or grant permission to secure reasonably necessary information from third parties as required in this paragraph shall terminate any liability of the Company under this policy as to that claim.

6. *Options to Pay or Otherwise Settle Claims; Termination of Liability.*

In case of a claim under this policy, the Company shall have the following additional options:

(a) To Pay or Tender Payment of the Amount of Insurance.

To pay or tender payment of the amount of insurance under this policy together with any costs, attorneys' fees and expenses incurred by the insured claimant, which were authorized by the Company, up to the time of payment or tender of payment and which the Company is obligated to pay.

Upon the exercise by the Company of this option, all liability and obligations to the insured under this policy, other than to make the payment required, shall terminate, including any liability or obligation to defend, prosecute, or continue any litigation, and the policy shall be surrendered to the Company for cancellation.

(b) To Pay or Otherwise Settle With Parties Other than the Insured or With the Insured Claimant.

(i) to pay or otherwise settle with other parties for or in the name of an insured claimant any claim insured against under this policy, together with any costs, attorneys' fees and expenses incurred by the insured claimant which were authorized by the Company up to the time of payment and which the Company is obligated to pay; or

(ii) to pay or otherwise settle with the insured claimant the loss or damage provided for under this policy, together with any costs, attorneys' fees and expenses incurred by the insured claimant which were authorized by the Company up to the time of payment and which the Company is obligated to pay.

Upon the exercise by the Company of either of the options provided for in paragraphs (b)(i) or (ii), the Company's obligations to the insured under this policy for the claimed loss or damage, other than the payments required to be made, shall terminate, including any liability or obligation to defend, prosecute or continue any litigation.

7. *Determination, Extent of Liability.*

This policy is a contract of indemnity against actual monetary loss or damage sustained or incurred by the insured claimant who has suffered loss or damage by reason of matters insured against by this policy and only to the extent herein described.

(a) The liability of the Company under this policy shall not exceed the least of:

(i) the Amount of Insurance stated in Schedule A, or,

(ii) the difference between the value of the insured estate or interest as insured and the value of the insured estate or interest subject to the defect, lien or encumbrance insured against by this policy.

(b) The company will pay only those costs, attorneys' fees and expenses incurred in accordance with Section 4 of the Conditions and Stipulations.

8. *Apportionment.*

If the land described in Schedule A consists of two or more parcels which are not used as a single site, and a loss is established affecting one or more of the parcels but not all, the loss shall be

OLD REPUBLIC NATIONAL TITLE INSURANCE COMPANY
100 South Ashley Drive
Suite 700
Tampa, FL 33602

SCHEDULE A

FILE NO. H 943472 @

POLICY NO. SD200866
AMOUNT: $3,088,735.00

1. Policy Date: May 26, 1995 4:18 P.M.

2. The Insured hereunder, in whom title to the fee simple estate is vested at the date hereof, is:

   HILLSBOROUGH COUNTY , a Political Subdivsion of the State of Florida

3. The land referred to in this policy is situated in the County of Hillsborough, State of Florida, and is described as follows:

   SEE EXHIBIT "A" ATTACHED HERETO AND MADE A PART HEREOF:

This Policy valid only if Schedule B is attached.

FILE NO. H 943472 @ POLICY NO. SD 200866

SCHEDULE B

This policy does not insure against loss or damage by reason of the following:

1. General or special taxes and assessments required to be paid in the year 1995 and subsequent years. Folio No(s) 51431.0000; 51426.0000; 51428.0000 and 51501.0000

2. Restrictions and limited easement recorded in O.R. Book 887, Page 778, O.R. Book 1097, Page 488; and O.R. Book 1658, Page 832, of the public records of Hillsborough County, Florida, which reserves to Tampa Electric Company the right to approve the plans for roads, utilities and drainage facilities before construction commences.

3. Easement granted to Tampa Electric Company, recorded May 26, 1995 in O.R. Book 7769, Page 1705, in the public records of Hillsborough County, Florida.

4. Easement granted to Tampa Electric Company, recorded May 26, 1995 in O.R. Book 7769, Page 1709, in the public records of Hillsborough County, Florida.

5. Easement granted to Tampa Electric Company, recorded May 26, 1995 in O.R. Book 7769, Page 1713, in the public records of Hillsborough County, Florida.

6. Easement granted to Tampa Electric Company, recorded May 26, 1995 in O.R. Book 7769, Page 1717, in the public records of Hillsborough County, Florida.

7. Easement granted to Tampa Electric Company, recorded May 26, 1995 in O.R. Book 7769, Page 1721, in the public records of Hillsborough County, Florida.

8. Lease Agreement for Crossings, as described in O.R. Book 7769, Page 1753, in the public records of Hillsborough County, Florida.

9. Fence encroachments on all boundaries as shown on page 10 of 18 of Survey prepared b# John Lester, P.L.S. #3861, regarding Parcel 102.2

CARL PROJECT

PARCEL 101.1

All that part of the East 1/2 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida. Lying East of the railroad right-of-way.

LESS

The North 20 feet of the East 650 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 10 feet of the East 560 feet of the South 35 feet of the North 55 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract beginning at the Southwest corner of the Southeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East 2,615.63 feet to the Southeast corner of Section 2, Township 31 South, Range 19 East, thence North 99.25 feet and Westerly to beginning.

PARCEL 101.2

The part of the East 1/2 of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida, lying West of East Bay Road, and lying West of land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

AND

The West 1/2 of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida, LESS the West 325.0 feet, thereof.

AND

All that part of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying West of land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

LESS

The South 1,216 feet of the West 816 feet of the Southeast 1/4 of said Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Portion deeded to State Road Department for State Road 672.

ALSO LESS

The South 3/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 325 feet of the Northwest 1/4 of the Northwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 300 feet of the Southwest 1/4 of the Northwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 300 feet of the North 1/2 of the Northwest 1/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract beginning 300 feet East of the Southwest corner of the North 1/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East to the East boundary of the Southwest 1/4, thence North 200 feet, thence West to point 200 feet, north of beginning and South 200 feet to beginning.

ALSO LESS

Tract beginning 1,378.6 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 200.04 feet; thence North 1,984.4 feet; thence West 1,067.05 feet; thence North 200.01 feet; thence East 1,266.80 feet; thence South 2,185 feet to beginning.

ALSO LESS

Tract beginning 1,578.64 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 254.37 feet; thence North 1,216 feet; thence West 815.44 feet; thence North 774.55 feet; thence East 1,067.05 feet; thence South 1,984.4 feet to beginning.

ALSO LESS

Right of way for State Road 672.

ALSO LESS

Less lands taken by Tampa Electric Company in Case Number 79-13223, in the

Circuit Court in and for Hillsborough County, Florida.

ALSO LESS

Land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

PARCEL 101.3

A tract beginning 1,578.64 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 254.37 feet; thence North 1,216 feet; thence West 815.44 feet; thence North 774.55 feet; thence East 1,067.05 feet; thence South 1,984.4 feet to beginning.

LESS

Right-of-way for State Road 672.

ALSO LESS

Lands taken by Division of Administration, State of Florida, Department of Transportation in Case Number 78-15387, in the Circuit Court of Hillsborough County, Florida.

ACQUISITIONS OF CONVENIENCE BY HILLSBOROUGH COUNTY

PARCEL 102.1

That part of Section 1 and the East 1/2 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying Westerly of East Bay Road and lying East of land taken by Division of Administration, State of Florida, Department of Transportation in case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

More particularly described as follows:

Commence at the Southeast corner of Section 12, Township 31 South, Range 19 East, said corner being the same as shown on Florida Department of Transportation Right-of-Way Maps for Interstate 75 (State Road 93-A, Section 10075-2404 dated 10/18/77); thence N.00°16'28"E. 2659.80 feet along the East boundary of the Southeast one quarter of said Section 12 to the Northeast corner of said Southeast one quarter; thence N.89°38'36"W. 75.00 feet to the Westerly Right-of-Way line of Bullfrog Creek Road (formerly East Bay Road) and the Point of Beginning; thence along said Westerly Right-of-Way line Southwesterly 1202.38 feet along the arc of a curve to the right having a radius of 1357.47 feet, chord of 1163.46 feet and chord bearing of S.25°43'54"W.; thence continuing along said Westerly Right-of-Way line S.51°06'24"W. 340.65 feet to the beginning of a curve to the left; thence continuing along said Westerly Right-of-Way line Southwesterly 468.80 feet along the arc of said curve having a radius of 1507.47 feet, chord of 466.92 feet and chord bearing of S.42°11'51"W. to the Easterly Right-of-Way line of Interstate 75 (State Road 93-A); thence along said Easterly Right-of-Way line N.16°01'48"E. 2373.25 feet to the beginning of a curve to the left; thence continuing along said Easterly Right-of-Way line Northeasterly 3149.90 feet along the arc of said curve having a radius of 11632.67 feet, chord of 3140.28 feet and chord bearing of N.08°16'22"E.; thence S.89°29'04"E. 0.32 feet to said Westerly Right-of-Way line of Bullfrog Creek Road; thence along said Westerly Right-of-Way line S.00°21'39"W. 1119.70 feet; thence continuing along said Westerly Right-of-Way line S.00°21'24"W. 2661.06 feet to the Point of Beginning.

PARCEL 102.2

That part of Southeast 1/4, Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying Easterly of East Bay Road, LESS Right-of-ways for Big Bend Road (672 State Road), LESS the East 387.28 feet thereof.

ALSO LESS

Land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

More particularly described as follows:

Commence at the Southeast corner of Section 12, Township 31 South, Range 19 East, said corner being the same as shown on Florida Department of Transportation Right-of-Way Maps for Interstate 75 (State Road 93-A, Section 10075-2404 dated 10/18/77); thence N.88°53'31"W. 387.32 feet along the South boundary of the Southeast one quarter of said Section 12, said South boundary being the same as shown on said Right-of-Way Maps; thence N.00°16'28"E. 47.18 feet along a line parallel with and 387.28 feet Westerly of the East boundary of the Southeast quarter of said Section 12 to the Northerly Right-of-Way line of Big Bend Road (County Road 672, formerly State Road 672) and the Point of Beginning; thence along said Northerly Right-of-Way line the following courses,

N.88°47'40"W.	576.65 feet
N.88°30'40"W.	181.20 feet
N.84°41'49"W.	150.33 feet

to the intersection of said Northerly Right-of-Way line with the Easterly Right-of-Way line of Bullfrog Creek Road (formerly East Bay Road); thence along said Easterly Right-of-Way line N.00°21'24"E. 46.39 feet; thence continuing along said Right-of-Way line N.16°01'48"E. 726.47 feet to the beginning of a curve to the right; thence continuing Northeasterly along said Right-of-Way line 571.72 feet along the arc of said curve having a radius of 946.41 feet, chord of 563.06 feet and chord bearing of N.33°20'09"E.; thence continuing along said Right-of-Way line N.48°43'59"E. 158.40 feet; thence continuing along said Right-of-Way line N.51°06'24"E. 206.08 feet to the beginning of a curve to the left; thence continuing along said Right-of-Way line Northeasterly 169.15 feet along the arc of said curve having a radius of 1457.47 feet, chord of 169.06 feet and chord bearing of N.47°46'55"E. to a point on a line parallel with and 387.28 feet Westerly of the East boundary of the Southeast one quarter of said Section 12; thence S.00°16'28"W. 1593.26 feet to the Point of Beginning.

(b) The Company shall have the right, at its own cost, to institute and prosecute any action or proceeding or to do any other act which in its opinion may be necessary or desirable to establish the title to the estate or interest, as insured, or to prevent or reduce loss or damage to the insured. The Company may take any appropriate action under the terms of this policy, whether or not it shall be liable hereunder, and shall not thereby concede liability or waive any provision of this policy. If the Company shall exercise its rights under this paragraph, it shall do so diligently.

(c) Whenever the Company shall have brought an action or interposed a defense as required or permitted by the provisions of this policy, the Company may pursue any litigation to final determination by a court of competent jurisdiction and expressly reserves the right, in its sole discretion, to appeal from any adverse judgment or order.

(d) In all cases where this policy permits or requires the Company to prosecute or provide for the defense of any action or proceeding, the insured shall secure to the Company the right to so prosecute or provide defense in the action or proceeding, and all appeals therein, and permit the Company to use, at its option, the name of the insured for this purpose. Whenever requested by the Company, the insured, at the Company's expense, shall give the Company all reasonable aid (i) in any action or proceeding, securing evidence, obtaining witnesses, prosecuting or defending the action or proceeding, or effecting settlement, and (ii) in any other lawful act which in the opinion of the Company may be necessary or desirable to establish the title to the estate or interest as insured. If the Company is prejudiced by the failure of the insured to furnish the required cooperation, the Company's obligations to the insured under the policy shall terminate, including any liability or obligation to defend, prosecute, or continue any litigation, with regard to the matter or matters requiring such cooperation.

5. *Proof of Loss or Damage.*

In addition to and after the notices required under Section 3 of these Conditions and Stipulations have been provided the Company, a proof of loss or damage signed and sworn to by the insured claimant shall be furnished to the Company within 90 days after the insured claimant shall ascertain the facts giving rise to the loss or damage. The proof of loss or damage shall describe the defect in, or lien or encumbrance on the title, or other matter insured against by this policy which constitutes the basis of loss or damage and shall state, to the extent possible, the basis of calculating the amount of the loss or damage. If the Company is prejudiced by the failure of the insured claimant to provide the required proof of loss or damage, the Company's obligations to the insured under the policy shall terminate, including any liability or obligation to defend, prosecute, or continue any litigation, with regard to the matter or matters requiring such proof of loss or damage.

In addition, the insured claimant may reasonably be required to submit to examination under oath by any authorized representative of the Company and shall produce for examination, inspection and copying, at such reasonable times and places as may be designated by any authorized representative of the Company, all records, books, ledgers, checks, correspondence and memoranda, whether bearing a date before or after Date of Policy, which reasonably pertain to the loss or damage. Further, if requested by any authorized representative of the Company, the insured claimant shall grant its permission, in writing, for any authorized representative of the Company to examine, inspect and copy all records, books, ledgers, checks, correspondence and memoranda in the custody or control of a third party, which reasonably pertain to the loss or damage. All information designated as confidential by the insured claimant provided to the Company pursuant to this Section shall not be disclosed to others unless, in the reasonable judgment of the Company, it is necessary in the administration of the claim. Failure of the insured claimant to submit for examination under oath, produce other reasonably requested information or grant permission to secure reasonably necessary information from third parties as required in this paragraph shall terminate any liability of the Company under this policy as to that claim.

6. *Options to Pay or Otherwise Settle Claims; Termination of Liability.*

In case of a claim under this policy, the Company shall have the following additional options:

(a) To Pay or Tender Payment of the Amount of Insurance.

To pay or tender payment of the amount of insurance under this policy together with any costs, attorneys' fees and expenses incurred by the insured claimant, which were authorized by the Company, up to the time of payment or tender of payment and which the Company is obligated to pay.

Upon the exercise by the Company of this option, all liability and obligations to the insured under this policy, other than to make the payment required, shall terminate, including any liability or obligation to defend, prosecute, or continue any litigation, and the policy shall be surrendered to the Company for cancellation.

(b) To Pay or Otherwise Settle With Parties Other than the Insured or With the Insured Claimant.

(i) to pay or otherwise settle with other parties for or in the name of an insured claimant any claim insured against under this policy, together with any costs, attorneys' fees and expenses incurred by the insured claimant which were authorized by the Company up to the time of payment and which the Company is obligated to pay; or

(ii) to pay or otherwise settle with the insured claimant the loss or damage provided for under this policy, together with any costs, attorneys' fees and expenses incurred by the insured claimant which were authorized by the Company up to the time of payment and which the Company is obligated to pay.

Upon the exercise by the Company of either of the options provided for in paragraphs (b)(i) or (ii), the Company's obligations to the insured under this policy for the claimed loss or damage, other than the payments required to be made, shall terminate, including any liability or obligation to defend, prosecute or continue any litigation.

7. *Determination, Extent of Liability.*

This policy is a contract of indemnity against actual monetary loss or damage sustained or incurred by the insured claimant who has suffered loss or damage by reason of matters insured against by this policy and only to the extent herein described.

(a) The liability of the Company under this policy shall not exceed the least of:

(i) the Amount of Insurance stated in Schedule A, or,

(ii) the difference between the value of the insured estate or interest as insured and the value of the insured estate or interest subject to the defect, lien or encumbrance insured against by this policy.

(b) The company will pay only those costs, attorneys' fees and expenses incurred in accordance with Section 4 of the Conditions and Stipulations.

8. *Apportionment.*

If the land described in Schedule A consists of two or more parcels which are not used as a single site, and a loss is established affecting one or more of the parcels but not all, the loss shall be

computed and settled on a pro rata basis as if the amount of insurance under this policy was divided pro rata as to the value on Date of Policy of each separate parcel to the whole, exclusive of any improvements made subsequent to Date of Policy, unless a liability or value has otherwise been agreed upon as to each parcel by the Company and the insured at the time of the issuance of this policy and shown by an express statement or by an endorsement attached to this policy.

9. Limitation of Liability.

(a) If the Company establishes the title, or removes the alleged defect, lien or encumbrance, or cures the lack of a right of access to or from the land, or cures the claim of unmarketability of title, all as insured, in a reasonably diligent manner by any method, including litigation and the completion of any appeals therefrom, it shall have fully performed its obligations with respect to that matter and shall not be liable for any loss or damage caused thereby.

(b) In the event of any litigation, including litigation by the Company or with the Company's consent, the Company shall have no liability for loss or damage until there has been a final determination by a court of competent jurisdiction, and disposition of all appeals therefrom, adverse to the title as insured.

(c) The Company shall not be liable for loss or damage to any insured for liability voluntarily assumed by the insured in settling any claim or suit without the prior written consent of the Company.

10. Reduction of Insurance; Reduction or Termination of Liability.

All payments under this policy, except payments made for costs, attorneys' fees and expenses, shall reduce the amount of the insurance pro tanto.

11. Liability Noncumulative.

It is expressly understood that the amount of insurance under this policy shall be reduced by any amount the Company may pay under any policy insuring a mortgage to which exception is taken in Schedule B or to which the insured has agreed, assumed, or taken subject, or which is hereafter executed by an insured and which is a charge or lien on the estate or interest described or referred to in Schedule A, and the amount so paid shall be deemed a payment under this policy to the insured owner.

12. Payment of Loss.

(a) No payment shall be made without producing this policy for endorsement of the payment unless the policy has been lost or destroyed, in which case proof of loss or destruction shall be furnished to the satisfaction of the Company.

(b) When liability and the extent of loss or damage has been definitely fixed in accordance with these Conditions and Stipulations, the loss or damage shall be payable within 30 days thereafter.

13. Subrogation Upon Payment or Settlement.

(a) The Company's Right of Subrogation.

Whenever the Company shall have settled and paid a claim under this policy, all right of subrogation shall vest in the Company unaffected by any act of the insured claimant.

The Company shall be subrogated to and be entitled to all rights and remedies which the insured claimant would have had against any person or property in respect to the claim had this policy not been issued. If requested by the Company, the insured claimant shall transfer to the Company all rights and remedies against any person or property necessary in order to perfect this right of subrogation. The insured claimant shall permit the Company to sue, compromise or settle in the name of the insured claimant and to use the name of the insured claimant in any transaction or litigation involving these rights or remedies.

If a payment on account of a claim does not fully cover the loss of the insured claimant, the Company shall be subrogated to these rights and remedies in the proportion which the Company's payment bears to the whole amount of the loss.

If loss should result from any act of the insured claimant, as stated above, that act shall not void this policy, but the Company, in that event, shall be required to pay only that part of any losses insured against by the policy which shall exceed the amount, if any, lost to the Company by reason of the impairment by the insured claimant of the Company's right of subrogation.

(b) The Company's Rights Against Non-insured Obligors.

The Company's right of subrogation against non-insured obligors shall exist and shall include, without limitation, the rights of the insured to indemnities, guaranties, other policies of insurance or bonds, notwithstanding any terms or conditions contained in those instruments which provide for subrogation rights by reason of this policy.

14. Arbitration.

Unless prohibited by applicable law, arbitration pursuant to the Title Insurance Arbitration Rules of the American Arbitration Association may be demanded if agreed to by both the Company and the insured. Arbitrable matters may include, but are not limited to, any controversy or claim between the Company and the insured arising out of or relating to this policy, any service of the Company in connection with its issuance or the breach of a policy provision or other obligation. Arbitration pursuant to this policy and under the Rules in effect on the date the demand for arbitration is made or, at the option of the insured, the Rules in effect at Date of Policy shall be binding upon the parties. The award may include attorneys' fees only if the laws of the state in which the land is located permit a court to award attorneys' fees to a prevailing party. Judgment upon the award rendered by the Arbitrator(s) may be entered in any court having jurisdiction thereof.

The law of the situs of the land shall apply to an arbitration under the Title Insurance Arbitration Rules.

A copy of the Rules may be obtained from the Company upon request.

15. Liabililty Limited to this Policy; Policy Entire Contract.

(a) This policy together with all endorsements, if any, attached hereto by the Company is the entire policy and contract between the insured and the Company. In interpreting any provision of this policy, this policy shall be construed as a whole.

(b) Any claim of loss or damage, whether or not based on negligence, and which arises out of the status of the title to the estate or interest covered hereby or by any action asserting such claim, shall be restricted to this policy.

(c) No amendment of or endorsement to this policy can be made except by a writing endorsed hereon or attached hereto signed by either the President, a Vice President, the Secretary, an Assistant Secretary, or validating officer or authorized signatory of the Company.

16. Severability.

In the event any provision of the policy is held invalid or unenforceable under applicable law, the policy shall be deemed not to include that provision and all other provisions shall remain in full force and effect.

17. Notices, Where Sent.

All notices required to be given the Company and any statement in writing required to be furnished the Company shall include the number of this policy and shall be addressed to the Company at its home office, 400 Second Avenue South, Minneapolis, Minnesota 55401, (612) 371-1111.

HILLSBOROUGH COUNTY

Florida

Office of the County Administrator
Daniel A. Kleman

BOARD OF COUNTY COMMISSIONERS
Dottie Berger
Phyllis Busansky
Joe Chillura
Chris Hart
Jim Norman
Ed Turanchik
Sandra Helen Wilson

Senior Assistant County Administrator
Patricia Bean

Assistant County Administrators
Edwin Hunzeker
Cretta Johnson
Jimmie Keel
Robert Taylor

May 4, 1995
HAND DELIVERED

Joey A. Kickliter
Real Estate Department
Tampa Electric Company
702 North Franklin Street
Tampa, Florida 33602

RE: Access Lease of TECO Right-of-Way
Golden Aster Scrub-ELAPP\CARL

Dear Mr. Kickliter:

As we indicated in our previous correspondence, the Assistant County Attorney assigned to the ELAP Program was not available to review the proposed lease that we provided to you in our April 26, 1995 correspondence. Our counsel has recently had the opportunity to review this document. The attached version reflects his requested changes with shading for additions and ~~strikethrough~~ for deletions. Please review this revised document as soon as possible.

In order to prevent (or minimize) a delay in the closing for the County's purchase of the referenced property we feel it is essential that we meet during the week of May 8th to bring this issue to closure. If we are not able to resolve any and all remaining issues by May 11, 1995, it will be necessary for us to advise the owner that we have reached an impasse in our efforts to resolve this title concern. It will then be the owner's responsibility to address this matter. Therefore, it is essential that the appropriate TEC staff attend this meeting. It is anticipated that ELAPP Counsel from the County Attorney's Office will be present.

We will be contacting your office on Friday to schedule this meeting. However, if you are able to provide us with your comments or suggested revisions prior to that meeting, please do not hesitate to submit them for our consideration. We appreciate your prompt attention to this matter and look forward to closure on the access issue.

Sincerely,

Kurt G. Gremley
ELAPP Acquisition Manager
(813) 272-5810
(813) 272-5597 FAX

Enclosure
jo
cc: Mike Kelly, Director, Real Estate Department
Ed Radice, Director, Parks and Recreation Department
with enclosures
Vincent Marchetti, Assistant County Attorney
Rob Heath, Environmental Supervisor, Parks and Recreation Department
Emil C. Marquardt, Jr., Trustee
Lew Freidland, President, Jireh, Inc.,
Ed Armstrong, Johnson, Blakely, Pope, Bokor, Ruppel & Burns, P.A.
Joseph M. Wiley, P.E., Director, Building & Real Estate Services, TECO

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ACCESS LEASE AGREEMENT BETWEEN BOARD OF COUNTY COMMISSIONERS OF HILLSBOROUGH COUNTY AND TAMPA ELECTRIC COMPANY

THIS LEASE AGREEMENT, made and entered into this _____ day of _____ _____, 19____, by and between HILLSBOROUGH COUNTY, a political subdivision of the State of Florida hereinafter referred to as "County", having a mailing address of Post Office Box 1110, Tampa, Florida 33601, and TAMPA ELECTRIC COMPANY, a _____, hereinafter referred to as the "Company" and having a mailing address of _____ _____.

WITNESSETH

WHEREAS, the County has contracted with Emil C. Marquardt, as Trustee, hereinafter referred to as the "Trust", for the purchase of a tract of land within Hillsborough County (hereinafter referred to as the "Property" and more specifically describe in Exhibit "A") as part of the Environmental Lands Acquisition and Protection Program (ELAPP) for the purpose of preservation and resource based recreation; and

WHEREAS, the Company is a public utility established for the purpose of providing electrical power to the citizens within Hillsborough County, the Company acquired several tracts of land by the deeds in Official Record Book 887 Page 778, Book 1097 Page 488, and Book 1658 Page 832 as recorded in the public record of Hillsborough County Florida (hereinafter referred to as the "Corridor"), the Corridor was acquired by the Company for the primary purpose of right-of-way for electrical power transmission, there are currently several separate powerlines and associated poles, towers, guy anchors, and other physical improvements associated with electrical transmission constructed within the corridor, (the "Transmission Facilities"), the Company anticipates that additional Transmission Facilities will be constructed within the Corridor but the nature of these facilities has yet to be established; and

WHEREAS, the Corridor was originally a part of the Property, all of the Deeds conveying the Corridor to the Company included an access reservation across the Property hereinafter referred to as the "Access Reservation" which is shown in Exhibit "B", the County proceeded to contract to purchase the Property from

the Trust in reliance upon the ~~of~~ right of the County to have access across the Corridor in accordance with the Access Reservation; and

WHEREAS, the Company ~~does not object to~~ acknowledges the right of the County~~'s~~ to use of the Corridor in accordance with the Access Reservation, however, the Company has requested the County's cooperation in the establishment of location of the County's access ~~Access Locations~~ to minimize the Company's potential liability ~~exposure or to have the County's use of the Access Locations in the Corridor restrict the Company's future use of the Corridor.~~ with respect to the County's use of the Access Corridor areas; and,

WHEREAS, Section 375.251, Florida Statutes, provides limited indemnification for property owners who permit the general public to have access to their lands for recreational purposes provided that there is no fee charged for the use of that land, the access envisioned by the County at the Access Location within the Corridor will be for recreational purposes of preservation lands and other uses associated with the management of lands held for preservation~~,~~ and based on initial analysis of the Property the County has delineated these access areas (the "Access Locations") that will address the current needs for access and management of the Property.

NOW, THEREFORE, in recognition of the mutual objectives of the County, as part of the ELAP Program, and the Company to serve the citizens of Hillsborough County, the unique requirements associated with the use of lands acquired for preservation and resource based recreation, and the mutual benefits for the cooperation between the two ~~agencies~~ Parties, the County and the Company hereby agree that the Company will lease the Access Locations to the County and the County hereby leases the Access Locations from the Company, for and in consideration of the ~~mutual benefits afforded to each party.~~ terms and conditions set forth below:

1) **PURPOSE:**

This Lease is ~~to detail~~ intended to set forth the County's and the Company's rights, responsibilities, terms, and conditions for the County's use

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of portion of the Corridor for access to portions of the Property (the "Access Locations", as described in Exhibit "C").

2) **TERM AND RENEWAL:**

The term of this Lease shall be for a period of Ninety Nine (99) Years from the Effective Date of ~~the~~ this Lease as defined in Paragraph 12 (b) hereof. Upon the expiration of the lease term, the Access Locations as described herein will become Perpetual Permanent Easements at their locations at the time of expiration with the form of the Perpetual permanent easement as generally provided in Exhibit "D".

3) **DESIGN AND CONSTRUCTION OF ACCESS FACILITIES:**

Within the Access Locations, the County may construct hiking trails, equestrian trails, fire lanes, and associated improvements (the "Access Facilities"). The Access Facilities will be constructed in accordance with the conceptual design provided in Exhibit "D". The Company acknowledges that there may be minor variations from these designs. The County acknowledges that the construction of the Access Facilities within the Access Locations will be generally performed in accordance with the requirements provided in Exhibit "E". ~~The~~ The Company acknowledges that the Access Facilities will not unreasonably impede the Company's management, maintenance, and construction of Transmission Facilities within the Corridor.

The use of any other portion of the Corridor by the County for the purpose of access will be promptly granted as an additional Access Location provided that

(1) the proposed use and design is similar to the other Access Locations; and

(2) the access point is at least Seventy Five (75) feet (as measured horizontally) from any existing or permitted ~~t~~Transmission ~~f~~Facility structures that will be used in the transmission of more than _____ kilo volts (the "Distance Requirement").

The Distance Requirement will be waived by the Company if the County can show that:

(1) in order to comply with the distance requirement the County will be required to mitigate for the destruction of wetlands or other regulated habitats that would not occur if the Distance Requirement is waived, or

(2) that an access point to the exterior of the Property (such as deeded or platted right-of-way) restricts the position of the Access Location and that relocation to comply with the Distance Requirement would necessitate the acquisition of other real property by the County in order to accomplish the access

Any other use of the Corridor by the County will be granted by the Company in accordance with the Access Reservation.

4) **RESOURCE BASED RECREATIONAL USES:**

The County is acquiring the Property for the purposes of preservation and recreational activities that do not degrade the environmental quality of the site. These activities can include, but are not limited to, hiking, picnicking, nature study, equestrian activities, swimming, canoeing, and other similar purposes that utilize the natural and physical qualities of the Property. Additionally, as part of the preservation of the Property there will be controlled burns, species inventory, introduction/reintroduction and monitoring of species, exotic/nuisance plant eradication, construction/maintenance of fire lanes, and other similar activities. The Company acknowledges that the Access Locations will be utilized by County staff, contractors, subcontractors, assigns, other government agencies, and the general public in conjunction with these recreational and related preservation activities in accordance with those uses described for the type of Access Facilities.

5) **NO WAIVER OR RELEASE OF RIGHTS:**

The Company acknowledges that this Lease of these Access Locations, the termination of this Lease and the granting of any Perpetual Permanent Easement by the Company on the Corridor **WILL NOT** change, waive, release, resend, terminate, or cancel any right or interest of the County in the Access Reservation as stated within any of the deeds that conveyed title to the Corridor

to the Company. The Company acknowledges that the County may request additional use of the Corridor in accordance with the Access Reservation and that the Company will grant this request for additional access in accordance with this Lease and/or the Access Reservation which ever is applicable at that time.

6) **RELOCATION OF ACCESS FACILITIES:**

It is anticipated that the Company will be constructing additional electrical transmission facilities within the Corridor at some time in the future. The Company is not able to determine or forecast the nature of these facilities at this time.

The County acknowledges that the County's use of the Access Locations will not be a basis for restricting or impeding the Company's ability to construct additional Transmission Facilities. The Company acknowledges that the County has not waived any rights they may have as a property owner adjoining the Corridor.

In the event that ~~the~~ any future Transmission Facilities will require the relocation of any of the Access Facilities and associated Access Locations due to their inability to satisfy the previously referenced Distance Requirement, the Company will establish a new location for the Access Location and Access Facilities with the mutual consent of the County (which consent will not be unreasonably withheld) and the Company will be responsible for all costs associated with the relocation of the Access Location and Access Facilities. The relocation will not occur if the location of the ~~a~~access ~~f~~acility is fixed due to the function of that facility (i.e. Fire Lane) or exterior right-of-way,

~~7) LIABILITY:~~

~~The Company and the County shall each bear its individual responsibility for any and all claims for personal injuries or property damage arising from, or incident to, its use, occupation, and possession of the Corridor, Access Location, Transmission Facilities, and the Access Facilities by the respective Party. The County acknowledges that the Company is leasing the Access Locations to the County under the premise that:~~

~~a) the Access Locations are being used for recreational purposes of the Property by the County and the general public,~~

~~b) the Company's liability for the use of the Access Locations by the County and the General Public is limited pursuant to Section 375.251, Florida Statues, as amended~~

~~c) that there will be no fee charged by the County for the public's use of the Property (unless Section 375.251, Florida Statutes is amended to permit such)~~

~~d) that the County, to the extent allowed by law and subject to the provisions of Section 768.28, Florida Statutes, and the Company shall hold and save the other party harmless and free from any loss, damage and liability occasioned by, growing out of, or arising or resulting from that Party's use, operation, and maintenance of the Corridor, Transmission Facilities, Access Locations, and Access Facilities, and for any tortious or negligent act on the part of the indemnifying Party, its agents, employees, and all persons who may come upon the Corridor or Access Locations pursuant to the indemnifying Party's possession of the Corridor or Access Locations and operation and maintenance of the Transmissions Facilities.~~

~~8~~7) ACCESS BY THE COMPANY:

Nothing herein shall prohibit the Company, its officers, agents, and assigns the right to cross, enter upon, traverse the Access Locations on existing roadways or paths as part of their management, maintenance, and operations of the Transmission Facilities~~.~~, provided said access does not interfere with the rights granted to the County herein or within the Access Reservation.

~~9~~8) RECORDING:

This agreement shall be in recordable form and shall be recorded in the Public Records of Hillsborough County.

~~10~~9) TERMINATION:

The Company acknowledges that the County is voluntarily entering into this Lease at the ~~option of the County at the~~ request of the Company and that in the event of any termination of this Lease for any reason by the County or the Company that the Access Locations will be automatically replaced by a

Perpetual Permanent Easement without further action by either party hereto, the form of which is provided in Exhibit "E". If the Company, for any reason, fails to perform any of the covenants, conditions, or responsibilities of this Lease, the County shall at its option (a) waive the nonperformance and proceed in accordance with the balance of the agreement; ~~or~~ (b) have the remedy of specific performance of this Contract or (c) impose the Perpetual Permanent Easement upon the Access Location.

~~11~~10) **NOTICES:**

Any and all notices, requests, or other communications hereunder shall be deemed to have been duly given if in writing and shall be deemed delivered if transmitted by hand delivery with receipt obtained therefore, or by certified mail with return receipt requested and first class postage prepaid as follows:

To the County:: Hillsborough County
Board of County Commissioners
P. O. Box 1110
Tampa, Florida 33601
Attention: Director, Real Estate Department

To the Company: Tampa Electric Company
P. O. Box 111
Tampa, Florida 33601-0111

or such other address as may be provided in writing according to the above provisions.

12) **MISCELLANEOUS:**

(a) Governing Law: This Lease shall be construed and enforced in accordance with the laws the State of Florida.

(b) Effective Date of Agreement: This Lease shall be effective upon the completion of both the (1) approval of both the County and the Company and (2) the recording of the deeds of conveyance of the Property from the Trust to the County. In the event the Property is not conveyed to the County by September 1, 1995 this Lease will be terminated and no longer in force and effect.

(c) Binding Effect: This Lease will be binding upon and inure to the benefit of the parties hereto, and its personal representatives, successors, and assigns and will be a covenant running with the Corridor for the benefit of the

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owner of the Property. The covenants of this Lease will survive delivery and recording of the deed and possession.

(d) Attachments: Attachments "A", "B", "C", "D", and "E" are attached hereto and made a part of this Agreement as fully as if set forth in the text of this Agreement.

(e) Amendments: This Agreement may be amended in writing by mutual consent of the County and the Company.

IN WITNESS WHEREOF, this Lease has been executed by and on behalf of the County by its Chairman of the Board of County Commissioners and the seal of the County affixed hereto and attested by the Clerk of the Board of County Commissioners, and Tampa Electric Company (the "Company") has caused this Lease to be executed by its _____ and its corporate seal to be affixed hereto and attested by the Secretary as of the _____ day of _____, 19_____.

ATTEST: RICHARD AKE
CLERK OF CIRCUIT COURT

By:_____
Deputy Clerk

ATTEST:

By:_____
Secretary

HILLSBOROUGH COUNTY, A POLITICAL SUBDIVISION OF THE STATE OF FLORIDA

DRAFT

By:_____
Chairman

Date:_____

TAMPA ELECTRIC COMPANY

DRAFT

By:_____
Its _____

Date:_____

Exhibit "A" Property Legal Description

Exhibit "B" Access Reservation

Exhibit "C" Access Locations

Exhibit "D" Access Facilities

Exhibit "E" Permanent Easement

EXHIBIT "B"
ACCESS RESERVATION

"The grantors, their heirs, legal representatives, successors, and assigns reserve the right to construct and maintain in, under, over, and across the within described land, roads, utilities, and drainage facilities as may be reasonably required to serve the improvements which may be constructed on adjoining lands. The facilities built however, shall be constructed on said lands in accordance with plans submitted to and approved by Grantee before such construction commences. It is understood that permission for construction shall not be unreasonably withheld. The reservations shall be covenants running with the land for the benefit of the adjoining property presently owned by the Grantors."

HILLSBOROUGH COUNTY

Florida

Office of the County Administrator
Daniel A. Kleman

BOARD OF COUNTY COMMISSIONERS
Dottie Berger
Phyllis Busansky
Joe Chillura
Chris Hart
Jim Norman
Ed Turanchik
Sandra Helen Wilson

Senior Assistant County Administrator
Patricia Bean

Assistant County Administrators
Edwin Hunzeker
Cretta Johnson
Jimmie Keel
Robert Taylor

May 11, 1995
HAND DELIVERED

Joey A. Kickliter
Real Estate Department
Tampa Electric Company
702 North Franklin Street
Tampa, Florida 33602

RE: Access Across TECO Right-of-Way
Golden Aster Scrub-ELAPP\CARL

Dear Mr. Kickliter:

On February 3, 1995, pursuant to your direction we provided an application for the use of Tampa Electric Company right-of-way (the "TEC Property"). The TEC Property was at one time part of a larger property (the "Parent Tract"). The TEC Property includes a reservation (the "Access Reservation") for the benefit of the owner of the Parent Tract for access across the TEC Property. The Access Reservation requires that TEC approve our construction drawings and locations.

Your March 21, 1995, response to our submittal for the use of TEC Property for access for recreational trails and fire lanes requested: 1) compensation for the loss of greenbelt ad valorem tax exemption, 2) relocation of access locations to at least Seventy Five (75) feet (horizontally) from your tower locations and fencing of the trail crossings, 3) a general liability insurance policy covering our use, and 4) release of our interest in the Access Reservation. In our response to you dated March 28, 1995, we advised you that, with the exception of the location and fencing request for trail crossings, none of your requests related to the approval stipulated in the Access Reservation.

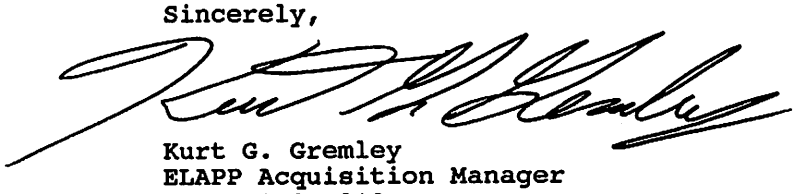
Pursuant to the the Access Reservation we are submitting revised construction drawings and legal descriptions for your approval. As verification of this approval we have attached an "Affidavit for Establishing Access" (the "Affidavit") for execution by the appropriate TEC Officer. This Affidavit includes the legal description of the property being acquired, legal descriptions and sketches for crossing locations that are at least Seventy Five (75) feet (horizontally) from any TEC power pole or similar structure, and construction drawings with specifications. We have also provided a sketch showing the location of the crossings and their distances from the structures. These are being provided by Hillsborough County, as the equitable owner of the property, on behalf of the owner of record, Emil C. Marquardt, as Trustee, in order to resolve a title issue as a requirement of our contract to purchase this property.

Please review this document as soon as possible. If further revisions are required please contact us immediately and advise us of your required changes to any portion of this document. In its current form it is acceptable to the title insurer. It is necessary that this item be recorded in the public record in order to clarify our rights as reflected in the public record. Please be advised that if we feel that your request is unreasonable that we will have to address the matter with the owner since we are acting on their behalf.

Please be advised that, with the exception of certain title issues, that all other requirements of the contract have been satisfied and we have scheduled the closing for this transaction on May 19, 1995. As we discussed at our meeting on Wednesday, May 10, 1995, we are willing to consider entering into a lease agreement in an effort to cooperate with TEC so your organization will have protection pursuant to Section 375.251, Florida Statutes, provided it does not impact our transaction with the owner. Please be advised that in order for us to consider a lease with TEC it will be necessary that we have an acceptable document that addresses our concerns (as detailed in our recent meeting) by noon on Monday, May 15, 1995, so it can be approved by our Board on Wednesday, May 17, 1995. Please be advised that the Board does not have another regular meeting after that date until June. If we do not have an acceptable lease by noon on Monday May 15, 1995, we may not be in a position to pursue this option without the authorization of the property owner.

If you have any questions on this matter or wish to discuss a particular aspect of this request, please do not hesitate to contact us. Thank you for your prompt attention and we look forward to finalizing this issue.

Sincerely,



Kurt G. Gremley
ELAPP Acquisition Manager
(813) 272-5810
(813) 272-5597 FAX

Enclosures
jo

cc: Mike Kelly, Director, Real Estate Department
Ed Radice, Director, Parks and Recreation Department
with enclosures
Vincent Marchetti, Assistant County Attorney
Rob Heath, Environmental Supervisor, Parks and Recreation Department
Emil C. Marquardt, Jr., Trustee (Certified Return Receipt #P 382 005 352)
Lew Freidland, President, Jireh, Inc., (Certified Return Receipt #P 382 005 353)
Ed Armstrong, Johnson, Blakely, Pope, Bokor, Ruppel & Burns, P.A.
(Certified Return Receipt #P 382 005 354)
Joseph M. Wiley, P.E., Director, Building & Real Estate Services, TECO
(Hand Delivered)
William Estes, Corporate Counsel, Tampa Electric Company
(Hand Delivered)
Jim Russick, State Counsel, Old Republic Title Insurance Company

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OLD REPUBLIC
National Title Insurance Company
100 South Ashley Drive, Suite 700
Tampa, Florida 33602-5300
(813) 228-0555
(800) 342-5957
Home Office: Minneapolis, Minnesota 55401-2499

May 11, 1995

"VIA FACSIMILE 813-272-5597 AND REGULAR U.S. MAIL"

Mr. Kurt G. Gremley
ELAPP Acquisition Manager
Real Estate Department
Office of the County Administrator
Hillsborough County, Florida
Post Office Box 4440
Tampa, Florida 33601

Re: Our File No. 943472
Marguardt

Dear Mr. Gremley:

You have inquired into Old Republic's position on insuring access on the referenced transaction. Please accept this letter as written confirmation of our previous oral representations to the effect that the presently recorded written agreement is insufficient to insure ingress and egress to subject properties. Old Republic will require a written, express, recordable understanding with TECO expressly identifying access in order to extend our normal coverage.

I look forward to reviewing any such agreement with the hope of assisting with the consummation of this transaction.

Sincerely,

James C. Russick
Florida State Underwriting Counsel

JCR/mja

AFFIDAVIT FOR ESTABLISHING ACCESS

STATE OF FLORIDA
COUNTY OF HILLSBOROUGH

BEFORE ME, the undersigned authority, personally appeared _____, hereinafter referred to as "Affiant," who being by me first duly sworn, on oath, says:

1. That Affiant is the _____ for Tampa Electric Company (TEC) who is the owner of the parcel of land part of which is particularly described in Official Record Book 887 Page 778, Book 1097 Page 488, and Book 1658 Page 832 as recorded in the public record of Hillsborough County Florida (the "TEC Property") and that the Affiant is the authorized representative for TEC in matters concerning the conveyance of any rights or interest in real property owned by TEC.

2. Affiant acknowledges that:

(a) the TEC Property was at one time part of a larger tract and that a portion of the larger tract is described in Exhibit "A" hereinafter referred to as the "Parent Tract"

(b) there is a reservation stated within the deeds for the TEC Property (and is recited in Exhibit "B" hereinafter referred to as the "Access Reservation") and this Access Reservation permits the owner of the Parent Tract access across the TEC Property and the associated improvements subject to the approval of the improvements by TEC

3. The Owner of the Parent Tract has a contract to sell the Parent Tract to Hillsborough County. Hillsborough County has requested that the Owner perfect their access rights in accordance with the Access Reservation.

4. The Owner of the Parent Tract has submitted the construction drawings and access locations required by the County for access as provided in Exhibit "C" (the "Access Facilities") to TEC.

5. TEC has reviewed these drawings and locations of these Access Facilities. In accordance with the Access Reservation TEC grants permission for the construction of these Access Facilities and their use in accordance with the Access Reservation.

6. TEC acknowledges that the authorization for the construction of these Access Facilities will be a covenant running with the TEC Property for the benefit of the Owner of the Parent Tract, their heirs, legal representatives, successors, and assigns.

7. TEC acknowledges that the authorization for the construction of these Access Facilities does not change, waive, release, resend, terminate, or cancel any rights that the Owner, their heirs, legal representatives, successors, and assigns have associated with the Access Reservations.

_____ _____

Witness

Title_____

_____ _____

Print Name Print Name

_____ Date:_____

Witness

_____

Print Name

STATE OF FLORIDA

COUNTY OF HILLSBOROUGH

The foregoing instrument was acknowledged before me this _____ day of_____, _____, by _____, who is personally known to me or who has produced _____ as identification.

NOTARY PUBLIC:

Sign:_____(SEAL)
PrintName:_____
Title or Rank:_____
Serial Commission Number:_____
My Commission Expires:_____

EXHIBIT "A"
"PARENT TRACT"

PARCEL 101.1

All that part of the East 1/2 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida. Lying East of the railroad right-of-way.

LESS

The North 20 feet of the East 650 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 10 feet of the East 560 feet of the South 35 feet of the North 55 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract beginning at the Southwest corner of the Southeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East 2,615.63 feet to the Southeast corner of Section 2, Township 31 South, Range 19 East, thence North 99.25 feet and Westerly to beginning.

PARCEL 101.2

The part of the East 1/2 of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida, lying West of East Bay Road, and lying West of land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

AND

The West 1/2 of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida, LESS the West 325.0 feet, thereof.

AND

All that part of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying West of land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

LESS

The South 1,216 feet of the West 816 feet of the Southeast 1/4 of said Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Portion deeded to State Road Department for State Road 672.

ALSO LESS

The South 3/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 325 feet of the Northwest 1/4 of the Northwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 300 feet of the Southwest 1/4 of the Northwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 300 feet of the North 1/2 of the Northwest 1/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract beginning 300 feet East of the Southwest corner of the North 1/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East to the East boundary of the Southwest 1/4, thence North 200 feet, thence West to point 200 feet, north of beginning and South 200 feet to beginning.

ALSO LESS

Tract beginning 1,378.6 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 200.04 feet; thence North 1,984.4 feet; thence West 1,067.05 feet; thence North 200.01 feet; thence East 1,266.80 feet; thence South 2,185 feet to beginning.

ALSO LESS

Tract beginning 1,578.64 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 254.37 feet; thence North 1,216 feet; thence West 815.44 feet; thence North 774.55 feet; thence East 1,067.05 feet; thence South 1,984.4 feet to beginning.

ALSO LESS

Right of way for State Road 672.

ALSO LESS

Less lands taken by Tampa Electric Company in Case Number 79-13223, in the Circuit Court in and for Hillsborough County, Florida.

ALSO LESS

Land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

PARCEL 101.3

A tract beginning 1,578.64 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 254.37 feet; thence North 1,216 feet; thence West 815.44 feet; thence North 774.55 feet; thence East 1,067.05 feet; thence South 1,984.4 feet to beginning.

LESS

Right-of-way for State Road 672.

ALSO LESS

Lands taken by Division of Administration, State of Florida, Department of Transportation in Case Number 78-15387, in the Circuit Court of Hillsborough County, Florida.

EXHIBIT "B"
ACCESS RESERVATION

"The grantors, their heirs, legal representatives, successors, and assigns reserve the right to construct and maintain in, under, over, and across the within described land, roads, utilities, and drainage facilities as may be reasonably required to serve the improvements which may be constructed on adjoining lands. The facilities built however, shall be constructed on said lands in accordance with plans submitted to and approved by Grantee before such construction commences. It is understood that permission for construction shall not be unreasonably withheld. The reservations shall be covenants running with the land for the benefit of the adjoining property presently owned by the Grantors."

EXHIBIT "C"

ACCESS FACILITY LOCATIONS ON TEC PROPERTY AND CONSTRUCTION DRAWINGS

LEGAL DESCRIPTIONS

Easement No. 1 (Fire Lane and Access)

Commence at the Northwest corner of Section 1, Township 31 South, Range 19 East, thence S.00°30'01"W. 40.00 feet along the West boundary of said Section 1 to the POINT OF BEGINNING; thence S.89°38'44"E. parallel with the North boundary of said Section 1 325.00 feet; thence S.00°30'01"W. parallel with the West boundary of said Section 1 40.00 feet; thence N.89°38'44"W. 325.00 feet to the West boundary of said Section 1; thence N.00°30'01"E. 40.00 feet to the POINT OF BEGINNING.

Easement No. 2 (Trail and Access)

Commence at the Southwest corner of Section 1, Township 31 South, Range 19 East; thence N.00°30'01"E. 3297.00 feet along the West boundary of said Section 1 to the POINT OF BEGINNING; thence N.00°30'01"E. 40.00 feet along the West boundary of said Section 1, thence S.89°29'59"E. 325.00 feet; thence S.00°30'01"W. parallel with the West boundary of said Section 1 40.00 feet; thence N.89°29'59"W. 325.00 feet to the West boundary of said Section 1 and the POINT OF BEGINNING.

Easement No. 3 (Trail and Access)

Commence at the Southwest corner of Section 1, Township 31 South, Range 19 East; thence N.00°30'01"E. 2238.39 feet along the West boundary of said Section 1 to the POINT OF BEGINNING; thence N.00°30'01"E. 40.00 feet along the West boundary of said Section 1; thence S.89°29'59"E. 325.00 feet; thence S.00°30'01"W. parallel with the West boundary of said Section 1 40.00 feet; thence N.89°29'59"W. 325.00 feet to the West boundary of said Section 1 and the POINT OF BEGINNING.

Easement No. 4 (Fire Lane and Access)

Commence at the Southwest corner of Section 1, Township 31 South, Range 19 East, thence N.00°30'01"E. 99.25 feet along the West boundary of said Section 1 to the POINT OF BEGINNING; thence N.00°30'01"E. 40.00 feet along the West

boundary of said Section 1; thence S.89°29'59"E. 325.00 feet; thence S.00°30'01"W. parallel with the West boundary of said Section 1 40.00 feet; thence N.89°29'59"W. 325.00 feet to the West boundary of said Section 1 and the POINT OF BEGINNING.

Easement No. 5 (Trail and Access)

Commence at a Hillsborough County 4-inch square concrete monument marking the intersection of the South line of a Tampa Electric Company 200.00 feet Right-of-Way recorded in Official Record Book 1097, Page 488, Public Records of Hillsborough County, Florida, and the West boundary of the Southeast one quarter of Section 12, Township 31 South, Range 19 East; thence N.88°55'01"W. 250.00 feet along the South boundary of said Right-of-Way to the POINT OF BEGINNING; thence N.88°55'01"W. 40.00 feet along said South boundary; thence N.01°04'59"E. 200.00 feet; thence S.88°55'01"E. 40.00 feet; thence S.01°04'59"W. 200.00 feet to the POINT OF BEGINNING.

Easement No. 6 (Fire Lane and Access)

For a POINT OF BEGINNING, commence at a Hillsborough County 4-inch square concrete monument marking the intersection of the South line of a Tampa Electric Company 200.00 feet Right-of-Way recorded in Official Record Book 1097, Page 488, Public Records of Hillsborough County, Florida, and the West boundary of the Southeast one quarter of Section 12, Township 31 South, Range 19 East; thence N.00°25'26"E. 200.00 feet along said West boundary; thence S.88°40'29"E. 40.00 feet; thence S.00°25'26"W. 200.00 feet to the South boundary of said Right-of-Way; thence N.88°40'29"W. 40.00 feet to the POINT OF BEGINNING.

Easement No. 7 (Trail and Access)

Commence at a Hillsborough County 4-inch square concrete monument marking the intersection of the South line of a Tampa Electric Company 200.00 feet Right-of-Way recorded in Official Record Book 1097, Page 488, Public Records of Hillsborough County, Florida, and the West boundary of the Southeast one quarter of Section 12, Township 31 South, Range 19 East; thence S.88°40'29"E. 593.49 feet along the South boundary of said Right-of-Way of the POINT OF BEGINNING; thence N.01°19'31"E. 200.00 feet; thence S.88°40'29"E. 40.00 feet; thence S.01°19'31"E. 200.00 feet to the South boundary of said Right-of-Way; thence N.88°40'29"W. 40.00 feet to the POINT OF BEGINNING.

Easement No. 8 (Fire Lane and Access)

For a POINT OF BEGINNING, commence at a Hillsborough County 4-inch square concrete monument marking the intersection of the West line of a Tampa Electric Company 200.00 feet Right-of-Way recorded in Official Record Book 1097, Page 488, Public Records of Hillsborough County, Florida, and the Northwesterly Right-of-Way of Interstate 75; thence N.00°20'08"E. 147.87 feet along the West line of said Tampa Electric Company Right-of-Way; thence N.16°01'48"E. 739.35 feet parallel with said Northwesterly Right-of-Way of Interstate 75 to the East line of said Tampa Electric Company Right-of-Way; thence S.00°20'08"W. 147.87 feet along said East line to said Northwesterly Right-of-Way of Interstate 75; thence S.16°01'48"W. 739.35 feet to the POINT OF BEGINNING.

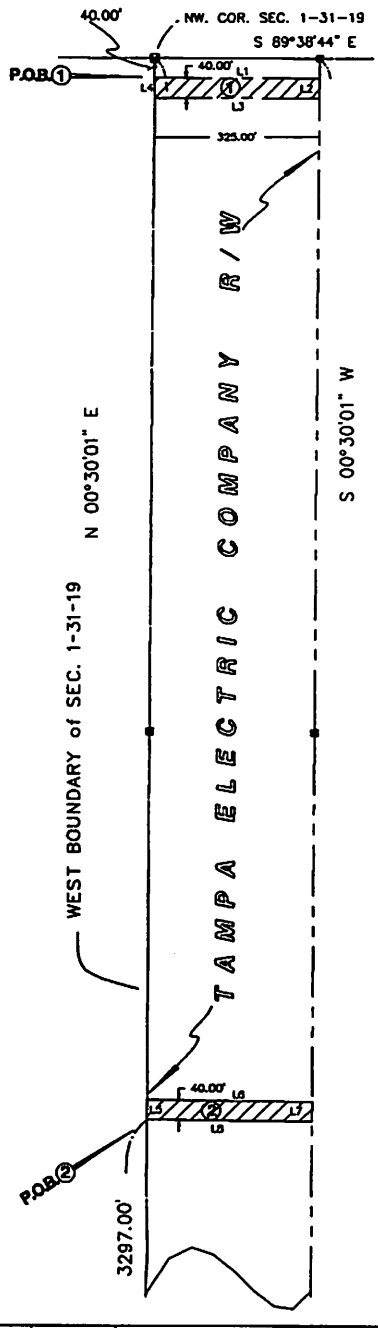
Revised Easement Nos. 2, 3, and 7 -- 5/11/95.

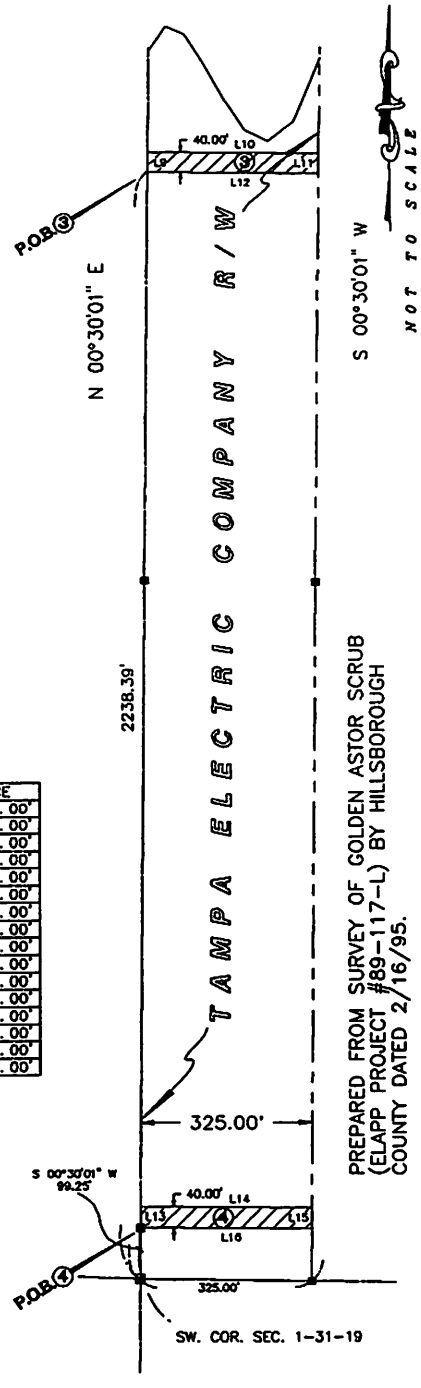
E.L.A.P.P.

PROJECT NAME: GOLDEN ASTER SCRUB - PROJECT #89-117-L

GRANTOR: TAMPA ELECTRIC COMPANY

SKETCH OF DESCRIPTION
(NOT A SURVEY)





PARCEL	LINE	DIRECTION	DISTANCE
ACCESS #1	L1	S 89° 38' 44" E	325.00'
	L2	S 00° 30' 01" W	40.00'
	L3	N 89° 38' 44" W	325.00'
	L4	N 00° 30' 01" E	40.00'
ACCESS #2	L5	N 00° 30' 01" E	40.00'
	L6	S 89° 29' 59" E	325.00'
	L7	S 00° 30' 01" W	40.00'
	L8	N 89° 29' 59" W	325.00'
ACCESS #3	L9	N 00° 30' 01" E	40.00'
	L10	S 89° 29' 59" E	325.00'
	L11	S 00° 30' 01" W	40.00'
	L12	N 89° 29' 59" W	325.00'
ACCESS #4	L13	N 00° 30' 01" E	40.00'
	L14	S 89° 29' 59" E	325.00'
	L15	S 00° 30' 01" W	40.00'
	L16	N 89° 29' 59" W	325.00'

PREPARED FROM SURVEY OF GOLDEN ASTOR SCRUB (ELAPP PROJECT #89-117-L) BY HILLSBOROUGH COUNTY DATED 2/16/95.

NO.	DATE	REVISIONS/DESCRIPTION	APPROVED
1	5/11/95	PER REAL ESTATE DEPT.	J LESTER

NOTE:
This sketch is not a survey. If there is a discrepancy between the legal description and the sketch, the legal description will control.

COUNTY of HILLSBOROUGH
ENGINEERING & CONSTRUCTION SERVICES
SURVEY & MAPPING/GIS SECTION
FIELD SURVEY OFFICE (813) 744-5619
7220 N. TAYLOR RD., SEFFNER, FL 33584

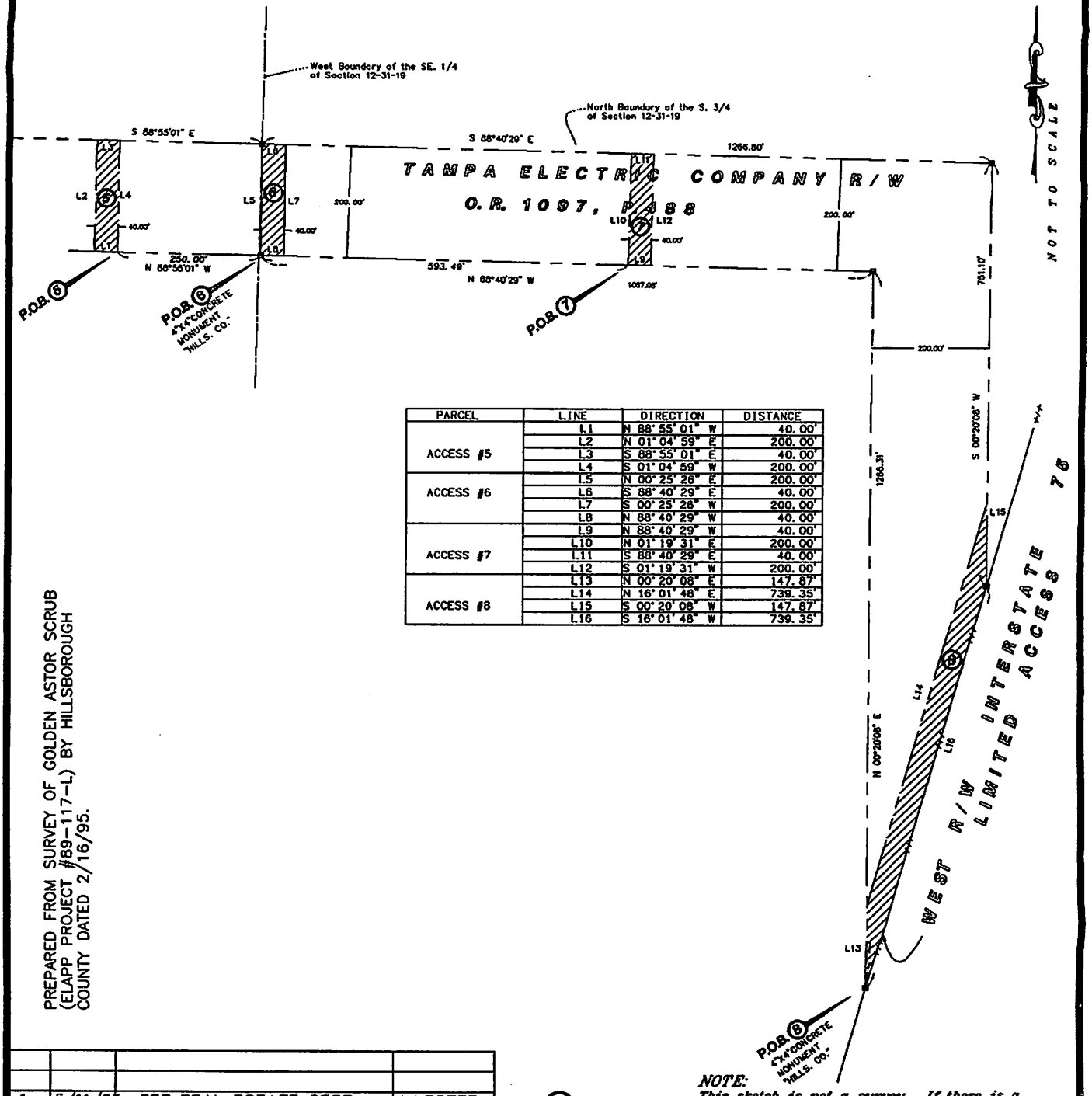
DATE	SCALE: NOT TO SCALE	SUR. REQ.# 940913
	DRAWN BY: J.PRADO	SEC 12 TWP 31 RGE 19
	CHECKED BY: J.LESTER	FLD. BOOK# 447
PROJECT # 89117L ELAPP		SHEET 03 of 03

E.L.A.P.P.

PROJECT NAME: GOLDEN ASTER SCRUB - PROJECT #89-117-L

GRANTOR: TAMPA ELECTRIC COMPANY

SKETCH OF DESCRIPTION
(NOT A SURVEY)



PARCEL	LINE	DIRECTION	DISTANCE
ACCESS #5	L1	N 88° 55' 01" W	40.00'
	L2	N 01° 04' 59" E	200.00'
	L3	S 88° 55' 01" E	40.00'
	L4	S 01° 04' 59" W	200.00'
ACCESS #6	L5	N 00° 25' 26" E	200.00'
	L6	S 88° 40' 29" E	40.00'
	L7	S 00° 25' 26" W	200.00'
	L8	N 88° 40' 29" W	40.00'
ACCESS #7	L9	N 88° 40' 29" W	40.00'
	L10	N 01° 19' 31" E	200.00'
	L11	S 88° 40' 29" E	40.00'
	L12	S 01° 19' 31" W	200.00'
ACCESS #8	L13	N 00° 20' 08" E	147.87'
	L14	N 16° 01' 48" E	739.35'
	L15	S 00° 20' 08" W	147.87'
	L16	S 16° 01' 48" W	739.35'

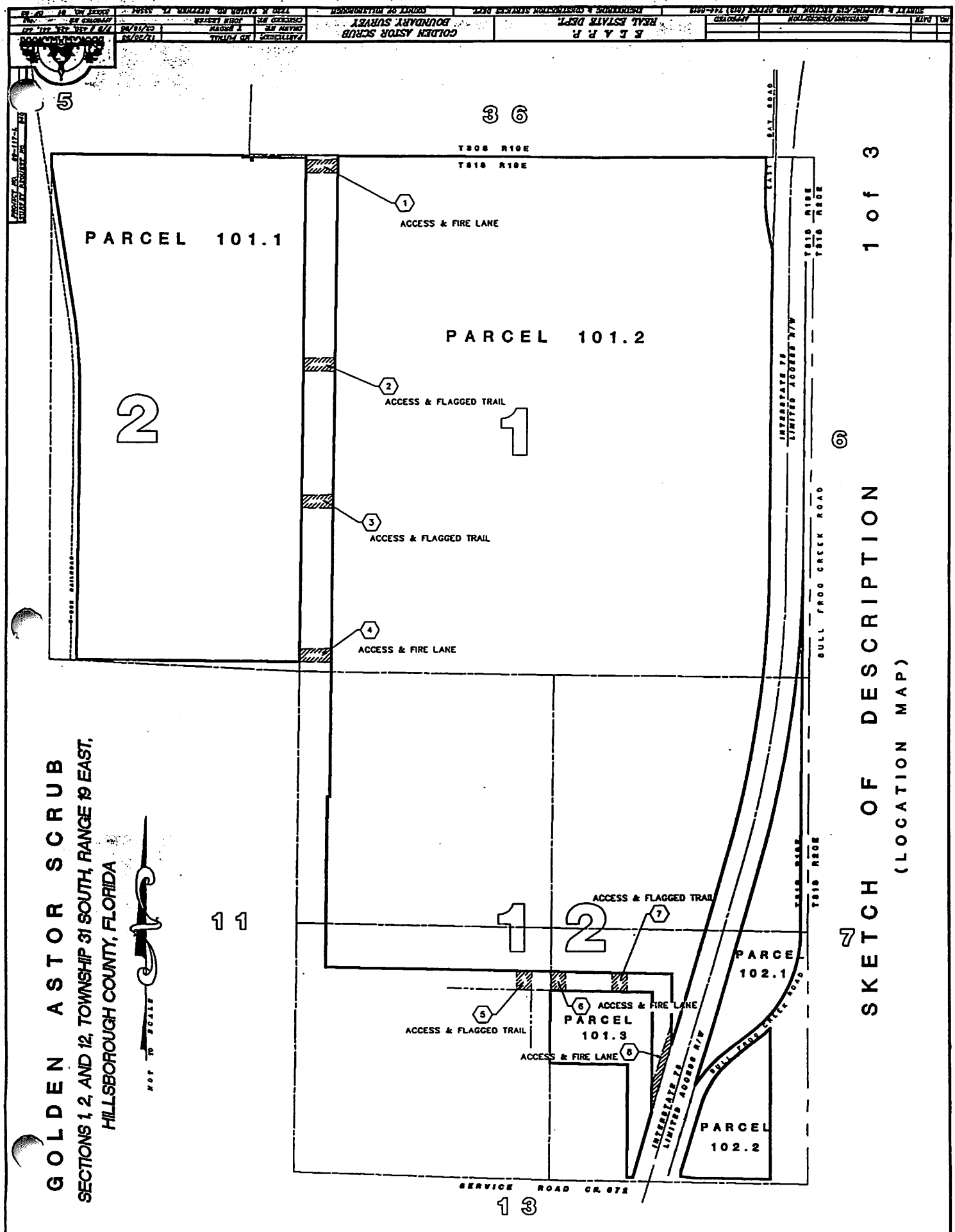
PREPARED FROM SURVEY OF GOLDEN ASTOR SCRUB (ELAPP PROJECT #89-117-L) BY HILLSBOROUGH COUNTY DATED 2/16/95.

NO.	DATE	REVISIONS/DESCRIPTION	APPROVED
1	5/11/95	PER REAL ESTATE DEPT.	J LESTER

NOTE: This sketch is not a survey. If there is a discrepancy between the legal description and the sketch, the legal description will control.

COUNTY of HILLSBOROUGH
ENGINEERING & CONSTRUCTION SERVICES
SURVEY & MAPPING/GIS SECTION
FIELD SURVEY OFFICE (813) 744-5619
7220 N. TAYLOR RD., SEFFNER, FL 33584

DATE	SCALE: NOT TO SCALE	SUR. REQ.# 940913
	DRAWN BY: J.PRADO	SEC 12 TWP 31 RGE 19
	CHECKED BY: J.LESTER	FLD. BOOK# 447
PROJECT # 89117L ELAPP		SHEET 02 of 03


GOLDEN ASTOR SCRUB
SECTIONS 1, 2, AND 12, TOWNSHIP 31 SOUTH, RANGE 19 EAST,
HILLSBOROUGH COUNTY, FLORIDA
SKETCH OF DESCRIPTION
(LOCATION MAP)
1 of 3
PARCEL 101.1
PARCEL 101.2
PARCEL 102.1
PARCEL 101.3
PARCEL 102.2
ACCESS & FIRE LANE
ACCESS & FLAGGED TRAIL
T30S R19E
T31S R19E
BULL FROG CREEK ROAD
SERVICE ROAD CR 672
INTERSTATE 75 LIMITED ACCESS R/W
1
2
3
4
5
6
7
8
11
12
13

CONSTRUCTION SPECIFICATIONS

NOTE: These specifications are to provide reasonable identification and effectively represent the nature of the improvements envisions within the specified easements. It is expected that there will be minor variations from these drawings and the final improvements.

ACCESS AND TRAIL EASEMENTS

1) These specifications related to Easements No. Two (2), Three (3), Five (5), and Seven (7)

2) The purpose of these crossings is to provide access for ingress and egress to all parties utilizing the trail entering and leaving Parent Tract onto the TEC Property as access to the other portions of the Parent Tract. While it is expected that this access will primarily be on foot, there is no limitation as to the nature of the access.

3) In addition to Signs "A" and "B", and addition sign stating the following will be posted on alternate sides of the trail at intervals of not more than one hundred (100) feet within the TEC Property:

   DANGER: HIGH VOLTAGE ELECTRICAL TRANSMISSION LINES - NO TRESPASSING

   All signs will have letters at least one inch high letters

4) Fencing will be "split rail" or similar rustic/natural fencing with and approximate minimum height of three (3) feet. At the crossing point with the TEC maintenance road a cable with a padlock will be used in lieu of gate.

   In the event that this type of fencing proves to be ineffective it will be replaced with a hog wire fence and a gate acceptable to TEC.

FIRE LANE AND ACCESS EASEMENTS

1) These specifications related to Easements No. One (1), Four (4), Six (6), and Eight (8)

2) The purpose of these crossings is to provide access for ingress and egress to County Staff, parties performing work on behalf of the County, and designated invitees as part of the management of the property as a preserve, maintenance of fences, creating and maintenance of fire lanes, and other associated activities for habitat management entering and leaving Parent Tract onto the TEC Property as access to the other portions of the Parent Tract. While it is expected that this access will primarily be on foot, there is no limitation as to the nature of the access.

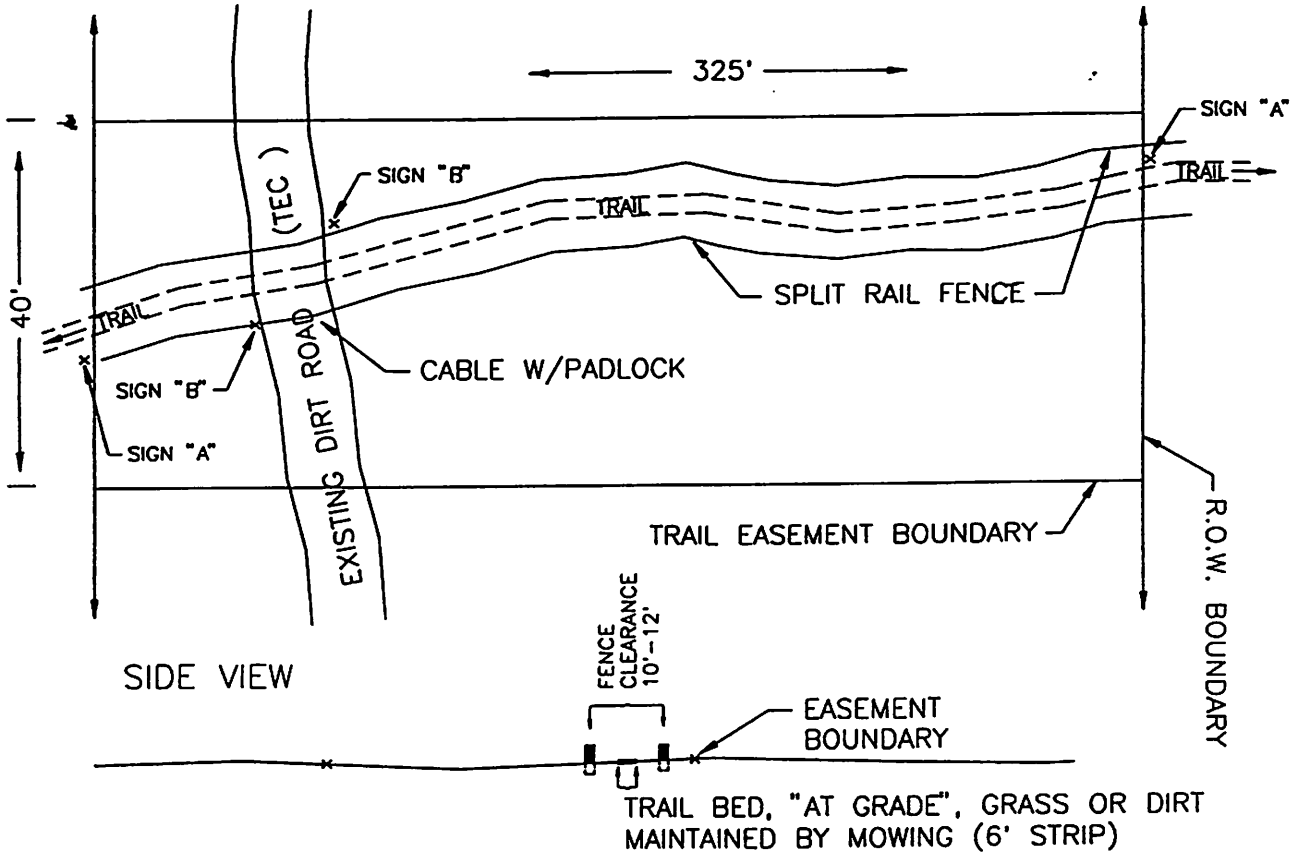
3) The following will be posted on alternate sides of the trail at intervals of not more than one hundred (100) feet within the TEC Property:

   DANGER: HIGH VOLTAGE ELECTRICAL TRANSMISSION LINES - NO TRESPASSING

   All signs will have letters at least one inch high letters

4) The exterior fencing will be a "hog wire fence and with the existing gate. In the event this gate is damaged or destroyed by County staff, the County will provide a replacement gate acceptable to TEC.

ACCESS & TRAIL



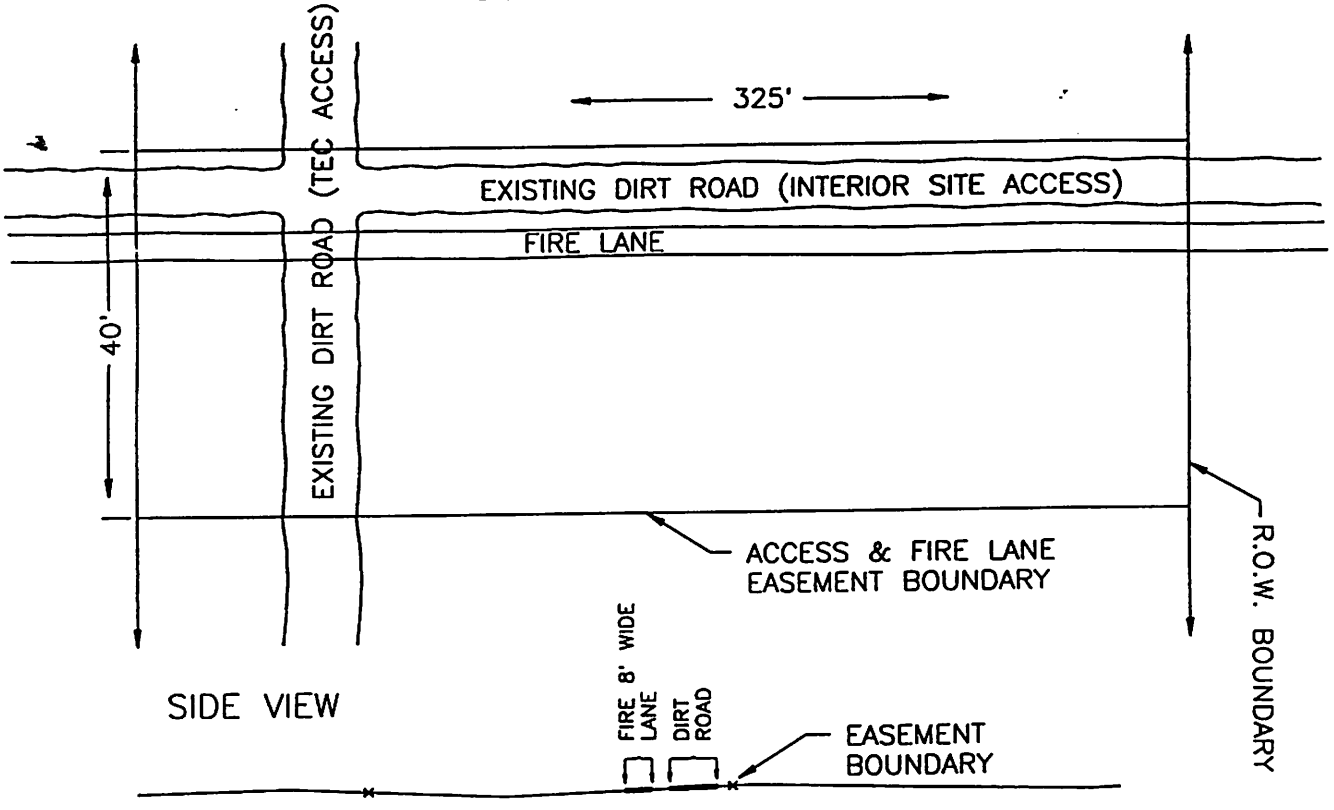
SIGN "A" (TYPICAL)

NOTICE:
PRIVATE PROPERTY
OF TAMPA ELECTRIC
COMPANY NEXT 325'
REMAIN ON TRAIL

SIGN "B" (TYPICAL)

CAUTION
VEHICLE TRAFFIC

ACCESS & FIRE LANE



AFFIDAVIT

STATE OF FLORIDA

COUNTY OF HILLSBOROUGH

BEFORE ME, the undersigned authority, personally appeared M. F. Wadsworth, Vice President, Corporate and ~~the~~ Operating Services, of **TAMPA ELECTRIC COMPANY ("TECO"),** hereinafter referred to as "Affiant," who, being by me first duly sworn, on oath, says:

1. That Affiant is the authorized representative for the owner of property located within Sections 1, 2 and 12, Township 31, Range 19, Hillsborough County, Florida.

2. Affiant understands that the estate of Emil C. Marquardt, as Trustee ("Trustee"), owns parcels of land located in Sections 1, 2, and 12, Township 31, Range 19, Hillsborough County, Florida (collectively, "Trust Property"), which parcels are more particularly described in Exhibit "A. Portions of the Trust Property are bordered by property owned by TECO as described in O.R. Book 887, Page 778, O.R. Book 1658, Page 832, and O.R. Book 1097, Page 488, all of the Public Records of Hillsborough County, Florida. The property owned by TECO is more particularly described in Exhibit "B" (collectively, "TECO's Property").

3. At some time in the past, various fences (collectively, "Fences") were constructed along or near various boundaries between the Trust Property and TECO's Property.

4. Subsequent to construction of the Fences, the Trustee obtained a survey of the Trust Property which disclosed that the Fences are located in the proximity of certain boundary lines between the Trust Property and TECO's Property, and shown on Exhibit "C", but are not solely on either the Trust Property or TECO's Property.

5. Affiant, on behalf of TECO, acknowledges that the Fences are fences of convenience and do not denote necessarily the location of the ownership boundary between the Trust Property and TECO's Property.

6. Affiant, on behalf of TECO, acknowledges that a portion of the Fences are located on TECO's Property and a portion of the Fences are located on the Trust Property.

7. Based on the present location of the Fence, Affiant, on behalf of TECO, does not claim, and on behalf of TECO, hereby expressly disclaims, any right, title or interest which TECO may claim in or to any portion of the Trust Property.

8. To the best of Affiant's knowledge, on behalf of TECO, but without inquiry, TECO is unaware that any party other than TECO or the Trustee is in possession or occupancy of the land located between the Fences and the boundary between the Trust Property and TECO's Property.

Name of Affiant: M. F. Wadsworth
Title: Vice President, Corp. & Operating Svcs.
Company: Tampa Electric Company
Address: P. O. Box 111
Tampa, FL 33601

The foregoing instrument was acknowledged before me this _____ day of _______________, 1995, by M. F. Wadsworth, as Vice President, Corp. & Op. Svcs, of TAMPA ELECTRIC COMPANY, on behalf of the Company. [He] [She], [is personally known to me] OR [has produced xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx as identification], and did take an oath.

JOEY A. KICKLITER
Notary Public, State of Florida
My comm. expires Apr. 16, 1997
No. CC270151

Print Name: Joey A. Kickliter

My Commission Expires:

Exhibit "A" - Legal Description for Parcels 101.1, 101.2, and 101.3
Exhibit "B" - Legal Description for Parcels 103.1 and 103.2
Exhibit "C" - Location of fences between TECO Property and Trust Property

32896.872325;CLG;05/16/95 2:34 PM (d-2)
67002.02

EXHIBIT "A"

CARL PROJECT

PARCEL 101.1

All that part of the East 1/2 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida. Lying East of the railroad right-of-way.

LESS

The North 20 feet of the East 650 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 10 feet of the East 560 feet of the South 35 feet of the North 55 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract beginning at the Southwest corner of the Southeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East 2,615.63 feet to the Southeast corner of Section 2, Township 31 South, Range 19 East, thence North 99.25 feet and Westerly to beginning.

PARCEL 101.2

The part of the East 1/2 of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida, lying West of East Bay Road, and lying West of land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

AND

The West 1/2 of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida, LESS the West 325.0 feet, thereof.

AND

All that part of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying West of land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

LESS

The South 1,216 feet of the West 816 feet of the Southeast 1/4 of said Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Portion deeded to State Road Department for State Road 672.

ALSO LESS

The South 3/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 325 feet of the Northwest 1/4 of the Northwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 300 feet of the Southwest 1/4 of the Northwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 300 feet of the North 1/2 of the Northwest 1/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract beginning 300 feet East of the Southwest corner of the North 1/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East to the East boundary of the Southwest 1/4, thence North 200 feet, thence West to point 200 feet, north of beginning and South 200 feet to beginning.

ALSO LESS

Tract beginning 1,378.6 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 200.04 feet; thence North 1,984.4 feet; thence West 1,067.05 feet; thence North 200.01 feet; thence East 1,266.80 feet; thence South 2,185 feet to beginning.

ALSO LESS

Tract beginning 1,578.64 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 254.37 feet; thence North 1,216 feet; thence West 815.44 feet; thence North 774.55 feet; thence East 1,067.05 feet; thence South 1,984.4 feet to beginning.

ALSO LESS

Right of way for State Road 672.

ALSO LESS

Less lands taken by Tampa Electric Company in Case Number 79-13223, in the Circuit Court in and for Hillsborough County, Florida.

ALSO LESS

Land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

PARCEL 101.3

A tract beginning 1,578.64 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 254.37 feet; thence North 1,216 feet; thence West 815.44 feet; thence North 774.55 feet; thence East 1,067.05 feet; thence South 1,984.4 feet to beginning.

LESS

Right-of-way for State Road 672.

ALSO LESS

Lands taken by Division of Administration, State of Florida, Department of Transportation in Case Number 78-15387, in the Circuit Court of Hillsborough County, Florida.

69639.01

EXHIBIT "B"

PARCELS SHOWN FOR INFORMATIONAL PURPOSES. NOT INTENDED FOR ACQUISITION

PARCEL 103.1

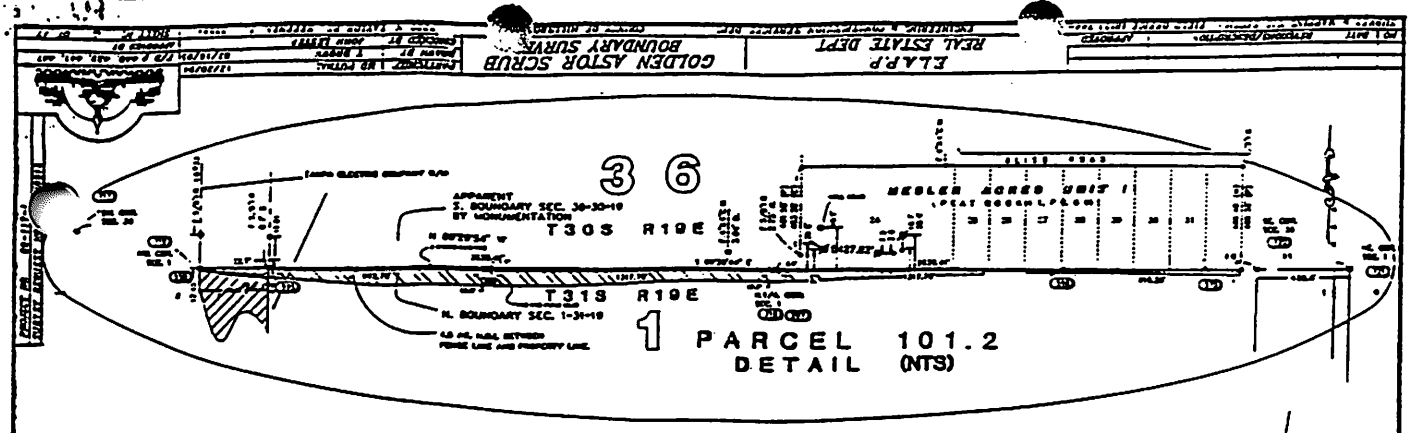
The West 100.00 feet of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida, AND the East 225 feet of the West 325 feet of the West one-half of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida.

PARCEL 103.2

A strip of land 200 feet wide, lying in the West half of the Southeast quarter of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, described as follows: Commence at the Southeast corner of said Section 12; thence West (assumed), along the South line of said Section 12, a distance of 1378.60 feet; thence N 01°27'48" W, a distance of 31.61 feet to a point at the intersection of the North right-of-way boundary of the 50-foot right-of-way of Big Bend Road, with the West right-of-way boundary of the 100-foot right-of-way of the East Bay Road and Point of Beginning; thence S 89°42'07" W, along the North right-of-way line of said Big Bend Road, a distance of 200.04 feet; thence N 01°27'48" W, 200 feet West of and parallel to the West right-of-way boundary of said East Bay Road and its Northerly projection, a distance of 1984.40 feet, to an intersection with the South boundary of the North half of the Northwest quarter of the Southeast quarter of said Section 12, thence S 89°32'09" W, along said South boundary of the North half of the Northwest quarter of the Southeast quarter, a distance of 1067.08, to an intersection with the North and South quarter line of said Section 12; thence N 01°22'46" W, along said North and South quarter line, a distance of 200.01 feet; thence N 89°32'09" E, a distance of 1266.82 feet; thence S 01°27'48" E, along the West right-of-way boundary of East Bay Road and its Northerly projection, a distance or 2185.00 feet, to the Point of Beginning.

LESS

Land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-11223, in the Circuit Court in and for Hillsborough County, Florida.



GOLDEN ASTOR SCRUB

SECTIONS 1, 2, AND 12, TOWNSHIP 31 SOUTH, RANGE 19 EAST,
HILLSBOROUGH COUNTY, FLORIDA

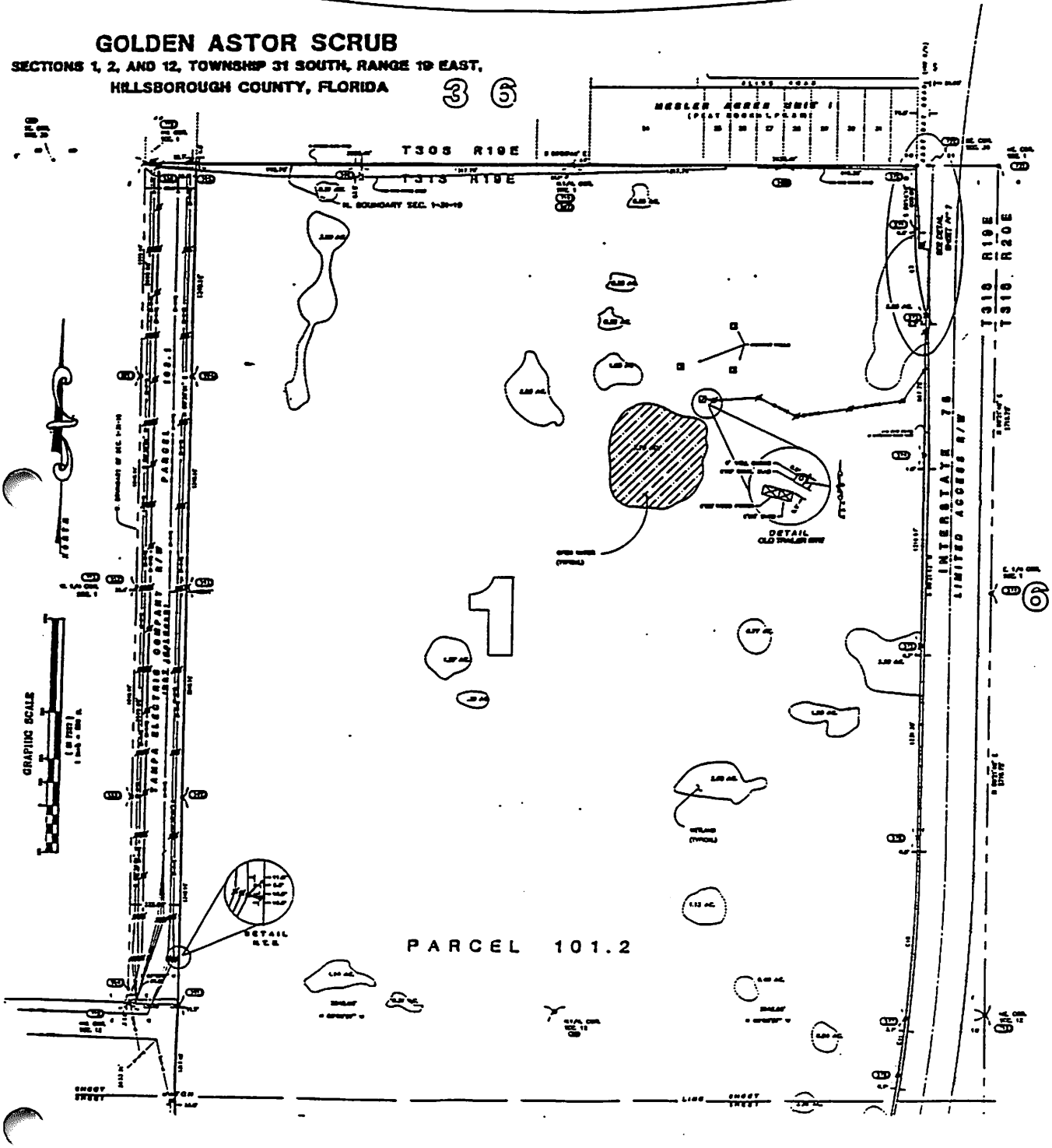


EXHIBIT C

AFFIDAVIT

STATE OF FLORIDA

COUNTY OF HILLSBOROUGH

BEFORE ME, the undersigned authority, personally appeared **JOHN LESTER,** hereinafter referred to as "Affiant," who, being by me first duly sworn, on oath, says that:

1. Affiant is a Registered Land Surveyor licensed by the State of Florida and holding Registered Land Surveyor Florida Certificate Number 3861.

2. Affiant is employed by Hillsborough County, Florida, as a surveyor in Hillsborough County's Surveying Department.

3. Affiant prepared a boundary survey dated February 16, 1995, and sealed and certified March 2, 1995, for the property known as the Golden Aster Scrub and located in Hillsborough County, Florida ("Survey").

4. The Survey reflects on Page 6 of 18 of the Survey, certain hog fences and five (5) strand barbed wire fences, located on the northerly boundary of Parcel 101.2, as denoted on the Survey (collectively, "Fences"). Parcel 101.2 is legally described in Exhibit "A" attached hereto and made a part hereof ("Property").

5. Affiant is familiar with the location of the Fences on the Property, and Affiant hereby states that the Fences are interior to the Property, and said Fences represent interior improvements to the Property.

John Lester

Address: 7220 N. Taylor Road
Seffner, Florida 33584

The foregoing instrument was acknowledged before me this 26TH day of MAY, 1995, by **JOHN LESTER**, who [is personally known to me] OR [has produced FL L236-460-40-091-0 as identification], and did take an oath.

Holly H. Pardi

Print Name: HOLLY H. PARDI

My Commission Expires:

OFFICIAL NOTARY SEAL
HOLLY H PARDI
NOTARY PUBLIC STATE OF FLORI
COMMISSION NO. CC365214
MY COMMISSION EXP. MAY 16,19

Exhibit "A" - Legal Description for Parcel 101.2

32896.872325;CLG;05/22/95 11:51 AM (d-1)
67002.04

EXHIBIT "A"

PARCEL 101.2

The part of the East 1/2 of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida, lying West of East Bay Road, and lying West of land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

AND

The West 1/2 of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida, LESS the West 325.0 feet, thereof.

AND

All that part of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying West of land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

LESS

The South 1,216 feet of the West 816 feet of the Southeast 1/4 of said Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Portion deeded to State Road Department for State Road 672.

ALSO LESS

The South 3/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 325 feet of the Northwest 1/4 of the Northwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 300 feet of the Southwest 1/4 of the Northwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 300 feet of the North 1/2 of the Northwest 1/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract beginning 300 feet East of the Southwest corner of the North 1/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East to the East boundary of the Southwest 1/4, thence North 200 feet, thence West to point 200 feet, north of beginning and South 200 feet to beginning.

ALSO LESS

Tract beginning 1,378.6 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 200.04 feet; thence North 1,984.4 feet; thence West 1,067.05 feet; thence North 200.01 feet; thence East 1,266.80 feet; thence South 2,185 feet to beginning.

ALSO LESS

Tract beginning 1,578.64 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 254.37 feet; thence North 1,216 feet; thence West 815.44 feet; thence North 774.55 feet; thence East 1,067.05 feet; thence South 1,984.4 feet to beginning.

ALSO LESS

Right of way for State Road 672.

ALSO LESS

Less lands taken by Tampa Electric Company in Case Number 79-13223, in the Circuit Court in and for Hillsborough County, Florida.

ALSO LESS

Land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

AFFIDAVIT

STATE OF FLORIDA

COUNTY OF HILLSBOROUGH

BEFORE ME, the undersigned authority, personally appeared **EMIL C. MARQUARDT, JR.**, hereinafter referred to as "Affiant," who, being by me first duly sworn, on oath, says:

1. Affiant, as Trustee under the provisions of the Land Trust Agreement dated December 10, 1990, owns parcels of land located in Sections 1, 2, and 12, Township 31, Range 19, Hillsborough County, Florida (collectively, "Property"), which parcels are more particularly described in Exhibit "A" attached hereto and made a part hereof.

2. John Lester prepared a boundary survey dated February 16, 1995, and sealed and certified March 2, 1995, for the Property ("Survey").

3. Affiant is familiar with the Survey. The Survey reflects on Page 6 of 18 of the Survey, certain hog fences and five (5) strand barbed wire fences, located on the northerly boundary of Parcel 101.2 ("Parcel 101.2"), as denoted on the Survey (collectively, "Fences").

4. Based upon the Survey, it appears the location of the Fences on Parcel 101.2 are interior to Parcel 101.2, and said Fences represent interior improvements to Parcel 101.2.

Emil C. Marquardt, Jr.

Address: P. O. Box 1669
Clearwater, Florida 34617

The foregoing instrument was acknowledged before me this 26 day of April, 1995, by **EMIL C. MARQUARDT, JR.**, who [is personally known to me] ~~OR [has produced _____ as identification]~~, and ~~did~~ take an oath.

Barbara Savery

Print Name: BARBARA SAVERY

My Commission Expires: 2/6/96

BARBARA SAVERY
MY COMMISSION # CC 178439
EXPIRES: February 6, 1996
Bonded Thru Notary Public Underwriters

Exhibit "A" - Legal Description for all Property
32896.872325;CLG;05/22/95 1:27 PM (d-1)
67002.05

EXHIBIT "A"

PARCEL 101.1

All that part of the East 1/2 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida. Lying East of the railroad right-of-way.

LESS

The North 20 feet of the East 650 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 10 feet of the East 560 feet of the South 35 feet of the North 55 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract beginning at the Southwest corner of the Southeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East 2,615.63 feet to the Southeast corner of Section 2, Township 31 South, Range 19 East, thence North 99.25 feet and Westerly to beginning.

PARCEL 101.2

The part of the East 1/2 of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida, lying West of East Bay Road, and lying West of land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

AND

The West 1/2 of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida, LESS the West 325.0 feet, thereof.

AND

All that part of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying West of land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

LESS

The South 1,216 feet of the West 816 feet of the Southeast 1/4 of said Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Portion deeded to State Road Department for State Road 672.

ALSO LESS

The South 3/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 325 feet of the Northwest 1/4 of the Northwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 300 feet of the Southwest 1/4 of the Northwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 300 feet of the North 1/2 of the Northwest 1/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract beginning 300 feet East of the Southwest corner of the North 1/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East to the East boundary of the Southwest 1/4, thence North 200 feet, thence West to point 200 feet, north of beginning and South 200 feet to beginning.

ALSO LESS

Tract beginning 1,378.6 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 200.04 feet; thence North 1,984.4 feet; thence West 1,067.05 feet; thence North 200.01 feet; thence East 1,266.80 feet; thence South 2,185 feet to beginning.

ALSO LESS

Tract beginning 1,578.64 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 254.37 feet; thence North 1,216 feet; thence West 815.44 feet; thence North 774.55 feet; thence East 1,067.05 feet; thence South 1,984.4 feet to beginning.

ALSO LESS

Right of way for State Road 672.

ALSO LESS

Less lands taken by Tampa Electric Company in Case Number 79-13223, in the Circuit Court in and for Hillsborough County, Florida.

ALSO LESS

Land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

PARCEL 101.3

A tract beginning 1,578.64 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 254.37 feet; thence North 1,216 feet; thence West 815.44 feet; thence North 774.55 feet; thence East 1,067.05 feet; thence South 1,984.4 feet to beginning.

LESS

Right-of-way for State Road 672.

ALSO LESS

Lands taken by Division of Administration, State of Florida, Department of Transportation in Case Number 78-15387, in the Circuit Court of Hillsborough County, Florida.

ACQUISITIONS OF CONVENIENCE BY HILLSBOROUGH COUNTY

PARCEL 102.1

That part of Section 1 and the East 1/2 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying Westerly of East Bay Road and lying East of land taken by Division of Administration, State of Florida, Department of Transportation in case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

More particularly described as follows:

Commence at the Southeast corner of Section 12, Township 31 South, Range 19 East, said corner being the same as shown on Florida Department of Transportation Right-of-Way Maps for Interstate 75 (State Road 93-A, Section 10075-2404 dated 10/18/77); thence N.00°16'28"E. 2659.80 feet along the East boundary of the Southeast one quarter of said Section 12 to the Northeast corner of said Southeast one quarter; thence N.89°38'36"W. 75.00 feet to the Westerly Right-of-Way line of Bullfrog Creek Road (formerly East Bay Road) and the Point of Beginning; thence along said Westerly Right-of-Way line Southwesterly 1202.38 feet along the arc of a curve to the right having a radius of 1357.47 feet, chord of 1163.46 feet and chord bearing of S.25°43'54"W.; thence continuing along said Westerly Right-of-Way line S.51°06'24"W. 340.65 feet to the beginning of a curve to the left; thence continuing along said Westerly Right-of-Way line Southwesterly 468.80 feet along the arc of said curve having a radius of 1507.47 feet, chord of 466.92 feet and chord bearing of S.42°11'51"W. to the Easterly Right-of-Way line of Interstate 75 (State Road 93-A); thence along said Easterly Right-of-Way line N.16°01'48"E. 2373.25 feet to the beginning of a curve to the left; thence continuing along said Easterly Right-of-Way line Northeasterly 3149.90 feet along the arc of said curve having a radius of 11632.67 feet, chord of 3140.28 feet and chord bearing of N.08°16'22"E.; thence S.89°29'04"E. 0.32 feet to said Westerly Right-of-Way line of Bullfrog Creek Road; thence along said Westerly Right-of-Way line S.00°21'39"W. 1119.70 feet; thence continuing along said Westerly Right-of-Way line S.00°21'24"W. 2661.06 feet to the Point of Beginning.

PARCEL 102.2

That part of Southeast 1/4, Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying Easterly of East Bay Road, LESS Right-of-ways for Big Bend Road (672 State Road), LESS the East 387.28 feet thereof.

ALSO LESS

Land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

More particularly described as follows:

Commence at the Southeast corner of Section 12, Township 31 South, Range 19 East, said corner being the same as shown on Florida Department of Transportation Right-of-Way Maps for Interstate 75 (State Road 93-A, Section 10075-2404 dated 10/18/77); thence N.88°53'31"W. 387.32 feet along the South boundary of the Southeast one quarter of said Section 12, said South boundary being the same as shown on said Right-of-Way Maps; thence N.00°16'28"E. 47.18 feet along a line parallel with and 387.28 feet Westerly of the East boundary of the Southeast quarter of said Section 12 to the Northerly Right-of-Way line of Big Bend Road (County Road 672, formerly State Road 672) and the Point of Beginning; thence along said Northerly Right-of-Way line the following courses,

N.88°47'40"W.	576.65 feet
N.88°30'40"W.	181.20 feet
N.84°41'49"W.	150.33 feet

to the intersection of said Northerly Right-of-Way line with the Easterly Right-of-Way line of Bullfrog Creek Road (formerly East Bay Road); thence along said Easterly Right-of-Way line N.00°21'24"E. 46.39 feet; thence continuing along said Right-of-Way line N.16°01'48"E. 726.47 feet to the beginning of a curve to the right; thence continuing Northeasterly along said Right-of-Way line 571.72 feet along the arc of said curve having a radius of 946.41 feet, chord of 563.06 feet and chord bearing of N.33°20'09"E.; thence continuing along said Right-of-Way line N.48°43'59"E. 158.40 feet; thence continuing along said Right-of-Way line N.51°06'24"E. 206.08 feet to the beginning of a curve to the left; thence continuing along said Right-of-Way line Northeasterly 169.15 feet along the arc of said curve having a radius of 1457.47 feet, chord of 169.06 feet and chord bearing of N.47°46'55"E. to a point on a line parallel with and 387.28 feet Westerly of the East boundary of the Southeast one quarter of said Section 12; thence S.00°16'28"W. 1593.26 feet to the Point of Beginning.

AFFIDAVIT

STATE OF FLORIDA

COUNTY OF HILLSBOROUGH

BEFORE ME, the undersigned authority, personally appeared **JOHN LESTER**, hereinafter referred to as "Affiant," who, being by me first duly sworn, on oath, says:

1. Affiant is a Registered Land Surveyor licensed by the State of Florida and holding Registered Land Surveyor Florida Certificate Number 3861.

2. Affiant is employed by Hillsborough County, Florida, as a surveyor in Hillsborough County's Surveying Department.

3. Affiant prepared a boundary survey dated February 16, 1995, and sealed and certified March 2, 1995, for the property known as the Golden Aster Scrub and located in Hillsborough County, Florida ("Survey").

4. A portion of the property shown on the Survey is described in Exhibit "A" ("Property"). The Property is located in Section 2, Township 31, Range 19, Hillsborough County, Florida, and is bordered on the west by a railroad right-of-way owned by CSX Railroad.

5. Based upon conversations Affiant had with Jerry Lemanski, a former tenant of the Property, Affiant was advised that a portion of the Property was previously owned by James Pichowski, and at some time during the past during James Pichowski's partial ownership of the Property, a barbed wire fence ("Fence") was erected along or near the boundary between the Property and the railroad's right-of-way by Jerry Lemanski and James Pichowski.

6. Based upon Affiant's Survey of the property, Affiant's knowledge of the location of the Fence, and Affiant's conversations with Jerry Lemanski, Affiant acknowledges and affirmatively states that the Fence is interior to the Property, and does not and was never intended to, denote the location of the ownership boundary between the Property and the railroad's right-of-way.

7. Affiant, to the best of his knowledge, and based upon his review of the Survey, does not know of any other fences being erected on the Property.

John Lester

Address: 7220 N Taylor Rd
Seffner FL 33584

The foregoing instrument was acknowledged before me this 26th day of MAY, 1995, by **JOHN LESTER**, who [is personally known to me] OR [has produced a FL L236-460-40-091-0 driver's license as identification], and did take an oath.

Holly H. Pardi

Print Name: HOLLY H. PARDI

My Commission Expires:

OFFICIAL NOTARY SEAL
HOLLY H PARDI
NOTARY PUBLIC STATE OF FLORIDA
COMMISSION NO. CC365214
MY COMMISSION EXP. MAY 16,1998

Exhibit "A" - Legal Description for Parcel 101.1
Exhibit "B" - Location of fence between Parcel 101.1 and Railroad's Right-of-Way

32696.872325;CLG;05/24/95 10:19 AM (d-1)
67002.06

EXHIBIT "A"

PARCEL 101.1

All that part of the East 1/2 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida. Lying East of the railroad right-of-way.

LESS

The North 20 feet of the East 650 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 10 feet of the East 560 feet of the South 35 feet of the North 55 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract beginning at the Southwest corner of the Southeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East 2,615.63 feet to the Southeast corner of Section 2, Township 31 South, Range 19 East, thence North 99.25 feet and Westerly to beginning.

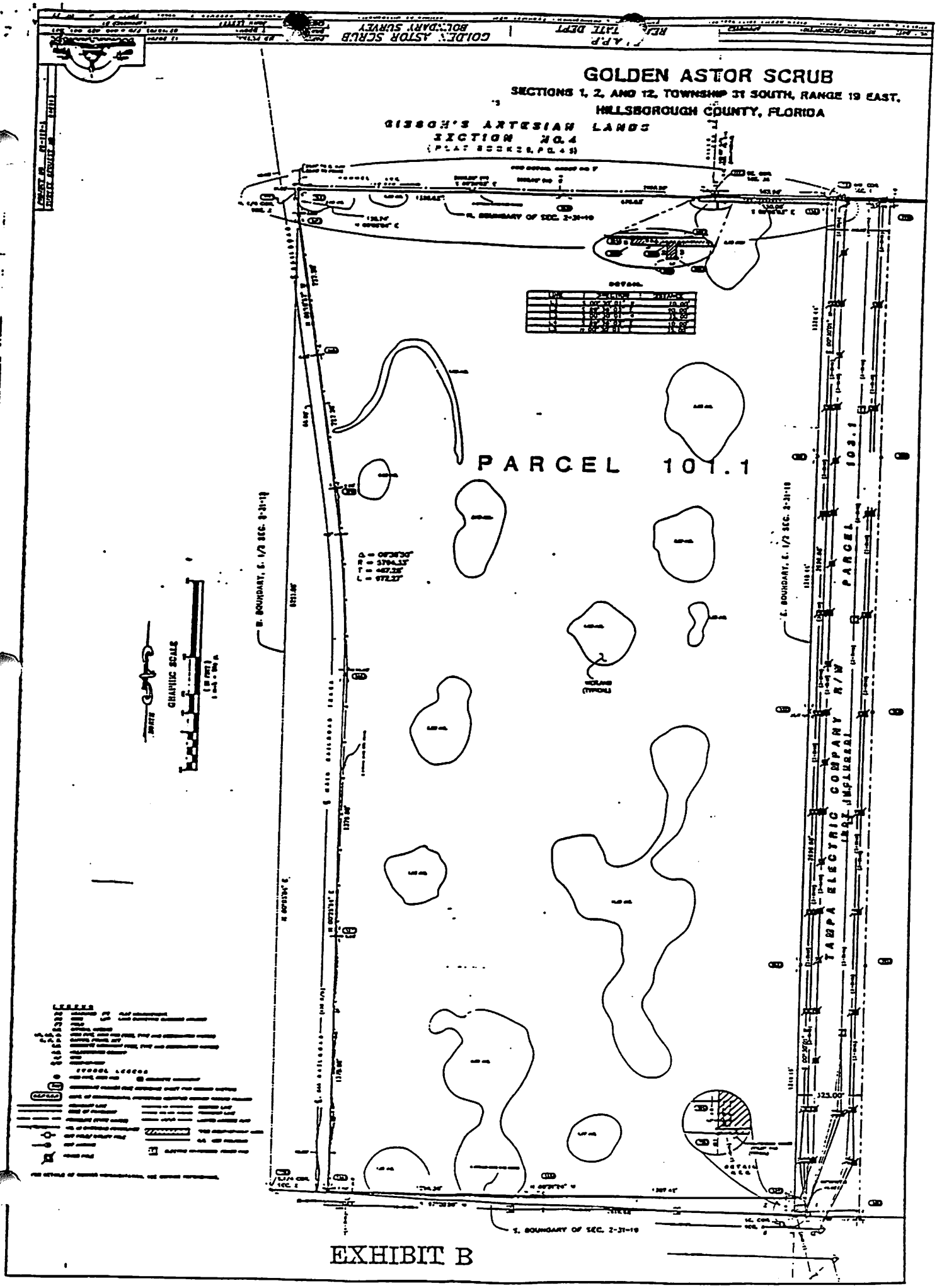

GOLDEN ASTOR SCRUB
SECTIONS 1, 2, AND 12, TOWNSHIP 31 SOUTH, RANGE 19 EAST,
HILLSBOROUGH COUNTY, FLORIDA
GIBSON'S ARTESIAN LANDS
SECTION NO. 4
PARCEL 101.1
PARCEL 103.1
TAMPA ELECTRIC COMPANY R/W
GRAPHIC SCALE
E. BOUNDARY, S. 1/2 SEC. 2-31-19
S. BOUNDARY OF SEC. 2-31-19

EXHIBIT B

AFFIDAVIT

STATE OF FLORIDA

COUNTY OF HILLSBOROUGH

BEFORE ME, the undersigned authority, personally appeared **JERRY LEMANSKI,** hereinafter referred to as "Affiant," who, being by me first duly sworn, on oath, says:

1. That Affiant leased the property described in Exhibit "A" ("Property") from the owner of the property, Emil C. Marquardt, as Trustee, for a number of years. The Property is located in Section 2, Township 31, Range 19, Hillsborough County, Florida. The Property is bordered on the west by a railroad right-of-way owned by CSX Railroad.

2. The Property was previously owned, in part, by James Pichowski.

3. At some time in the past during James Pichowski's partial ownership of the Property by James Pichowski, a barbed wire fence ("Fence") was erected along or near the boundary between the Property and the railroad's right-of-way, by Affiant and James Pichowski.

4. Affiant has reviewed the survey of the Property prepared by John Lester, Registered Land Surveyor, and certified and dated as of March 2, 1995 ("Survey").

5. Based upon Affiant's knowledge of the location of the Fence and his review of the Survey, Affiant acknowledges and affirmatively states that the Fence is interior to the Property, and does not and was never intended to, denote the location of the ownership boundary between the Property and the railroad's right-of-way.

6. Affiant, to the best of his knowledge, and based upon his review of the Survey, does not know of any other fences being erected on the Property.

Jerry Lemanski

Address: 11509 E. Bay Rd.
Gibsonton FLA 33534

The foregoing instrument was acknowledged before me this 31st day of May, 1995, by **JERRY LEMANSKi**, who [is personally known to me] OR [has produced a Florida driver's license as identification], and did take an oath.

Print Name: Anthony L. Haynes

My Commission Expires:

OFFICIAL NOTARY SEAL
ANTHONY L HAYNES
NOTARY PUBLIC STATE OF FLORIDA
COMMISSION NO. CC285088
MY COMMISSION EXP. JUNE 16,1997

Exhibit "A" - Legal Description for Parcel 101.1
Exhibit "B" - Location of fence between Parcel 101.1 and Railroad's Right-of-Way

32896.872325;CLG;05/19/95 1:46 PM (d-1)
67002.03

EXHIBIT "A"

PARCEL 101.1

All that part of the East 1/2 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida. Lying East of the railroad right-of-way.

LESS

The North 20 feet of the East 650 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 10 feet of the East 560 feet of the South 35 feet of the North 55 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract beginning at the Southwest corner of the Southeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East 2,615.63 feet to the Southeast corner of Section 2, Township 31 South, Range 19 East, thence North 99.25 feet and Westerly to beginning.

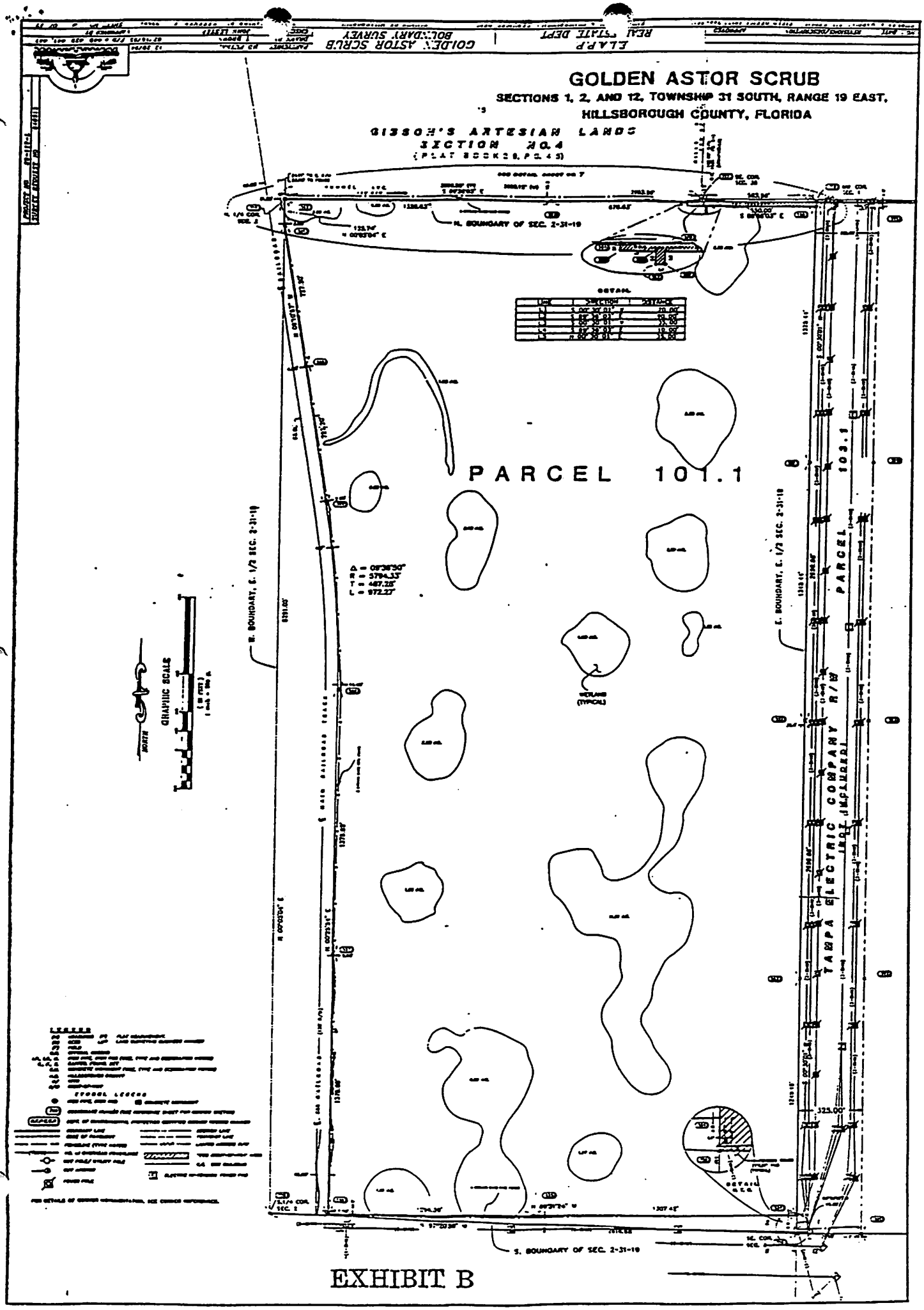

GOLDEN ASTOR SCRUB
SECTIONS 1, 2, AND 12, TOWNSHIP 31 SOUTH, RANGE 19 EAST,
HILLSBOROUGH COUNTY, FLORIDA
GIBSON'S ARTESIAN LANDS
SECTION NO. 4
PARCEL 101.1
PARCEL 103.1
TAMPA ELECTRIC COMPANY R/W
N. BOUNDARY OF SEC. 2-31-19
S. BOUNDARY OF SEC. 2-31-19
E. BOUNDARY, E 1/2 SEC. 2-31-19
W. BOUNDARY, E 1/2 SEC. 2-31-19
GRAPHIC SCALE
325.00'

EXHIBIT B

AFFIDAVIT

STATE OF FLORIDA)

COUNTY OF PINELLAS)

BEFORE ME, the undersigned authority duly authorized to administer oaths and take acknowledgments, personally appeared **GARY SALING**, who, being first duly sworn, deposes and says that, in the operation of the property described on Exhibit "A" attached hereto and incorporated herein ("Property"), the owner of the Property, where applicable, complied in all respects with the sales tax law, and shall submit in a timely fashion all filings not currently due.

Gary Saling

Gary Saling

The foregoing instrument was acknowledged before me this 24th day of May, 1995, by **GARY SALING.** He [is personally known to me] OR [has produced a Florida driver's license as identification] and did take an oath.

Diane L. Ewell

Notary Public

Print name: Diane L. Ewell

My commission expires: 3-29-96

DIANE L. EWELL
MY COMMISSION # CC 183634
EXPIRES: March 29, 1998
Bonded Thru Notary Public Underwriters

Exhibit "A" - Legal Description of Property

05/17/95 2:56 PM D-2
32896.87225
#0070186.01

EXHIBIT "A"

All Property above the ordinary high water line within the following:

PARCEL 101.1

All that part of the East 1/2 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida. Lying East of the railroad right-of-way.

LESS

The North 20 feet of the East 650 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 10 feet of the East 560 feet of the South 35 feet of the North 55 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract beginning at the Southwest corner of the Southeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East 2,615.63 feet to the Southeast corner of Section 2, Township 31 South, Range 19 East, thence North 99.25 feet and Westerly to beginning.

PARCEL 101.2

The part of the East 1/2 of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida, lying West of East Bay Road, and lying West of land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

AND

The West 1/2 of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida, LESS the West 325.0 feet, thereof.

AND

All that part of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying West of land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

LESS

The South 1,216 feet of the West 816 feet of the Southeast 1/4 of said Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Portion deeded to State Road Department for State Road 672.

ALSO LESS

The South 3/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 325 feet of the Northwest 1/4 of the Northwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 300 feet of the Southwest 1/4 of the Northwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 300 feet of the North 1/2 of the Northwest 1/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract beginning 300 feet East of the Southwest corner of the North 1/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East to the East boundary of the Southwest 1/4, thence North 200 feet, thence West to point 200 feet, north of beginning and South 200 feet to beginning.

ALSO LESS

Tract beginning 1,378.6 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 200.04 feet; thence North 1,984.4 feet; thence West 1,067.05 feet; thence North 200.01 feet; thence East 1,266.80 feet; thence South 2,185 feet to beginning.

ALSO LESS

Tract beginning 1,578.64 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 254.37 feet; thence North 1,216 feet; thence West 815.44 feet; thence North 774.55 feet; thence East 1,067.05 feet; thence South 1,984.4 feet to beginning.

ALSO LESS

Right of way for State Road 672.

ALSO LESS

Less lands taken by Tampa Electric Company in Case Number 79-13223, in the Circuit Court in and for Hillsborough County, Florida.

ALSO LESS

Land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

PARCEL 101.3

A tract beginning 1,578.64 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 254.37 feet; thence North 1,216 feet; thence West 815.44 feet; thence North 774.55 feet; thence East 1,067.05 feet; thence South 1,984.4 feet to beginning.

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That part of Section 1 and the East 1/2 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying Westerly of East Bay Road and lying East of land taken by Division of Administration, State of Florida, Department of Transportation in case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

More particularly described as follows:

Commence at the Southeast corner of Section 12, Township 31 South, Range 19 East, said corner being the same as shown on Florida Department of Transportation Right-of-Way Maps for Interstate 75 (State Road 93-A, Section 10075-2404 dated 10/18/77); thence N.00°16'28"E. 2659.80 feet along the East boundary of the Southeast one quarter of said Section 12 to the Northeast corner of said Southeast one quarter; thence N.89°38'36"W. 75.00 feet to the Westerly Right-of-Way line of Bullfrog Creek Road (formerly East Bay Road) and the Point of Beginning; thence along said Westerly Right-of-Way line Southwesterly 1202.38 feet along the arc of a curve to the right having a radius of 1357.47 feet, chord of 1163.46 feet and chord bearing of S.25°43'54"W.; thence continuing along said Westerly Right-of-Way line S.51°06'24"W. 340.65 feet to the beginning of a curve to the left; thence continuing along said Westerly Right-of-Way line Southwesterly 468.80 feet along the arc of said curve having a radius of 1507.47 feet, chord of 466.92 feet and chord bearing of S.42°11'51"W. to the Easterly Right-of-Way line of Interstate 75 (State Road 93-A); thence along said Easterly Right-of-Way line N.16°01'48"E. 2373.25 feet to the beginning of a curve to the left; thence continuing along said Easterly Right-of-Way line Northeasterly 3149.90 feet along the arc of said curve having a radius of 11632.67 feet, chord of 3140.28 feet and chord bearing of N.08°16'22"E.; thence S.89°29'04"E. 0.32 feet to said Westerly Right-of-Way line of Bullfrog Creek Road; thence along said Westerly Right-of-Way line S.00°21'39"W. 1119.70 feet; thence continuing along said Westerly Right-of-Way line S.00°21'24"W. 2661.06 feet to the Point of Beginning.

PARCEL 102.2

That part of Southeast 1/4, Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying Easterly of East Bay Road, LESS Right-of-ways for Big Bend Road (672 State Road), LESS the East 387.28 feet thereof.

ALSO LESS

Land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

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Commence at the Southeast corner of Section 12, Township 31 South, Range 19 East, said corner being the same as shown on Florida Department of Transportation Right-of-Way Maps for Interstate 75 (State Road 93-A, Section 10075-2404 dated 10/18/77); thence N.88°53'31"W. 387.32 feet along the South boundary of the Southeast one quarter of said Section 12, said South boundary being the same as shown on said Right-of-Way Maps; thence N.00°16'28"E. 47.18 feet along a line parallel with and 387.28 feet Westerly of the East boundary of the Southeast quarter of said Section 12 to the Northerly Right-of-Way line of Big Bend Road (County Road 672, formerly State Road 672) and the Point of Beginning; thence along said Northerly Right-of-Way line the following courses,

N.88°47'40"W.	576.65 feet
N.88°30'40"W.	181.20 feet
N.84°41'49"W.	150.33 feet

to the intersection of said Northerly Right-of-Way line with the Easterly Right-of-Way line of Bullfrog Creek Road (formerly East Bay Road); thence along said Easterly Right-of-Way line N.00°21'24"E. 46.39 feet; thence continuing along said Right-of-Way line N.16°01'48"E. 726.47 feet to the beginning of a curve to the right; thence continuing Northeasterly along said Right-of-Way line 571.72 feet along the arc of said curve having a radius of 946.41 feet, chord of 563.06 feet and chord bearing of N.33°20'09"E.; thence continuing along said Right-of-Way line N.48°43'59"E. 158.40 feet; thence continuing along said Right-of-Way line N.51°06'24"E. 206.08 feet to the beginning of a curve to the left; thence continuing along said Right-of-Way line Northeasterly 169.15 feet along the arc of said curve having a radius of 1457.47 feet, chord of 169.06 feet and chord bearing of N.47°46'55"E. to a point on a line parallel with and 387.28 feet Westerly of the East boundary of the Southeast one quarter of said Section 12; thence S.00°16'28"W. 1593.26 feet to the Point of Beginning.

AFFIDAVIT

STATE OF FLORIDA)

COUNTY OF PINELLAS)

BEFORE ME, the undersigned authority duly authorized to administer oaths and take acknowledgments, personally appeared **DANIEL E. ALDRIDGE** , who, being first duly sworn, deposes and says that:

1. There has been no labor performed on or materials furnished to the property described on Exhibit "A" attached hereto and incorporated herein ("Property") within the past ninety (90) days for which payment in full has not been made or for which valid liens could be filed; there are no claims whatsoever of any kind or description against the Property for which liens could be filed according to the statutes in such cases made and provided; and no informal notice of claim has been received by the undersigned or the owner of the Property, including without limitation unrecorded labor, construction or materialmen's liens against the Property.

2. The undersigned hereby warrants that neither the undersigned nor the owner of the Property have received any notice of any public hearing regarding pending or future assessments for improvements by any governmental agency and there are no unpaid or pending bills, assessments or liens against the Property for sanitary sewers, paving, utility installation, service or other improvements made by any public utility or governmental agency, whether or not such assessments appear of record.

3. The undersigned knows of no violations of municipal or county ordinances, or any easements or claims of easements for uses or adverse interests not shown by the public records, pertaining to the Property including without limitation any unrecorded easements or rights-of-way created through use or adverse interest with respect to the Property. The undersigned knows of no violations or breaches of any covenants, conditions or restrictions applicable to the Property, including without limitation, building setback violations and use restrictions violations.

Daniel E. Aldridge

The foregoing instrument was acknowledged before me this 24th day of May, 1995, by **DANIEL E. ALDRIDGE**. He [is personally known to me] OR [has produced a Florida driver's license as identification] and did take an oath.

Diane L. Ewell
Notary Public
Print name: Diane L. Ewell

My commission expires: 3-29-96

DIANE L. EWELL
MY COMMISSION # CC 183634
EXPIRES: March 29, 1996
Bonded Thru Notary Public Underwriters

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ALSO LESS

The West 10 feet of the East 560 feet of the South 35 feet of the North 55 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

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AFFIDAVIT OF NO LIENS

STATE OF FLORIDA)

COUNTY OF PINELLAS)

BEFORE ME, the undersigned authority duly authorized to administer oaths and take acknowledgments, personally appeared **EMIL C. MARQUARDT, JR., AS TRUSTEE UNDER THE PROVISIONS OF THE LAND TRUST AGREEMENT DATED DECEMBER 10, 1990** ("Land Trust"), who, being first duly sworn, deposes and says that:

1. He is the Trustee of a Land Trust Agreement dated December 10, 1990.

2. The Land Trust is the owner of the real property located in Hillsborough County, Florida, as is more particularly described on Exhibit "A" attached hereto and incorporated herein ("Property"). The Property is now in possession of the Land Trust, and there is no other person or entity in possession of the Property or who has any rights or tenancies to the Property.

3. No Notice of Commencement affecting the Property has been executed, recorded or posted by the undersigned, on behalf of the Land Trust.

4. The Property is free and clear of all liens, taxes, encumbrances, and claims of every kind, nature, and description whatsoever except for real and personal property taxes for the year 1995, which are not yet due and payable, and matters shown on Title Insurance Commitment No. CA-100969 issued by OLD REPUBLIC NATIONAL TITLE INSURANCE COMPANY, through its agent JOHNSON, BLAKELY, POPE, BOKOR, RUPPEL & BURNS, P.A. (collectively, "Title Company").

5. ——The undersigned, on behalf of the Land Trust, knows of no state or federal judgment or lien of any kind or nature whatever against the Property.

6. Based upon the attached statement of Daniel E. Aldridge, it is my understanding that there has been no labor performed on or materials furnished to the Property within the past ninety (90) days for which payment in full has not been made or for which valid liens could be filed; there are no claims whatsoever of any kind or description against the Property for which liens could be filed according to the statutes in such cases made and provided; and no informal notice of claim has been received by the undersigned, including without limitation unrecorded labor, construction or materialmen's liens against the Property.

7. Based upon the attached statement of Daniel E. Aldridge, the undersigned, on behalf of the Land Trust, hereby warrants that neither the undersigned, on behalf of the Land Trust, nor the Land Trust have received any notice of any public hearing regarding pending or future assessments for improvements by any governmental agency and there are no unpaid or pending bills, assessments or liens against the Property for sanitary sewers, paving, utility installation, service or other improvements made by any public utility or governmental agency, whether or not such assessments appear of record.

8. Based upon the attached statement of Daniel E. Aldridge, the undersigned, on behalf of the Land Trust, knows of no violations of municipal or county ordinances, or any easements or claims of easements for uses or adverse interests not shown by the public records, pertaining to the Property including without limitation any unrecorded easements or rights-of-way created through use or adverse interest with respect to the Property. The undersigned, on behalf of the Land Trust, knows of no violations or breaches of any covenants, conditions or restrictions applicable to the Property, including without limitation, building setback violations and use restrictions violations.

9. Based upon the attached statement of Gary Saling, the undersigned, on behalf of the Land Trust, has, in the operation of the Property, where applicable, complied in all respects with the sales tax law, and shall submit in a timely fashion all filings not currently due.

10. The undersigned, on behalf of the Land Trust, warrants that there are no estate tax, inheritance tax, or income tax liens, under federal or state laws, against the Property, or against the undersigned, on behalf of the Land Trust, or against the Land Trust, which would affect the Property.

11. There is no outstanding unrecorded agreement of sale, option, deed, agreement for deed, conveyance, mortgage, or lease affecting the title to the Property, other than the Contract for Purchase and Sale/Exchange between the Land Trust, and Hillsborough County, a political subdivision of the State of Florida ("Purchaser") incident to which this Affidavit is given.

12. The undersigned, on behalf of the Land Trust, as owner of the Property states the Land Trust is not a foreign corporation, foreign partnership, foreign trust, or foreign estate (as those terms are defined in the Internal Revenue Code and Income Tax Regulations), and the U.S. taxpayer identification number of said owner is: 65-00441-97.

13. This representation is made under oath for the purpose of inducing Purchaser to purchase, and the Title Company to insure title to the Property.

14. The undersigned, on behalf of the Land Trust, makes and delivers this Affidavit of No Liens fully realizing that the Title Company and Purchaser are relying hereon in order to close such purchase. This Affidavit of No Liens is made with full understanding of all laws appertaining to affidavits in Florida, and full faith and credit may be given hereto. The undersigned, on behalf of the Land Trust, further certifies that the undersigned, on behalf of the Land Trust, has read the complete text of this Affidavit and fully understands its contents.

15. All statements made herein shall, to the best of the knowledge and belief of the undersigned, on behalf of the Land Trust, be true and correct as of the date and time the deed is recorded. There are no matters pending against the undersigned, on behalf of the Land Trust, nor the Land Trust, that could give rise to a lien that would attach to the Property between the date hereof and such recordation. The undersigned, on behalf of the Land Trust, has not and will not commit, between the date hereof and the date and time of such recordation, any act that would cause the statements made herein to change or to become invalid, nor will the undersigned, on behalf of the Land Trust, execute any instrument that would adversely affect the title to the Property.

Emil C. Marquardt, Jr., ~~as Trustee~~

The foregoing instrument was acknowledged before me this 26 day of May, 1995, by **EMIL C. MARQUARDT, JR., as Trustee under the Provisions of the Land Trust Agreement dated December 10, 1990**, on behalf of the Land Trust. He [is personally known to me] OR ~~[has produced a Florida driver's license as identification]~~ and did take an oath.

BARBARA SAVERY
MY COMMISSION # CC 178439
EXPIRES: February 6, 1996
Bonded Thru Notary Public Underwriters

Notary Public
Print name: BARBARA SAVERY

My commission expires: 2/6/96

Exhibit "A" - Legal Description of Property

05/17/95 1:33 PM d-3
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EXHIBIT "A"

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ALSO LESS

Tract beginning 300 feet East of the Southwest corner of the North 1/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East to the East boundary of the Southwest 1/4, thence North 200 feet, thence West to point 200 feet, north of beginning and South 200 feet to beginning.

ALSO LESS

Tract beginning 1,378.6 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 200.04 feet; thence North 1,984.4 feet; thence West 1,067.05 feet; thence North 200.01 feet; thence East 1,266.80 feet; thence South 2,185 feet to beginning.

ALSO LESS

Tract beginning 1,578.64 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 254.37 feet; thence North 1,216 feet; thence West 815.44 feet; thence North 774.55 feet; thence East 1,067.05 feet; thence South 1,984.4 feet to beginning.

ALSO LESS

Right of way for State Road 672.

ALSO LESS

Less lands taken by Tampa Electric Company in Case Number 79-13223, in the Circuit Court in and for Hillsborough County, Florida.

ALSO LESS

Land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

PARCEL 101.3

A tract beginning 1,578.64 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 254.37 feet; thence North 1,216 feet; thence West 815.44 feet; thence North 774.55 feet; thence East 1,067.05 feet; thence South 1,984.4 feet to beginning.

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PARCEL 102.1

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PARCEL 102.2

That part of Southeast 1/4, Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying Easterly of East Bay Road, LESS Right-of-ways for Big Bend Road (672 State Road), LESS the East 387.28 feet thereof.

ALSO LESS

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N.88°47'40"W.	576.65 feet
N.88°30'40"W.	181.20 feet
N.84°41'49"W.	150.33 feet

to the intersection of said Northerly Right-of-Way line with the Easterly Right-of-Way line of Bullfrog Creek Road (formerly East Bay Road); thence along said Easterly Right-of-Way line N.00°21'24"E. 46.39 feet; thence continuing along said Right-of-Way line N.16°01'48"E. 726.47 feet to the beginning of a curve to the right; thence continuing Northeasterly along said Right-of-Way line 571.72 feet along the arc of said curve having a radius of 946.41 feet, chord of 563.06 feet and chord bearing of N.33°20'09"E.; thence continuing along said Right-of-Way line N.48°43'59"E. 158.40 feet; thence continuing along said Right-of-Way line N.51°06'24"E. 206.08 feet to the beginning of a curve to the left; thence continuing along said Right-of-Way line Northeasterly 169.15 feet along the arc of said curve having a radius of 1457.47 feet, chord of 169.06 feet and chord bearing of N.47°46'55"E. to a point on a line parallel with and 387.28 feet Westerly of the East boundary of the Southeast one quarter of said Section 12; thence S.00°16'28"W. 1593.26 feet to the Point of Beginning.

AFFIDAVIT

STATE OF FLORIDA)

COUNTY OF PINELLAS)

BEFORE ME, the undersigned authority duly authorized to administer oaths and take acknowledgments, personally appeared **GARY SALING**, who, being first duly sworn, deposes and says that, in the operation of the property described on Exhibit "A" attached hereto and incorporated herein ("Property"), the owner of the Property, where applicable, complied in all respects with the sales tax law, and shall submit in a timely fashion all filings not currently due.

Gary Saling

Gary Saling

The foregoing instrument was acknowledged before me this 24th day of May, 1995, by **GARY SALING.** He [is personally known to me] OR [has produced a Florida driver's license as identification] and did take an oath.

Diane L. Ewell

Notary Public

Print name: Diane L. Ewell

My commission expires: 3-29-96

DIANE L. EWELL
MY COMMISSION # CC 183634
EXPIRES: March 29, 1998
Bonded Thru Notary Public Underwriters

Exhibit "A" - Legal Description of Property

05/17/95 2:56 PM D-2
32896.87225
#0070186.01

EXHIBIT "A"

All Property above the ordinary high water line within the following:

PARCEL 101.1

All that part of the East 1/2 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida. Lying East of the railroad right-of-way.

LESS

The North 20 feet of the East 650 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 10 feet of the East 560 feet of the South 35 feet of the North 55 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract beginning at the Southwest corner of the Southeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East 2,615.63 feet to the Southeast corner of Section 2, Township 31 South, Range 19 East, thence North 99.25 feet and Westerly to beginning.

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AND

The West 1/2 of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida, LESS the West 325.0 feet, thereof.

AND

All that part of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying West of land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

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The South 1,216 feet of the West 816 feet of the Southeast 1/4 of said Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Portion deeded to State Road Department for State Road 672.

ALSO LESS

The South 3/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

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AFFIDAVIT

STATE OF FLORIDA)

COUNTY OF PINELLAS)

BEFORE ME, the undersigned authority duly authorized to administer oaths and take acknowledgments, personally appeared **DANIEL E. ALDRIDGE** , who, being first duly sworn, deposes and says that:

1. There has been no labor performed on or materials furnished to the property described on Exhibit "A" attached hereto and incorporated herein ("Property") within the past ninety (90) days for which payment in full has not been made or for which valid liens could be filed; there are no claims whatsoever of any kind or description against the Property for which liens could be filed according to the statutes in such cases made and provided; and no informal notice of claim has been received by the undersigned or the owner of the Property, including without limitation unrecorded labor, construction or materialmen's liens against the Property.

2. The undersigned hereby warrants that neither the undersigned nor the owner of the Property have received any notice of any public hearing regarding pending or future assessments for improvements by any governmental agency and there are no unpaid or pending bills, assessments or liens against the Property for sanitary sewers, paving, utility installation, service or other improvements made by any public utility or governmental agency, whether or not such assessments appear of record.

3. The undersigned knows of no violations of municipal or county ordinances, or any easements or claims of easements for uses or adverse interests not shown by the public records, pertaining to the Property including without limitation any unrecorded easements or rights-of-way created through use or adverse interest with respect to the Property. The undersigned knows of no violations or breaches of any covenants, conditions or restrictions applicable to the Property, including without limitation, building setback violations and use restrictions violations.

Daniel E. Aldridge

The foregoing instrument was acknowledged before me this 24th day of May, 1995, by **DANIEL E. ALDRIDGE**. He [is personally known to me] OR [has produced a Florida driver's license as identification] and did take an oath.

Diane L. Ewell
Notary Public
Print name: Diane L. Ewell

My commission expires: 3-29-96

DIANE L. EWELL
MY COMMISSION # CC 183634
EXPIRES: March 29, 1996
Bonded Thru Notary Public Underwriters

Exhibit "A" - Legal Description of Property

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HILLSBOROUGH COUNTY PARKS, RECREATION AND CONSERVATION DEPARTMENT
RESIDENT SITE SECURITY AGREEMENT

THIS AGREEMENT is made and entered into this 15 day of JULY, 2005 by and between HILLSBOROUGH COUNTY, a political subdivision of the State of Florida, hereinafter referred to as the "COUNTY"; and Eric Hornsby, the Security Resident at Golden Aster Scrub Preserve, hereinafter referred to as the " Resident " .

WITNESSETH

WHEREAS, the COUNTY desires the physical presence of the RESIDENT at the aforesaid Preserve for the sake of security; and

WHEREAS, the RESIDENT is willing to occupy a trailer site provided by the COUNTY at the aforesaid Preserve under the terms provided herein below;

NOW, THEREFORE, in consideration of the mutual covenants and provisions contained herein, the Parties hereto agree as follows:

A. The COUNTY shall provide for the RESIDENT:

1. An adequate space to park a trailer for residential purposes;

2. Safe, potable drinking water;

3. The disposal of liquid and solid waste;

4. Electrical power;

5. A reasonable yard for RESIDENT"S private use, the boundaries of which will be designated by the COUNTY, with fence if deemed necessary and contingent upon funds being available.

B. The RESIDENT shall:

1. Provide a trailer of adequate size for residence, but limited to be compatible with the area, and will provide to the COUNTY, prior to moving on site, a print of the home showing layouts, electric panel inlet, potable water inlet, and sewer drop out.

2. Notify the Conservation Services Office and submit a written notice prior to a period of absence of more than three days from the residence due to vacation, sick leave, or other reasons;

3. Conduct routine patrols of the Preserve on a frequent basis to check for illegal activities such as off-road vehicle use, dumping, poaching, etc. Specific duties for Golden Aster Scrub Preserve are described in Golden Aster Scrub Preserve Security Resident Duties attached as Exhibit "A";

4. Assist in the enforcement of applicable rules, regulations, and ordinances by posting and maintaining signs and boundary markers, by advising visitors to the Preserve of same, and by reporting violations as detailed below in section 8,5. Under no circumstances shall RESIDENT subject self to personal risk by deliberate involvement in confrontational situations with violators.

Preserves are normally open to the public for foot traffic during daylight hours. Exceptions may be granted by the Conservation Services Office of the Parks, Recreation and Conservation Department. RESIDENT shall be notified of all persons with vehicular or after hours access to the Preserve.

5. Report any incidents to the COUNTY in a timely manner. Emergencies shall be reported immediately in the following sequence:

   - During normal working hours Monday – Friday 8AM to 5PM:

     1. Contact the Sheriff's Office, 911

     2. Call the Conservation Services Office – (813) 672-7876 or Call the Administrative Office - (813) 975-2160

   - After hours:

     1. Forest Turbiville – (813) 991-9109 or Cell phone (813) 393-7741 or

     2. Peter Fowler – (813) 961-5497

   Following any emergency, a written report must be submitted to the COUNTY with Case number, if applicable, to the following address:

   Conservation Services Section
   Hillsborough County Parks, Recreation and Conservation Department
   10940 McMullen Road
   Riverview, FL 33569
   Attn: Forest Turbiville

6. Maintain the trailer exterior and outside areas adjacent to the trailer in a neat, clean, well kept manner. RESIDENT shall not plan, or allow to be planted, invasive non-vegetation in the yard or any other portion of the Preserve.

7. Obtain prior written approval from the COUNTY for any alteration to the exterior of the trailer; any such request must be accompanied by a written or drawn plan; all such alterations must meet all local codes and permitting requirements;

8. Obtain prior written approval from the COUNTY to permit guests of the RESIDENT (other than immediate family) to stay in the trailer for periods of more than thirty (30) days:

9. Obtain prior written approval from the COUNTY to permit out-buildings in the area of the trailer;

10. Be responsible for personal pets and domestic animals which shall not be a nuisance; under no circumstances shall dogs or cats be allowed to roam freely beyond the RESIDENT'S yard area;

C. During the term of this Agreement, the COUNTY will indemnify and hold the RESIDENT harmless from any and all liability, damages, claims or demands which may arise out of any condition of the premises within the control of the COUNTY to the extent provided by law.

During said term the RESIDENT will indemnify and hold the COUNTY harmless from any and all liability, damages, claims, or demands which may arise due to the RESIDENT'S negligent use of the said premises.

D. Occupancy of the aforesaid trailer site shall begin on or before October 1, 2005 and shall end upon termination of this Agreement as provided herein below.

E. This agreement may be terminated at will by either party hereto giving thirty (30) days prior written notice thereof to the other.

I, the undersigned, have read the aforementioned rules and regulations and agree to obey the Resident Site Security Agreement of the Hillsborough County Parks, Recreation and Conservation Department.

Eric Horvsberg
Resident

15-7-05
Date

Section Manager

7/15/05
Date

EXHIBIT "A"

GOLDEN ASTER SCRUB PRESERVE SECURITY RESIDENT DUTIES

The Preserve will be open to the public during daylight hours, seven days a week, for foot traffic. The area immediately adjacent to the security residence, designated as the Resident's yard, will be off limits to the public. Access for the public is provided via the designated public access point and parking area located at the dead end of East Bay Road, south of Symmes Road, at the northeast boundary of the site.

The Security Resident is required to keep a detailed log of all activities and occurrences at the Preserve site. Observations should include but not be limited to:

- wildlife sightings
- public use of the preserve (# of visitors, type of activity, etc.)
- public contacts
- illegal activities
- maintenance/repair needs

Quarterly patrol/activity reports shall be submitted to Conservation Services via fax at 813-672-7880, Attn: Forest Turbiville.

Activities to be Performed on a Daily Basis

- Visually check boundary fence along eastern perimeter adjacent to East Bay Road to detect unauthorized vehicular access.
- Investigate any unusual observances to determine purpose of unauthorized access, i.e., dumping, ORV use, poaching, etc. **DO NOT RISK PERSONAL INJURY**. Resident should contact appropriate law enforcement agency if he believes trespassers are still on site and pose a threat.
- Report any incidences to the Conservation Services Office.
- Collect any visible trash left at parking and pavilion/picnic areas and inspect restroom.
- Check signs (posted, orientation, etc.) and replace as needed.

Activities to be Performed on an as Needed Basis

- Submit incident reports if unusual events have occurred (trespass, dumping, discharge of firearms, vandalism, personal injury, theft, etc.)
- Patrol interior road/trail system as seasonal conditions and availability of patrol vehicle permits.

Project # _____

MOBILE HOME PERMIT APPLICATION

OWNER NAME X Hillsborough Co. E.L.A.P.P.

OWNER'S CURRENT ADD.X _____ CITY X _____ ZIP X _____

ADD. OF PROPOSED STRUCTURE 2127 East Bay Rd. DUE 7-10-95

FOLIO # X 31428.0000 CITY X Gibsonton ZIP CODE X _____

MOBILE HOME MAKE X _____ 24x60 YEAR X _____ # BEDRM X 3

HAS SITE BEEN USED PREVIOUSLY FOR MH X NO (TECO LAYOUT #) X ERL 3825

EXISTING STRUCTURES ON PROPERTY X Vacant

PLAT BK — PAGE — MAP 00000 BLK — LOT — QTR/STR NE 31, T31, R19

SUB metes and bounds CENSUS 138

ZONING/LAND USE AR AREA _____ DEPTH _____ FRONTAGE 150'

SETBACKS: F 50 R 50 L 25 R 25 FLOOD ZONE _____ BASE ELEV. _____

IMP. ZONES ROW/TRANS. 08 FIRE CE PARK/SCHOOL CE GRAPHICS 1

FOR OFFICE USE ONLY "No Tree Removal"
LAL PERMIT Rqd. (Y) (N) Affidavit JS 7-10-95
GAS PERMIT Rqd. Y N
TYPE OF HEAT

30,000

FEES

PERMITS		IMPACTS	
BU		T	
EL		R	
ME		P	
MS		S	
LS		F	
RAD			
OTHER			

It is understood that any permit issued on this application will not grant the right of privilege to erect any structure or to use any premises described for any purpose or in any manner prohibited by the zoning ordinance or by other ordinances, codes, or regulations of Hillsborough County.

By signature on this application, it is unequivocably stated that pursuant to Chapter 440, Florida Statutes, the entity named herein possesses workers' compensation coverage, if required, for all its employees of any subcontractor/specialty contractor that performs work relative to this permit, where said individual has not provided coverage for its own employees. A copy of this workers' compensation policy, if required, is on file with the Hillsborough County Building Department.

I, the applicant named in the above (and foregoing) application, do hereby answer under penalty of perjury, provided for in Section 837.06., Florida Statutes, that the information contained and the statements herein made are, to the best of my knowledge and belief, true, correct and complete. I also am aware that Impact Fees may be due on new developments.

Angel Meana 7-10-95 744-5610
APPLICANT SIGNATURE X DATE SIGNED X PHONE X

310 N. Falkenburg Rd. Tp. Fl. 33619
ADDRESS X CITY X STATE X ZIP X

CONTRACTORS NAME _____ LIC. NO.

Project #_____

MOBILE HOME PERMIT APPLICATION

OWNER NAME X Hillsborough Co. E.L.A.P.P.

OWNER'S CURRENT ADD. X _____ CITY X _____ ZIP X _____

ADD. OF PROPOSED STRUCTURE 12127 East Bay Rd. Due 7-10-95

FOLIO # X 51428.0000 CITY X Gibsonton ZIP CODE X _____

MOBILE HOME MAKE X _____ 24x60 YEAR X _____ # BEDRM X 3

HAS SITE BEEN USED PREVIOUSLY FOR MH X No TECO LAYOUT # X ERL 38256

EXISTING STRUCTURES ON PROPERTY X Vacant

PLAT BK — PAGE — MAP 00000 BLK — LOT — QTR/STR NE 31, T31, R19

SUB Metes and bounds CENSUS 138

ZONING/LAND USE AR AREA _____ DEPTH _____ FRONTAGE 150'

SETBACKS: F 50 R 50 L 25 R 25 FLOOD ZONE _____ BASE ELEV. _____

IMP. ZONES ROW/TRANS. 08 FIRE CE PARK/SCHOOL Ce GRAPHICS AR 7/12/95

FOR OFFICE USE ONLY "No Tree Removal"
LAL PERMIT Rqd. (Y) (N) Affidavit JS 7-10-95
GAS PERMIT Rqd. Y N
TYPE OF HEAT

30,000

FEES

PERMITS		IMPACTS	
BU		T	
EL		R	
ME		P	
MS		S	
LS		F	
RAD			
OTHER			

It is understood that any permit issued on this application will not grant the r[illegible] to violate any of the provisions of the zoning o[illegible] of Hillsborough County.

By [illegible] pursuant [illegible] Workers' [illegible] any subc[illegible] this per[illegible] employee [illegible] is on fi[illegible]

I, th[illegible] do hereb[illegible] Florida [illegible] made are [illegible] I also ac[illegible]

EXEMPTION Approved
George Flood
Dec 4, 1995
12:49p

Please [illegible] at [illegible] assesses [illegible] if [illegible] p[illegible] own [illegible]

37.06.. herein complete.

Angel Means 7-10-95 744-5610
APPLICANT'S SIGNATURE X DATE SIGNED X PHONE X

310 N. Falkenburg Rd. Tp. Fl. 33619
ADDRESS X CITY X STATE X ZIP X

CONTRACTORS NAME _____ LIC. NO.

STATE OF FLORIDA
DEPARTMENT OF HEALTH AND REHABILITATIVE SERVICES
ONSITE SEWAGE DISPOSAL SYSTEM
CONSTRUCTION PERMIT
Authority: Chapter 381, FS & Chapter 10D-6, FAC

PERMIT # 95-546
DATE PAID 7/10/95
FEE PAID $ 235.00
RECEIPT # P.O # 55066

CONSTRUCTION PERMIT FOR:
[✓] New System [ ] Existing System [ ] Holding Tank [ ] Temporary/Experimental
[ ] Repair [ ] Abandonment [ ] Other(Specify) _____

APPLICANT: Hillsborough County AGENT: ELAPP

PROPERTY STREET ADDRESS: 12127 East Bay Rd

LOT: / BLOCK: / SUBDIVISION: MHC

PROPERTY ID #: 51727 [SECTION/TOWNSHIP/RANGE/PARCEL NUMBER] [OR TAX ID NUMBER]

==========

SYSTEM MUST BE CONSTRUCTED IN ACCORDANCE WITH SPECIFICATIONS AND STANDARDS OF CHAPTER 10D-6, FAC REPAIR PERMITS AND HOLDING TANK PERMITS EXPIRE 90 DAYS FROM THE DATE OF ISSUE. ALL OTHER PERMITS EXPIRE ONE YEAR FROM THE DATE OF ISSUE. HRS APPROVAL OF SYSTEM DOES NOT GUARANTEE SATISFACTORY PERFORMANCE FOR ANY SPECIFIC PERIOD OF TIME. ANY CHANGE IN MATERIAL FACTS WHICH SERVED AS A BASIS FOR ISSUANCE OF THIS PERMIT, REQUIRE THE APPLICANT TO MODIFY THE PERMIT APPLICATION. SUCH MODIFICATIONS MAY RESULT IN THIS PERMIT BEING MADE NULL AND VOID.

==========

SYSTEM DESIGN AND SPECIFICATIONS

This permit does not guarantee issuance of a building permit.

T [900] (GALLONS / GPD) (SEPTIC TANK) AEROBIC UNIT CAPACITY MULTI-CHAMBERED/IN SERIES: [
P [ ] [GALLONS / GPD] _____ CAPACITY MULTI-CHAMBERED/IN SERIES: [
N [ ] GALLONS GREASE INTERCEPTOR CAPACITY [MAXIMUM CAPACITY SINGLE TANK: 1250 GALLONS
K [ ] GALLONS PER DOSE DOSING TANK CAPACITY DOSE RATE [ ] PER 24 HRS NO. OF PUMPS: [

D [333] (SQUARE FEET) PRIMARY DRAINFIELD SYSTEM ___ Br. House ___ Other
R [ ] SQUARE FEET _____ SYSTEM 3 Br (Trailer)
A TYPE SYSTEM: [ ] STANDARD [X] FILLED [ ] MOUND [ ] _____
I CONFIGURATION: [X] TRENCH [ ] BED [ ] _____
N
F LOCATION OF BENCHMARK: Corner of Slab w/ capped well
I ELEVATION OF PROPOSED SYSTEM SITE [9"] (INCHES/FT) [ABOVE/BELOW] BENCHMARK/(REFERENCE POIN
E BOTTOM OF DRAINFIELD TO BE [15"] (INCHES/FT) [ABOVE/BELOW] BENCHMARK/(REFERENCE POIN
L
D FILL REQUIRED: [18"] INCHES EXCAVATION REQUIRED: [—] INCHES

O ~~fill perimeter 7½' feet~~ WATER: Public
T (Well) (Private) - Public
H (New) - Existing
E Mound 7½ ft for prob well
R

SPECIFICATIONS BY: _____ TITLE: _____

APPROVED BY: _____ TITLE: Env Sp II HRS CPH

DATE ISSUED: 7/14/95 EXPIRATION DATE: 1/14/9

Signature _____

HRS-H Form 4016, Mar 92 (Obsoletes previous editions which may not be used)
(Stock Number: 5744-001-4016-0)

Page 1 of

INSTALLER/CONTRACTOR

N
W E
S

1"=50'

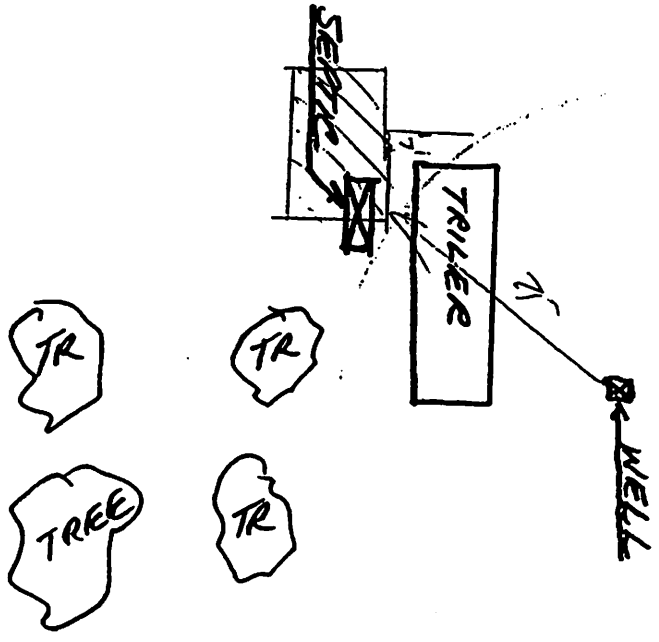
1200 ACRE

APPROVED

HILLSBOROUGH COUNTY
HEALTH DEPARTMENT

NAME SSO DATE 7/14/95

SEDIMENT	YES	NO
DRAINAGE	YES	NO
SLOPE	YES	NO
NO WELLS WITHIN 75' OF ADJACENT PROPERTY		
SIGNATURE		



HILLSBOROUGH COUNTY

Florida

Office of the County Administrator
Daniel A. Kleman

BOARD OF COUNTY COMMISSIONERS
Dottie Berger
Phyllis Busansky
Joe Chillura
Chris Hart
Jim Norman
Ed Turanchik
Sandra Helen Wilson

Senior Assistant County Administrator
Patricia Bean

Assistant County Administrators
Edwin Hunzeker
Cretta Johnson
Jimmie Keel
Robert Taylor

FLOOD ZONE/ELEVATION DETERMINATION

[X] Building Department Hills. Co. E.L.A.P.P.

[ ] S.C. [ ] P.C. (Satellite Ofc.) 271.0 ~~feet~~ acres

SUBDIVISION: _____

LOT: _____ BLOCK: _____

METES AND BOUNDS: E½ less County Rd. and less I-75 By-Pass NE¼ of S1, T31, R19

FOLIO NUMBER: 51428.0000 ATLAS PAGE: _____

ADDRESS: Gibsonton, FL

FLOOD ZONE(S): C BASE FLOOD ELEVATION: N/A

FINISHED FLOOR ELEVATION REQUIRED: _____

The above described site has _____ % in a floodway.
(See attached Plot)

Building Footprint lies in zone(s): C

(The above complies with Hillsborough County Land Development Codes and the Federal Emergency Management Agency Flood Insurance Rate Maps).

Community-Panel Number: 120112 0503C Map Revision Date 4-17-84

Signed by: W R Rhodes 7-10-95
Permit Permit Services Center Date

OFF. REC. 7769 PG 1728

RICHARD AKE
CLERK OF CIRCUIT COURT
HILLSBOROUGH COUNTY

Documentary Tax Pd - F.S. 201.02 $ 21,621.60
Documentary Tax Pd - F.S. 201.08 $ 0
Intangible Tax Pd - F.S. 199 $ 0
Richard Ake, Clerk Hillsborough County
By: S. Mean Deputy Clerk

37 50
21,621.60
11,659.10

1995 MAY 26 PM 4:16

511848 3

JOHNSON, BLAKELY, POPE, BISSETT & HARRIS
P.O. Box 1368, Clearwater, FL 34617-1368

TRUSTEE'S DEED

THIS INDENTURE is made on the 26th day of May, 1995, between **EMIL C. MARQUARDT, JR., AS TRUSTEE UNDER THE PROVISIONS OF THE LAND TRUST AGREEMENT DATED DECEMBER 10, 1990,** with full power and authority to protect, conserve, sell, lease, encumber, or otherwise manage and dispose of the property, whose post office address is: P. O. Box 1669, Clearwater, Florida 34616, ("Grantor") and **HILLSBOROUGH COUNTY, a political subdivision of the State of Florida,** whose address is: P. O. Box 1110, Tampa, Florida 33601 ("Grantee").

WITNESSETH:

GRANTOR, in consideration of the sum of Ten and 00/100 Dollars ($10.00) and other valuable consideration, the receipt of which is hereby acknowledged, does hereby grant, bargain, sell, convey, transfer and assign to Grantee, its, successors and assigns, all that certain real property located in Hillsborough County, Florida, more particularly described as follows:

SEE EXHIBIT "A" ATTACHED HERETO AND MADE A PART HEREOF

Folio Numbers: 51431.0000, 51426.0000, 51428.0000, and 51501.0000.

Grantees' Tax Identification Number: 59-6000661.

THE PROPERTY DESCRIBED HEREIN IS NOT THE HOMESTEAD OF THE GRANTOR.

SUBJECT TO:

(a) Real Estates Taxes for the year 1995 and all subsequent years, which are not yet due and payable;

(b) Restrictions and limited easement recorded in O. R. Book 887, Page 778, of the Public Records of Hillsborough County, Florida, which reserves to Tampa Electric Company the right to approve the plans for roads, utilities and drainage facilities before construction commences;

(c) Restrictions and limited easement recorded in O.R. Book 1658, Page 832, of the Public Records of Hillsborough County, Florida, which reserves to Tampa Electric Company the right to approve the plans for roads, utilities and drainage facilities before construction commences; and

(d) Restrictions and limited easement recorded in O.R. Book 1097, Page 488, of the Public Records of Hillsborough County, Florida, which reserves to Tampa Electric Company the right to approve the plans for roads, utilities and drainage facilities before construction commences.

NONE OF WHICH SHALL BE REIMPOSED HEREBY.

TO HAVE and to hold the same in fee simple forever.

AND GRANTOR does hereby fully warrant the title to said land and will defend the same against the lawful claims of all persons whomsoever claiming or to claim the same by, through and under Grantor.

IN WITNESS WHEREOF, Grantor has executed this deed the day and year first above written.

WITNESSES:

Print Name: CHERYL L. GUNDRY

Print Name _____

EMIL C. MARQUARDT, Jr., as Trustee
under the provisions of the Land Trust
dated December 10, 1990

P. O. Box 1669
Clearwater, Florida 34616

STATE OF FLORIDA)

COUNTY OF PINELLAS)

The foregoing instrument was acknowledged before me this 26 day of _____, 1995, by **EMIL C. MARQUARDT, JR., AS TRUSTEE UNDER THE PROVISIONS OF THE LAND TRUST AGREEMENT DATED DECEMBER 10, 1990,** with full power and authority to protect, conserve, sell, lease, encumber, or otherwise

manage and dispose of the property, who [is personally known to me] OR [has produced a Florida Driver's License as identification].

Notary Public
Print Name

My Commission Expires:

BARBARA SAVERY
MY COMMISSION # CC 178439
EXPIRES: February 6, 1996
Bonded Thru Notary Public Underwriters

05/11/95 2:11 PM (d-1)
32896.87225;CLG
69747.01

APPROVED
Board of County Commissioners
DATE 11-16-94
MICHAEL KELLY
Director
Real Estate Department

EXHIBIT "A"

All Property above the ordinary high water line within the following:

PARCEL 101.1

All that part of the East 1/2 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida. Lying East of the railroad right-of-way.

LESS

The North 20 feet of the East 650 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 10 feet of the East 560 feet of the South 35 feet of the North 55 feet of the Northeast 1/4 of the Northeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract beginning at the Southwest corner of the Southeast 1/4 of Section 2, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East 2,615.63 feet to the Southeast corner of Section 2, Township 31 South, Range 19 East, thence North 99.25 feet and Westerly to beginning.

PARCEL 101.2

The part of the East 1/2 of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida, lying West of East Bay Road, and lying West of land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

AND

The West 1/2 of Section 1, Township 31 South, Range 19 East, Hillsborough County, Florida; LESS the West 325.0 feet, thereof.

AND

All that part of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying West of land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

LESS

The South 1,216 feet of the West 816 feet of the Southeast 1/4 of said Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Portion deeded to State Road Department for State Road 672.

ALSO LESS

The South 3/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 325 feet of the Northwest 1/4 of the Northwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 300 feet of the Southwest 1/4 of the Northwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

The West 300 feet of the North 1/2 of the Northwest 1/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida.

ALSO LESS

Tract beginning 300 feet East of the Southwest corner of the North 1/4 of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run East to the East boundary of the Southwest 1/4, thence North 200 feet, thence West to point 200 feet, north of beginning and South 200 feet to beginning.

ALSO LESS

Tract beginning 1,378.6 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 200.04 feet; thence North 1,984.4 feet; thence West 1,067.05 feet; thence North 200.01 feet; thence East 1,266.80 feet; thence South 2,185 feet to beginning.

ALSO LESS

Tract beginning 1,578.64 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 254.37 feet; thence North 1,216 feet; thence West 815.44 feet; thence North 774.55 feet; thence East 1,067.05 feet; thence South 1,984.4 feet to beginning.

ALSO LESS

Right of way for State Road 672.

ALSO LESS

Less lands taken by Tampa Electric Company in Case Number 79-13223, in the Circuit Court in and for Hillsborough County, Florida.

ALSO LESS

Land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

PARCEL 101.3

A tract beginning 1,578.64 feet West of the Southeast corner of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, and run West 254.37 feet; thence North 1,216 feet; thence West 815.44 feet; thence North 774.55 feet; thence East 1,067.05 feet; thence South 1,984.4 feet to beginning.

LESS

Right-of-way for State Road 672.

ALSO LESS

Lands taken by Division of Administration, State of Florida, Department of Transportation in Case Number 78-15387, in the Circuit Court of Hillsborough County, Florida.

PARCEL 102.1

That part of Section 1 and the East 1/2 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying Westerly of East Bay Road and lying East of land taken by Division of Administration, State of Florida, Department of Transportation in case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

More particularly described as follows:

Commence at the Southeast corner of Section 12, Township 31 South, Range 19 East, said corner being the same as shown on Florida Department of Transportation Right-of-Way Maps for Interstate 75 (State Road 93-A, Section 10075-2404 dated 10/18/77); thence N.00°16'28"E. 2659.80 feet along the East boundary of the Southeast one quarter of said Section 12 to the Northeast corner of said Southeast one quarter; thence N.89°38'36"W. 75.00 feet to the Westerly Right-of-Way line of Bullfrog Creek Road (formerly East Bay Road) and the Point of Beginning; thence along said Westerly Right-of-Way line Southwesterly 1202.38 feet along the arc of a curve to the right having a radius of 1357.47 feet, chord of 1163.46 feet and chord bearing of S.25°43'54"W.; thence continuing along said Westerly Right-of-Way line S.51°06'24"W. 340.65 feet to the beginning of a curve to the left; thence continuing along said Westerly Right-of-Way line Southwesterly 468.80 feet along the arc of said curve having a radius of 1507.47 feet, chord of 466.92 feet and chord bearing of S.42°11'51"W. to the Easterly Right-of-Way line of Interstate 75 (State Road 93-A); thence along said Easterly Right-of-Way line N.16°01'48"E. 2373.25 feet to the beginning of a curve to the left; thence continuing along said Easterly Right-of-Way line Northeasterly 3149.90 feet along the arc of said curve having a radius of 11632.67 feet, chord of 3140.28 feet and chord bearing of N.08°16'22"E.; thence S.89°29'04"E. 0.32 feet to said Westerly Right-of-Way line of Bullfrog Creek Road; thence along said Westerly Right-of-Way line S.00°21'39"W. 1119.70 feet; thence continuing along said Westerly Right-of-Way line S.00°21'24"W. 2661.06 feet to the Point of Beginning.

PARCEL 102.2

That part of Southeast 1/4, Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, lying Easterly of East Bay Road, LESS Right-of-ways for Big Bend Road (672 State Road), LESS the East 387.28 feet thereof.

ALSO LESS

Land taken by Division of Administration, State of Florida, Department of Transportation in Case No. 78-15387, in the Circuit Court in and for Hillsborough County, Florida.

More particularly described as follows:

Commence at the Southeast corner of Section 12, Township 31 South, Range 19 East, said corner being the same as shown on Florida Department of Transportation Right-of-Way Maps for Interstate 75 (State Road 93-A, Section 10075-2404 dated 10/18/77); thence N.88°53'31"W. 387.32 feet along the South boundary of the Southeast one quarter of said Section 12, said South boundary being the same as shown on said Right-of-Way Maps; thence N.00°16'28"E. 47.18 feet along a line parallel with and 387.28 feet Westerly of the East boundary of the Southeast quarter of said Section 12 to the Northerly Right-of-Way line of Big Bend Road (County Road 672, formerly State Road 672) and the Point of Beginning; thence along said Northerly Right-of-Way line the following courses,

N.88°47'40"W.	576.65 feet
N.88°30'40"W.	181.20 feet
N.84°41'49"W.	150.33 feet

to the intersection of said Northerly Right-of-Way line with the Easterly Right-of-Way line of Bullfrog Creek Road (formerly East Bay Road); thence along said Easterly Right-of-Way line N.00°21'24"E. 46.39 feet; thence continuing along said Right-of-Way line N.16°01'48"E. 726.47 feet to the beginning of a curve to the right; thence continuing Northeasterly along said Right-of-Way line 571.72 feet along the arc of said curve having a radius of 946.41 feet, chord of 563.06 feet and chord bearing of N.33°20'09"E.; thence continuing along said Right-of-Way line N.48°43'59"E. 158.40 feet; thence continuing along said Right-of-Way line N.51°06'24"E. 206.08 feet to the beginning of a curve to the left; thence continuing along said Right-of-Way line Northeasterly 169.15 feet along the arc of said curve having a radius of 1457.47 feet, chord of 169.06 feet and chord bearing of N.47°46'55"E. to a point on a line parallel with and 387.28 feet Westerly of the East boundary of the Southeast one quarter of said Section 12; thence S.00°16'28"W. 1593.26 feet to the Point of Beginning.

REAL ESTATE DEED/SALES INFORMATION DRAFT

EY IN FOLIO NUMBER 51428.0000 TRANSACTION CODE 1

**** D E E D I N F O R M A T I O N ****

OWNER NAME MARQUARDT EMIL C JR TRS % MCMULLEN EVERETT
ADDRESS-1 LOGAN MARQUARDT & CLINE
ADDRESS-2 P O BOX 1669
ADDRESS-3 CLEARWATER FL ZIP CODE 34617

NUMBER DIR STREET NAME MODE UNIT
LOCATION

TAX DISTRICT A PBOOK/PAGE
MAP NUMBER 1A ACREAGE 271.00
SEC-TWP-RGE 01-31-19 REVIEW FILE
PERCT EXEMPT NUMBER UNITS
NEW CONSTR PREV FOLIO
YEAR BUILT
MTG CODE NEW OWNER APPL CODE

*** SALES ***	DATE	SALE PRICE	OR/BOOK	OR/PAGE	TRANSFER	DEED	V/I
W SALES INFO							
SALES INFO1	02/91	100	6187	1042	M	WD	V
SALES INFO2	/73	100	2645	0416	Q		
SALES INFO3							

5=FWD PF6=BWD PF7=CLEAR MAINT DATE 05/05/95

PROPERTY LEGAL DESCRIPTION

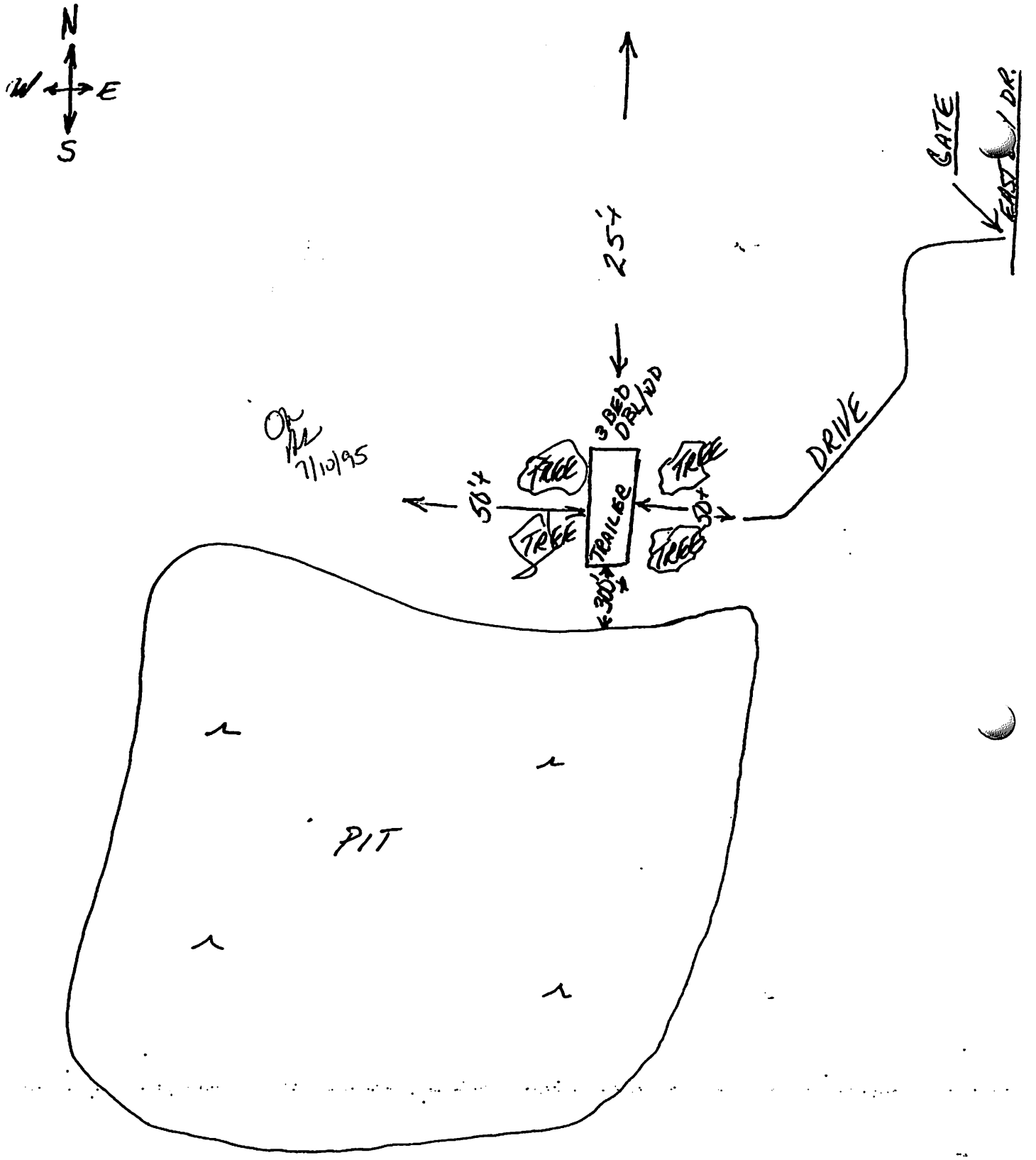
Y IN FOLIO NUMBER 51428.0000 TRANSACTION CODE I

EEZE CODE

SSAGES NUM LEGAL DESCRIPTION

01 E 1/2 LESS COUNTY RD AND LESS I-75 BY-PASS
09 PRO-RATION GOLDEN ASTOR SCRUB P101 COUNTY 5-5-95
END OF LEGAL DESCRIPTION

5=FWD PF6=BWD PF9=CLEAR 05/05/95

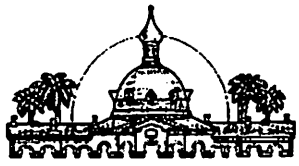

N
W
E
S
GATE
EAST DR.
25'±
3 BED DBL/WD
DRIVE
OK
7/10/95
50'±
TREE
TREE
TREE
TREE
TRAILER
30'±
PIT

HILLSBOROUGH COUNTY

Florida

Office of the County Administrator
Daniel A. Kleman

BOARD OF COUNTY COMMISSIONERS
Dottie Berger
Phyllis Busansky
Joe Chillura
Chris Hart
Jim Norman
Ed Turanchik
Sandra Helen Wilson



Senior Assistant County Administrator
Patricia Bean

Assistant County Administrators
Edwin Hunzeker
Cretta Johnson
Jimmie Keel
Robert Taylor

FLOOD ZONE/ELEVATION DETERMINATION

[X] Building Department Hills. Co. E.L.A.P.P.

[ ] S.C. [ ] P.C. (Satellite Ofc.) 271.0 ~~feet~~ acres

SUBDIVISION: _____

LOT: _____ BLOCK: _____

METES AND BOUNDS: E½ less County Rd. and less I-75 By-Pass NE¼ of S1, T31, R19

FOLIO NUMBER: 51428.0000 ATLAS PAGE: _____

ADDRESS: Gibsonton, Fl

FLOOD ZONE(S): C BASE FLOOD ELEVATION: N/A

FINISHED FLOOR ELEVATION REQUIRED: _____

The above described site has _____ % in a floodway. (See attached Plot)

Building Footprint lies in zone(s): C

(The above complies with Hillsborough County Land Development Codes and the Federal Emergency Management Agency Flood Insurance Rate Maps).

Community-Panel Number: 120112 0503C Map Revision Date 4-17-84

Signed by: YR Rhodes 7-10-95
Permit Permit Services Center Date

This instrument prepared by:
Joel Pollock
Department of Environmental Protection
Bureau of Public Administration
Division of State Lands
3900 Commonwealth Blvd. MS 130
Tallahassee, Florida 32399-3000
AID# 43772

ATL1
[4.433 +/- acres]

BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND OF THE STATE OF FLORIDA

AMENDMENT NUMBER ONE TO LEASE NUMBER 4133

THIS LEASE AMENDMENT is entered into this _____ day of _____, 20___, by and between the **BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND OF THE STATE OF FLORIDA**, hereinafter referred to as "LESSOR" and **HILLSBOROUGH COUNTY**, **FLORIDA**, a political subdivision of the State of Florida, hereinafter referred to as "LESSEE";

WITNESSETH:

WHEREAS, LESSOR, by virtue of Section 253.03, Florida Statutes, holds title to certain lands and property for the use and benefit of the State of Florida; and

WHEREAS, on November 14, 1996, LESSOR and LESSEE entered into Lease Number **4133** (the "Lease"); and

WHEREAS, LESSOR and LESSEE desire to amend the lease to remove land encumbered with easements granted to the State of Florida Department of Transportation and add land to the leased premises.

NOW THEREFORE, in consideration of the mutual covenants and agreements contained herein, the parties hereto agree as follows:

1. The legal description of the leased premises set forth in Exhibit "A" of Lease Number **4133** is hereby amended to include the real property described in Exhibit "A" attached hereto and by this reference made a part hereof and to remove the real property described in Exhibit "B" attached hereto and by reference made a part hereof.

2. It is understood and agreed by LESSOR and LESSEE that in each and every respect the terms of Lease Number **4133**, except as amended, shall remain unchanged and in full force and effect and the same are hereby ratified, approved and confirmed by LESSOR and LESSEE as of the date of this amendment.

3. It is understood and agreed by LESSOR and LESSEE that this Amendment Number **One** to Lease Number **4133** is hereby binding upon the parties hereto and their successors and assigns.

IN WITNESS WHEREOF, the parties have caused this Amendment to Lease to be executed on the day and year first above written.

WITNESSES:

BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND OF THE STATE OF FLORIDA

Original Signature

(SEAL)

BY: _____

Print/Type Name of Witness

Brad Richardson, Chief, Bureau of Public Land Administration, Division of State Lands, State of Florida Department of Environmental Protection, as agent for and on behalf of the Board of Trustees of the Internal Improvement Trust Fund of the State of Florida

Original Signature

Print/Type Name of Witness

"LESSOR"

STATE OF FLORIDA
COUNTY OF LEON

The foregoing instrument was acknowledged before me by means of ___ physical presence or ___ online notarization this ____ day of _____, 20___, by Brad Richardson, Chief, Bureau of Public Land Administration, Division of State Lands, State of Florida Department of Environmental Protection for, as agent for and on behalf of the Board of Trustees of the Internal Improvement Trust Fund of the State of Florida. He is personally known to me.

APPROVED SUBJECT TO PROPER EXECUTION:

1-7-2022

DEP Attorney Date

_____
Notary Public, State of Florida

_____
Printed, Typed or Stamped Name

_____
My Commission Expires:

_____
Commission/Serial No.

IN WITNESS WHEREOF, the parties hereto, through their duly authorized representatives, have executed this County Agreement on the day(s) and year set forth below.

ATTEST:

CINDY STUART
CLERK OF THE CIRCUIT COURT

By:_____
DEPUTY CLERK

HILLSBOROUGH COUNTY, A POLITICAL SUBDIVISION OF THE STATE OF FLORIDA

By:_____
CHAIR

"LESSEE"

Date:_____

APPROVED AS TO FORM AND LEGAL SUFFICIENCY

By: _____
Richard Tschantz
Chief Assistant County Attorney

BOCC Document No:_____

EXHIBIT "A"

April 6, 2020

I-75 Interchange Parcel
FOLIO # 051513.0000
C.I.P. NO. C6965600
GLAD NO. 2018-099-R
PARCEL 101
Page 1 of 1

That Part of:

The South 1216 feet of the West 816 feet of the Southeast 1/4 of Section 12,Township 31 South, Range 19 East, Hillsborough County, Florida, LESS Road Right-of-Way for State Road 672.
And
The East 50' feet of the South 1216 feet of the Southwest 1/4 of Section 12, Township 31 South, Range 19 East, Hillsborough County, Florida, LESS Road Right-of-Way for State Road 672.

Lying within the following metes and bounds description:

Commence at the Southeast corner of Section 12, Township 31 South, Range 19 East Hillsborough County, Florida, monumented with a one inch iron rod as per Certified Corner Record # 51425; thence N88°54'30"W, on the south boundary of Southeast 1/ 4 of said Section 12, a distance of 1849.45 to a point of intersection with the projected west boundary of GOLDEN ASTER SCRUB property as described Official Records Book 8044, Page 1404 of the Public Records of Hillsborough County, Florida; thence N00°26'23"E, on said projected west boundary and on the west boundary of said GOLDEN ASTER SCRUB property, a distance of 745.64 feet to the POINT OF BEGINNING; thence departing said west boundary, N44°04'01"W, a distance of 686.64 feet to the south boundary of said GOLDEN ASTER SCRUB property; thence on the said south boundary, S88°34'25"E, a distance of 481.40 feet to the intersecting west boundary of said GOLDEN ASTER SCRUB property; thence continue on said west boundary of GOLDEN ASTER SCRUB property, S00°26'23"W, a distance of 481.40 feet to the POINT OF BEGINNING.

The above described parcel contains 115856 square feet (2.66 acres).

Prepared by:
Gary Albritton PSM No.5519
Hillsborough County Geospatial
and Land Acquisition Services
2218 Falkenburg Rd, Tampa, Florida 33619

The Description is not complete without the accompanying sketch

BSM: [signature]

DATE: April 8, 2020

As recorded in Instrument Number 2020175560, Public Records of Hillsborough County, Florida.

EXHIBIT "B"

PARCELS 100A & 100B
LEGAL DESCRIPTION

PARCEL 100

LIMITED ACCESS RIGHT OF WAY

PART "A"

A PARCEL OF LAND LYING IN THE SOUTHEAST 1/4 OF SECTION 12, TOWNSHIP 31 SOUTH, RANGE 19 EAST, HILLSBOROUGH COUNTY, FLORIDA, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCE AT THE SOUTHEAST CORNER OF SECTION 12, TOWNSHIP 31 SOUTH, RANGE 19 EAST; THENCE ALONG THE SOUTH LINE OF THE SOUTHEAST 1/4 OF SAID SECTION 12, N 88°53'26" W, A DISTANCE OF 1395.00 FEET; THENCE N 00°21'20" E, A DISTANCE OF 51.00 FEET TO THE NORTH RIGHT OF WAY LINE OF COUNTY ROAD 672; THENCE ALONG SAID NORTH RIGHT OF WAY LINE OF COUNTY ROAD 672 THE FOLLOWING THREE (3) COURSES: (1) N 88°30'40" W, A DISTANCE OF 313.62 FEET; (2) S 01°29'20" W, A DISTANCE OF 10.00 FEET; (3) N 88°30'40" W, A DISTANCE OF 79.68 FEET TO A POINT ON THE EXISTING WESTERLY LIMITED ACCESS RIGHT OF WAY LINE OF STATE ROAD 93-A(I-75), SAID POINT ALSO BEING THE POINT OF BEGINNING; THENCE CONTINUING ALONG SAID NORTH RIGHT OF WAY LINE OF COUNTY ROAD 672, N 88°30'40" W, A DISTANCE OF 60.60 FEET TO A POINT ON THE WEST LINE OF THE PROPERTY DESCRIBED IN OFFICIAL RECORDS BOOK 8044, PAGE 1404 OF THE PUBLIC RECORDS OF HILLSBOROUGH COUNTY, FLORIDA, ALSO BEING A POINT ON THE EAST LINE OF PROPERTY DESCRIBED IN OFFICIAL RECORDS BOOK 1885, PAGE 883 OF THE PUBLIC RECORDS OF HILLSBOROUGH COUNTY, FLORIDA; THENCE ALONG SAID LINE, N 00°33'53" E, A DISTANCE OF 184.57 FEET TO THE POINT OF CURVATURE OF A NON-TANGENTIAL CURVE CONCAVE NORTHWESTERLY, HAVING A RADIUS OF 437.00 FEET; THENCE DEPARTING SAID LINE, NORTHEASTERLY 192.36 FEET ALONG THE ARC OF SAID CURVE, THROUGH A CENTRAL ANGLE OF 25°13'13" AND A CHORD BEARING AND DISTANCE OF N 32°38'25" E, A DISTANCE OF 190.81 FEET TO THE END OF SAID CURVE; THENCE N 20°01'48" E, A DISTANCE OF 434.74 FEET; THENCE N 16°01'48" E, A DISTANCE OF 18.58 FEET TO A POINT ON THE EAST LINE OF THE PROPERTY DESCRIBED IN OFFICIAL RECORDS BOOK 8044, PAGE 1404 OF THE PUBLIC RECORDS OF HILLSBOROUGH COUNTY, FLORIDA, ALSO BEING A POINT ON THE WEST LINE OF PROPERTY DESCRIBED IN OFFICIAL RECORDS BOOK 1097, PAGE 488 OF THE PUBLIC RECORDS OF HILLSBOROUGH COUNTY, FLORIDA; THENCE ALONG SAID LINE, S 00°21'20" W, A DISTANCE OF 85.13 FEET TO THE AFORESAID EXISTING WESTERLY LIMITED ACCESS RIGHT OF WAY LINE OF STATE ROAD 93-A(I-75); THENCE ALONG SAID EXISTING WESTERLY LIMITED ACCESS RIGHT OF WAY LINE OF STATE ROAD 93-A(I-75), S 16°01'48" W, A DISTANCE OF 715.81 FEET TO THE POINT OF BEGINNING.

CONTAINING 1.005 ACRES, MORE OR LESS.

"TOGETHER WITH ALL RIGHTS OF INGRESS, EGRESS, LIGHT, AIR AND VIEW BETWEEN THE GRANTOR'S REMAINING PROPERTY AND ANY FACILITY CONSTRUCTED ON THE ABOVE DESCRIBED PROPERTY."

AND

PART "B"

A PARCEL OF LAND LYING IN SECTION 12, TOWNSHIP 31 SOUTH, RANGE 19 EAST, HILLSBOROUGH COUNTY, FLORIDA, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCE AT THE SOUTHEAST CORNER OF SECTION 12, TOWNSHIP 31 SOUTH, RANGE 19 EAST; THENCE ALONG THE SOUTH LINE OF THE SOUTHEAST 1/4 OF SAID SECTION 12, N 88°53'26" W, A DISTANCE OF 1395.00 FEET; THENCE N 00°21'20" E, A DISTANCE OF 51.00 FEET TO THE NORTH RIGHT OF WAY LINE OF COUNTY ROAD 672; THENCE ALONG SAID NORTH RIGHT OF WAY LINE OF COUNTY ROAD 672 THE FOLLOWING THREE (3) COURSES: (1) N 88°30'40" W, A DISTANCE OF 313.62 FEET; (2) S 01°29'20" W, A DISTANCE OF 10.00 FEET; (3) N 88°30'40" W, A DISTANCE OF 79.68 FEET TO THE EXISTING WESTERLY LIMITED ACCESS RIGHT OF WAY LINE OF STATE ROAD 93-A(I-75); THENCE ALONG SAID EXISTING WESTERLY LIMITED ACCESS RIGHT OF WAY LINE OF STATE ROAD 93-A(I-75), N 16°01'48" E, A DISTANCE OF 1456.17 FEET TO A POINT ON THE WEST LINE OF THE PROPERTY DESCRIBED IN OFFICIAL RECORDS BOOK 8044, PAGE 1404 OF THE PUBLIC RECORDS OF HILLSBOROUGH COUNTY, FLORIDA, ALSO BEING A POINT ON THE EAST LINE OF PROPERTY DESCRIBED IN OFFICIAL RECORDS BOOK 1097, PAGE 488 OF THE PUBLIC RECORDS OF HILLSBOROUGH COUNTY, FLORIDA AND TO THE POINT OF BEGINNING; THENCE ALONG SAID LINE, N 00°21'20" E, A DISTANCE OF 85.13 FEET; THENCE DEPARTING SAID LINE, N 16°01'48" E, A DISTANCE OF 1413.45 FEET; THENCE S 73°58'12" E, A DISTANCE OF 23.00 FEET TO THE AFORESAID EXISTING WESTERLY LIMITED ACCESS RIGHT OF WAY LINE OF STATE ROAD 93-A(I-75); THENCE ALONG SAID EXISTING WESTERLY LIMITED ACCESS RIGHT OF WAY LINE OF STATE ROAD 93-A(I-75), S 16°01'48" W, A DISTANCE OF 1495.41 FEET TO THE POINT OF BEGINNING.

CONTAINING 0.768 ACRES, MORE OR LESS.

"TOGETHER WITH ALL RIGHTS OF INGRESS, EGRESS, LIGHT, AIR AND VIEW BETWEEN THE GRANTOR'S REMAINING PROPERTY AND ANY FACILITY CONSTRUCTED ON THE ABOVE DESCRIBED PROPERTY."

PARTS "A"& "B"CONTAINING A TOTAL OF 1.773 ACRES, MORE OR LESS.

BSM: [signature]

DATE: 4/8/2020

NOT A SURVEY

SEE SHEET 2 FOR LEGEND, NOTES AND CERTIFICATION.
ATTENTION IS DIRECTED TO THE FACT THAT THESE SKETCHES MAY HAVE BEEN ALTERED IN SIZE BY REPRODUCTION.

ECHEZABAL AND ASSOC., INC.
LB 6429
108 W. COUNTRY CLUB DR.
TAMPA, FL 33612
PHONE: (813) 933-2505

HILLSBOROUGH COUNTY
GEOSPATIAL & LAND ACQUISITION SERVICES DEPARTMENT

RIGHT OF WAY PARCEL SKETCH

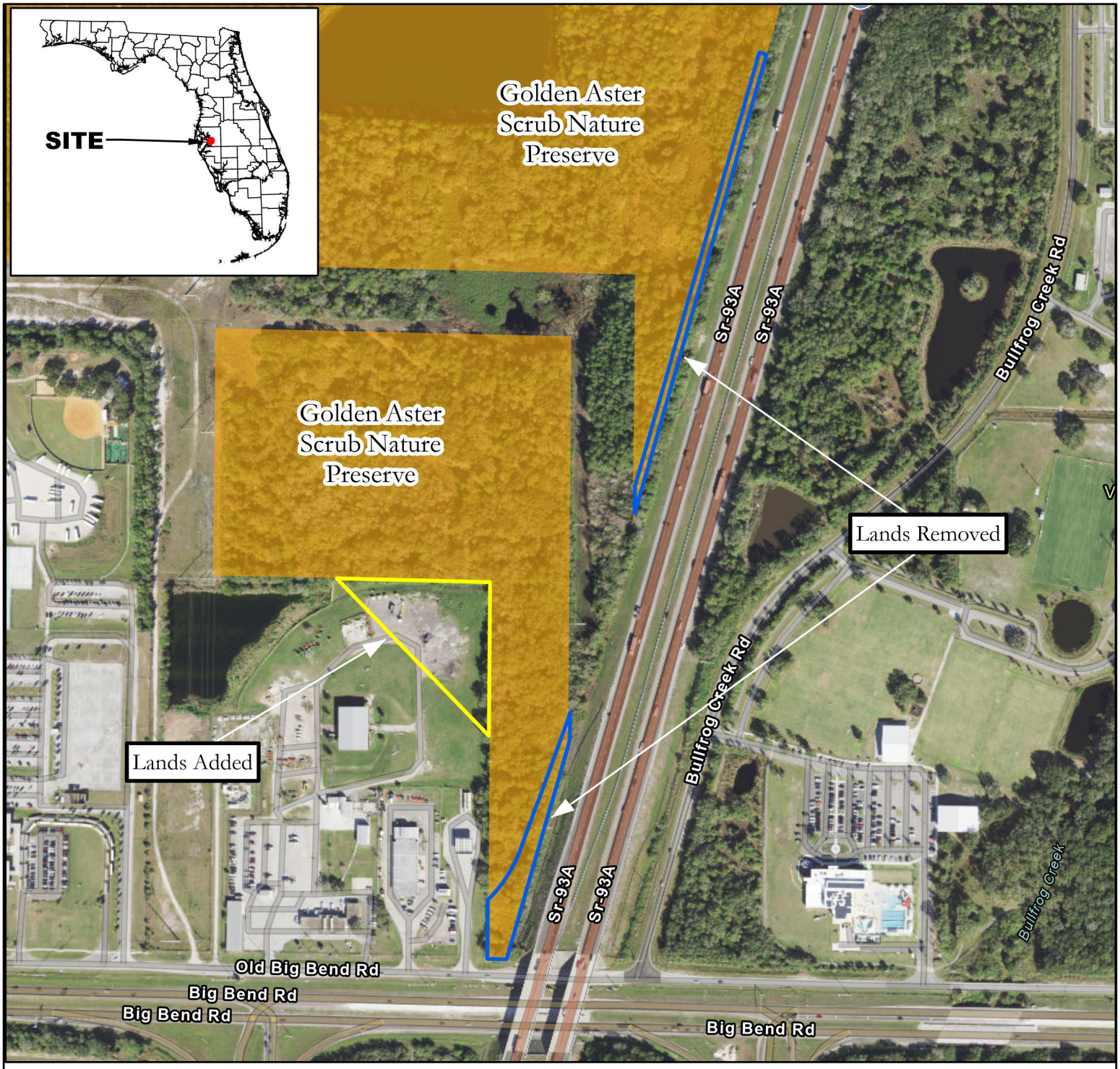
SR 93-A(I-75) HILLSBOROUGH COUNTY

	BY	DATE
PRELIM	R.B.	8/2/19
FINAL	S.T.	8/19/19
CHECKED	C.B.	8/19/19

APPROVED BY: [signature] DATE: 8/23/19

PREPARED BY: ECHEZABAL AND ASSOCIATES, INC
FIELDBOOK NO.: N/A
W.P.I. NO.: N/A
SCALE: N/A
WORK ORDER NO. N/A
SHEET 5 OF 5

THIS PAGE AND ANY FOLLOWING PAGES ARE ATTACHED ONLY FOR STATE OF FLORIDA TRACKING PURPOSES AND FORM NO PART OF THE INSTRUMENT AND ARE NOT TO BE RELIED ON BY ANY PARTY.



Lands Added
Lands Removed
City/County Managed Conservation Lands

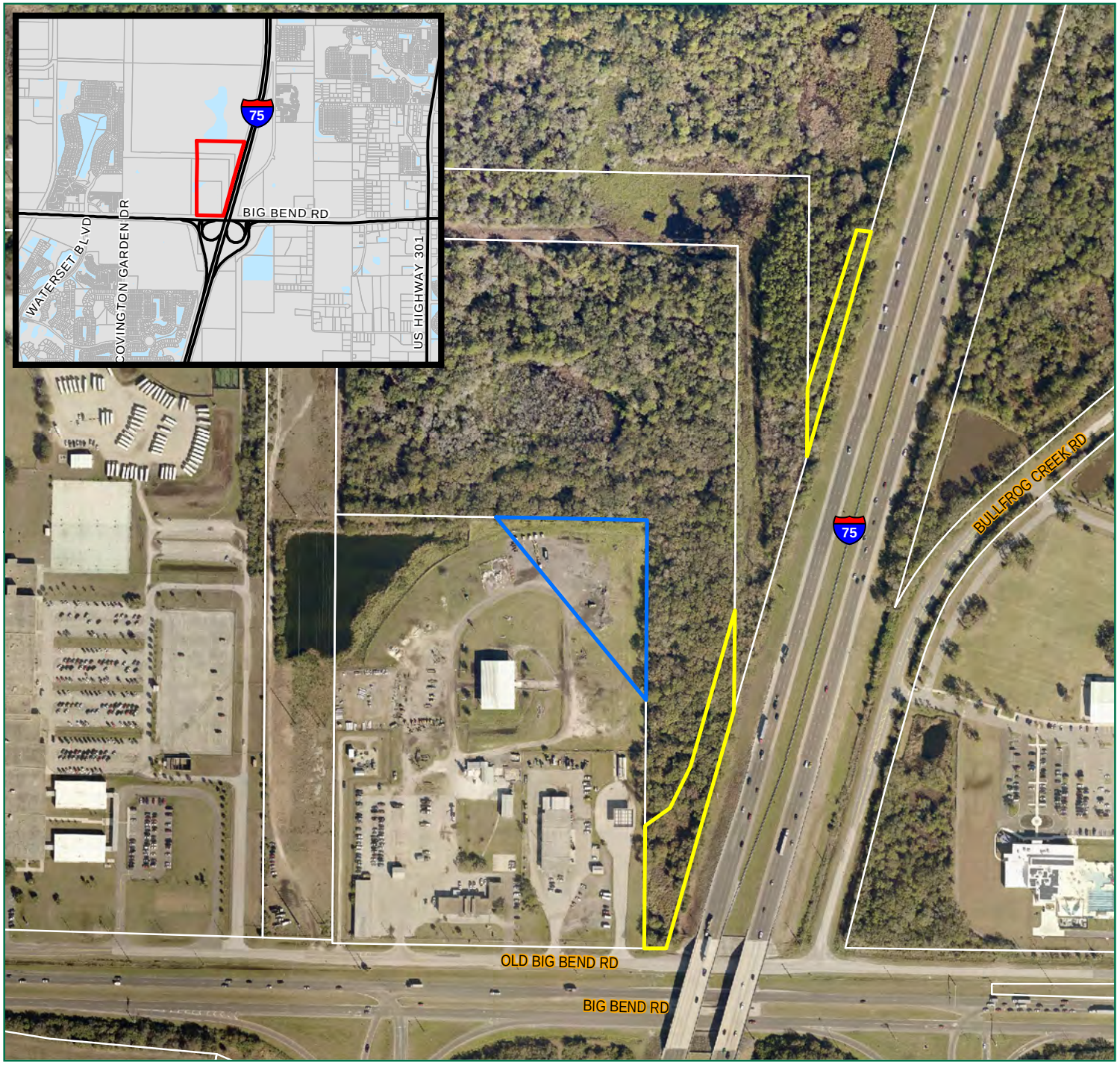
0 225 450 900
Feet

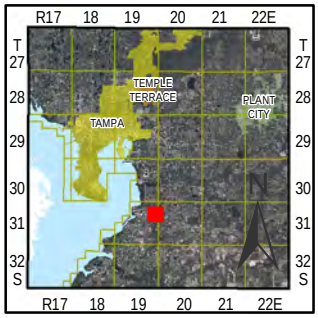
Lease 4133 - Amendment 1

Hillsborough County, Florida

File Location: DSL_Data\BLMS\STANDARD\STANDARD\CURRENT UPLAND EMPLOYEES\Dalton_L\BPLA Maps\AID43772\AID43772\AID43772.aprx
Date Saved: 1/6/2022 3:41 PM
Map Created By: Laurel Dalton

208-099-R
Golder Aster Scrub Lease Amendment





LEGEND

Property being added to lease

Property being removed from lease

SEC 12 TWP 31S RNG 19E

Hillsborough County Florida

601 E Kennedy Blvd, Tampa, FL 33602
(813) 272-5900
printroom@hillsboroughcounty.org

NOTE: Every reasonable effort has been made to assure the accuracy of this map.Hillsborough County does not assume any liability arising from use of this map. THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, either expressed or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

SOURCE: This map has been prepared for the inventory of real property found within Hillsborough County and is compiled from recorded deeds, plats, and other public records; it has been based on BEST AVAILABLE data.

Users of this map are hereby notified that the aforementioned public primary information sources should be consulted for verification of the information contained on this map.

Date: 06/27/2019 Path: W:\Real_Estate\G19-1000_REFS_Board_Items_2019\I75_BigBend_Interchange_G19-203\Maps\I75_BigBend_Interchange 2022.mxd

Appendix B
Timber Assessment of Golden Aster Scrub Preserve

TIMBER ASSESSEMT

GOLDEN ASTER SCRUB PRESERVE
(HILLSBOROUGH COUNTY ELAPP)
PREPARED BY:
MICHAEL EDWARDS, SENIOR FORESTER
OTHER PUBLIC LANDS REGION 3 & 4
FLORIDA FOREST SERVICE

February 18, 2022

PURPOSE

This document is intended to fulfill the timber assessment requirement for Golden Aster Scrub Preserve (GASP) of Hillsborough County's Environmental Lands Acquisition, and Protection Program (ELAPP) as required by Section 1. Section 253.036, Florida Statutes. The goal of this timber assessment is to evaluate the potential, and feasibility of managing timber resources for conservation, and revenue generation purposes.

BACKGROUND

LOCATION
The legal description of GASP property location is Sections 1, 2 and 12 of Township 31 South, Range 19 East, Hillsborough County, Florida. GASP is in the Alafia River Watershed, eastern Hillsborough County. GASP is located west of I-75 and north of Big Bend Road (SR 672), near Apollo Beach, Florida.

HISTORY
The 1,191.40-acre GASP site was purchased by Hillsborough County in 1995.The county then sold most of the land to the State of Florida in 1996 and is now leasing and managing the preserve.

PAST LAND MANAGEMENT
The GASP has been used for open cattle grazing for the last 70 years. During the construction of I-75 in the 1980s, a portion of the site was used for an asphalt manufacturing plant. In addition, an extraction operation was active at that time, providing fill dirt for the construction of the highway. The extraction operation left two lakes on the site, and the asphalt plant site, although removed, has left a disturbed area vegetated with opportunistic species.

ADJACENT LAND USE
Electrical transmission corridors split GASP down the middle north to south, as well as along the southern tip. The CSX Transportation System, Inc. railroad forms the western boundary. The surrounding GASP is low to medium density residential areas, agriculture, and institutional with the location of Eisenhower Junior High and East Bay High School on the southern boundary of GASP. A Hillsborough County maintenance unit is also found on the southern boundary.

PRESCRIBED BURN UNITS
Local resource managers have designated Burn Units (BU) on GASP. There are 24 BU that range in size from 14 acres to 105 acres. BU were based on natural fire breaks, the initial fuel loading, and consistent cover type. Hillsborough County began their prescribed burn program to restore fire adapted natural communities back to a more natural fire return interval. Managers started burning in 1996 and have burned almost every year up to most recent records of 2020. Managers have used chopping as a fuels

management tool along with prescribed fire to widen control lines near trouble areas like I-75 and to reduce stress to overstory trees when burning in overgrown understories.

GOALS AND OBJECTIVES

A field visit and discussions with the GASP Environmental Lands Management Coordinator was conducted on November 16, 2021. Also, a document review of the of the 2008 GASP Resource Management Plan's goals, and objectives was completed. This background information has resulted in the identification of three goals and eight objectives that can be achieved through silvicultural treatments of the GASP timber resources. It is feasible to manage timber resources for conservation of natural resources, plants, and wildlife with the possibility for revenue generation, while meeting HC's goals and objectives described below.

GOALS

- Protect listed species.
- Conduct prescribed burns/ vegetation management.
- Control invasive exotic plant and animal species.
- Conduct wildlife surveys.

OBJECTIVES

- Protect and manage all listed species populations in GASP. Specifically, Florida golden asters, Florida scrub jays, and gopher tortoises.
- Conduct prescribed burns and other vegetation management measures to improve habitat conditions and reduce fuel loads.
- Manage invasive exotic species in GASP. Survey and map new invasive exotic plant and animal species and track treated areas (torpedo grass and Cogongrass).
- Map listed species and implement management strategies for protection of listed species.

EXISTING CONDITIONS

ECOLOGICIAL COMMUNITIES

Hillsborough County used the Florida Natural Areas Inventory (FNAI) to conduct a 2020 Plant Community Type Mapping Report. In this report FNAI described nine current natural communities and one current altered community type on GASP. This timber assessment will address four natural communities and one altered landcover community, covering approximately eighty-five percent of the total acres on GASP. Like the BU, resource managers use Management Units (MU) for other land management activities and will be referred to later in the timber assessment as (MU) when identifying timber management recommendations.

WET FLATWOODS (114 acres) MU (1a, 1b, 2,3, 8a, 8b, 11)

The wet flatwoods community comprises approximately 9.6% of the total acreage on GASP. On the eastern parcel of GASP wet flatwoods occur mostly east of the scrub, surrounding several depression marshes. On the western parcel, wet flatwoods commonly form a mosaic within the mesic flatwoods. Most wet flatwoods on GASP are heavily fire suppressed. On the southeastern corner of the property, most historic wet flatwoods have converted to successional hardwood forest. On the western parcel, roughly half have transitioned to hydric hammock. The canopy and subcanopy is primarily uneven aged slash pine, with 30 square feet of basal area. Other tree species including sweetbay, swamp laurel oak and cabbage palm. The shrub layer is dense with St. John's wort dahoon, gallberry fetterbush southern bayberry, swamp bay, saw palmetto, American snowbell (*Styrax americanus*), and Darrow's blueberry. Herbaceous cover is moderate to dense and includes blue maidencane, purple bluestem, wiregrass, pink sundew, slender flattop goldenrod,

narrowleaf sunflower, clustered bushmint, Carolina redroot, shrubby primrose willow, cinnamon fern, procession flower, yellow milkwort, maid marian, Nuttall's meadowbeauty, Carolina wild petunia, , sugarcane plumegrass, and yellow hatpins.The main method for managing this community is with prescribed fire and mechanical removal of encroaching hardwoods from the hammocks. The FNAI fire return interval is two to four years. Where wiregrass and other native herbaceous groundcover is missing, reintroduction by seed or plants may be necessary. The wet flatwoods do not have enough mature pine basal area to require a timber thinning. Natural regeneration of the slash pines looks to be adequate.

MESIC FLATWOODS (518 acres) MU (1a, 1b, 2, 3, 4, 5, 6a, 7, 8a, 8b, 10a, 10b, 11a, 16a, 16b)
The mesic flatwoods community cover the most area on GASP. Mesic flatwoods comprise approximately 44% of the total acreage on GASP. Roads and trails divide the mesic flatwoods, although they appear mostly unchanged from their historic condition. Some of the original acreage has been lost due to creation of the artificial ponds. Some of the historical mesic flatwoods have succeeded into mesic hammock and hardwood forest due to fire suppression, particularly in the southeastern corner. The canopy and subcanopy are primarily uneven aged longleaf pine, with a range of 10 to 30 square feet of basal area. On the western parcel, fire suppression has allowed the mesic flatwoods to become overgrown, making it difficult to distinguish from the wet flatwoods. The canopy in this area includes longleaf pine or slash pine, with a sparse to moderate subcanopy of water oak, live oak, and cabbage palm. Typical shrubs include netted pawpaw tarflower dwarf huckleberry, roundpod St. John's wort, Atlantic St. John's wort, fourpetal St. John's wort gallberry, coastalplain staggerbush, fetterbush, southern bayberry, wild pennyroyal, dwarf live oak, winged sumac, saw palmetto, Darrow's blueberry, shiny blueberry, and deerberry . The herb layer is sparse to moderate, depending on shrub cover, and includes blue maidencane, purple bluestem, wiregrass, Michaux's croton, cypress witchgrass, hemlock witchgrass, tall elephantsfoot, dogfennel, slender flattop goldenrod, Elliott's milkpea, pinweed, thin paspalum, yellow milkwort, bracken fern, sweet goldenrod, lopsided indiangrass, and yellow-eyed grass. The main method for managing this community is with prescribed fire and mechanical removal of encroaching hardwoods from the hammocks. The FNAI fire return interval is two to four years. Where wiregrass and other native herbaceous groundcover is missing, reintroduction by seed or plants may be necessary. The wet flatwoods do not have enough mature pine basal area to require a timber thinning. Natural regeneration of the pines looks to be adequate in some areas.

SCRUB (121 acres) MU (6a, 6b, 9, 12, 13, 15, 16a, 16b)
The scrub covers approximately 10% of the area on GASP. A large scrub ridge extends from the northeast to southwest corner in the eastern parcel. Approximately 14 acres of historic scrub has been converted to clearings, roads, or artificial ponds. The canopy is sand pine on some areas of scrub, but other areas lack this canopy. The tall and short shrub layers are dense with scrub oaks. A sparse herbaceous layer includes capillary hairsedge, coastalplain chaffhead spurge, Piedmont pinweed and *blackroot*. The sand pine has a maximum of 10 square feet of basal area at its' most dense. The scrub doesn't have a pine canopy that can be managed by commercial timber sale. The scrub on the northeastern side of the property differs in structure from the largest section of scrub to the south. Fire suppression has led to a scattered canopy of sand live oak. The saw palmetto is much more common there than scrub oaks and wiregrass is occasional throughout. The overall structure is very similar to overgrown scrubby flatwoods, but longleaf pines are absent. Scrub The scrub oaks and saw palmetto require a combination of chopping and burning to create open sandy patches and keep the shrub height low for optimum scrub jay habitat. The FNAI fire return interval is eight to fifteen years.

SCRUBBY FLATWOODS (115) acres) MU (6a, 6b, 9, 13, 15, 16a, 16b)
Scrubby flatwoods account for approximately 10% of the total acreage at GASP. The scrubby flatwoods border the entire scrub ridge and grade into mesic flatwoods. Approximately 18 acres of historic scrubby flatwoods has been converted to clearings, roads, or artificial ponds. The extant scrubby flatwoods on GASP have a canopy of longleaf pine and/or sand pine. The mature pines are approximately one to two trees per acre. Shrubs are moderate to dense with open patches of sand throughout. Typical shrubs include netted

pawpaw, pricklypear, sand live oak, myrtle oak, saw palmetto, and shiny blueberry. Scattered herbs include wiregrass, scrubland goldenaster, tread softly, pinebarren frostweed, fragrant eryngo, Piedmont pinweed, candyroot, sandyfield beaksedge, and pineland scalypink. Managing the scrubby flatwoods through a commercial timber sale is not practical. Avoiding additional ground disturbance is important. Prescribed fire should be used to control the shrub height and promote native groundcover. The FNAI fire return interval varies based on the condition of the scrubby flatwoods. In some areas control of understory re-growth may require a temporary fire return interval as short as three years. Fire return intervals of more than five years and less than fifteen years would allow for maximal acorn production while preventing the oaks from growing to heights detrimental to Florida scrub-jays.

ALTERED LANDCOVER (17.04 acres) MU (18)
This MU consists of approximately 1%of the total acreage of GASP. Altered land cover refers to areas where native vegetation has been disturbed to the degree that they don't resemble a natural community. Altered land cover types in GASP include artificial ponds, developed areas, clearings, roads, and successional hardwood forest. It may not be practical or desirable to restore some of the altered land cover areas (roads and developed areas) to the historic natural community.

On the eastern parcel of GASP, there is a clearing of historic scrub and scrubby flatwoods in the northeastern corner where an asphalt manufacturing plant once stood in the 1980s. Cabbage palm is occasional in the canopy, subcanopy and shrub layers. Other shrubs include groundsel tree, Brazilian pepper and saw palmetto. Herbs are dense and weedy, including common ragweed partridge pea, Virginia buttonweed ,fingergrass, rustweed, licoriceweed, buttonweed, and dropseed.

On GASP, successional hardwood forest occupies areas of former scrubby, mesic, and wet flatwoods where prolonged fire suppression has resulted in significant changes to the plant community composition and structure. The canopy consists of slash pine, swamp laurel oak, water oak, and live oak. The subcanopy includes loblolly bay, dahoon, swamp bay, and cabbage palm. The shrub layer is fairly scattered under the heavy shade of canopy trees and incudes remnant flatwoods vegetation such as huckleberry, gallberry, fetterbush, saw palmetto, and shiny blueberry. Herbaceous species include bluestem, Carolina redroot, whitehead bogbutton, maidencane, bracken fern, and Virginia chain fern.

Both the clearing and successional hardwood forest do not have a pine overstory dense enough to be managed by commercial timber sale. A combination of prescribed fire, chemical and mechanical treatments of the woody and invasive species should be used to restore these altered communities to their natural composition and function. FNAI doesn't have a suggested fire return interval for altered landcover types. Burning should be as often as necessary to achieve restoration goals. Perhaps burning these areas with the surrounding natural communities would be the easiest way. Artificial regeneration of pines and ground cover like wiregrass may be needed.

SOILS AND PRODUCTIVITY
The United States Department of Agriculture (USDA), Natural Resource Conservation Service (NRCS) publishes soil series profiles and site index (SI) for pines.

WET FLATWOODS SOIL TYPE		
#5 BASINGER, HOLOPAW & SAMSULA	NEARLY LEVEL	PINES NOT SUITABLE, PONDING/PROLONGED WETNESS
#27 MALABAR SAND PINE	NEARLY LEVEL	SI- SP 80, LLP 70

#29 MYAKKA FINE SAND	0-2% SLOPE	SI- SP 70, LLP 60
#57WABASSO FINE SAND	NEARLY LEVEL	SI- SP 80, LLP 65, LB 80

MESIC FLATWOODS SOIL TYPE		
#5 BASINGER, HOLOPAW & SAMSULA	NEARLY LEVEL	PINES NOT SUITABLE, PONDING/PROLONGED WETNESS
#15 FELDA FINE SAND	NEARLY LEVEL	SI- SP 80, LLP 65
#27 MALABAR SAND PINE	NEARLY LEVEL	SI- SP 80, LLP 70
#29 MYAKKA FINE SAND	0-2% SLOPE	SI- SP 70, LLP 60
#41 POMELLO FINE SAND	NEARLY LEVEL-GENTLY SLOPING	SI-SD 60, SP 70, LLP 60
#52 SMYRNA	NEARLY LEVEL	SI- SP 80, LLP 70
#57WABASSO FINE SAND	NEARLY LEVEL	SI- SP 80, LLP 65, LB 80

SCRUB SOIL TYPES		
#3 ARCHBOLD FINE SAND	NEARLY LEVEL	SI- SD 60
#29 MYAKKA FINE SAND	0-2% SLOPE	SI- SP 70, LLP 60
#41 POMELLO FINE SAND	NEARLY LEVEL	SI- SD 60, SP 70, LLP 60

SCRUBBY FLATWOODS SOIL TYPES		
#3 ARCHBOLD FINE SAND	NEARLY LEVEL	SI- SD 60
#29 MYAKKA FINE SAND	0-2% SLOPE	SI- SP 70, LLP 60
#41 POMELLO FINE SAND	NEARLY LEVEL	SI- SD 60, SP 70, LLP 60

ALTERED LANDCOVER SOIL TYPES

#29 MYAKKA FINE SAND	0-2% SLOPE	SI- SP 70, LLP 60
#41 POMELLO FINE SAND	NEARLY LEVEL	SI- SD 60, SP 70, LLP 60
#46 ST. JOHNS FINE SAND	NEARLY LEVEL	SI- SP 80, LLP 70

GENERAL TIMBER MANAGEMENT GUIDELINES

Note: Any timber harvest, site preparation, seedling planting, or other timber management activity will adhere to Florida's Silviculture Best Management Practices (BMP), available online. In addition, all known historical and archeological sites will also be protected.

A useful measurement of tree stocking and density is basal area (BA). BA is the total cross-sectional area in square feet per acre of all the trees at a certain point in the MU. The diameter of individual trees is measured at four and one-half feet above the ground. This height is referred to as the diameter breast height (DBH). A fully stocked pine MU has enough trees per acre of a size large enough to utilize the growing space without causing over-crowding. SP and LLP MU with 80 to 120 square feet of BA per acre are considered fully stocked. It requires more, smaller diameter trees than it does larger diameter trees to equal one square foot of BA. For example: It takes 357 evenly spaced, six-inch DBH trees to equal 70 square feet BA per acre. Whereas only 89 twelve-inch DBH trees per acre equal the same 70 square feet BA. BA can be roughly correlated to crown coverage and therefore needle-cast. About 40 to 60 square feet BA per acre should provide sufficient needle-cast to carry prescribed fire and adequate sunlight for native grasses to be maintained.

Natural communities are dynamic things. A MU of scattered mature trees has not looked exactly as it does today throughout its existence. In natural, pine dominated forest systems trees die because they become old and less able to withstand insect and disease attack. SP has a life expectancy of about 100 years. LLP has a life expectancy of 250 years or more. Bark beetles might invade a weakened tree then multiply and kill some of its neighbors. Lightning strikes and windstorms do the same thing. Thus, holes of various sizes are continuously being created in the canopy. These openings allow full sunlight to reach the forest floor. In addition, lightning caused fires to burn away leaf litter and expose bare mineral soil. The bare soil and canopy openings permit large numbers of sun loving pine seedlings to become established and grow straight and tall.

Where naturally occurring fire has kept the understory open, pine seedlings become established in these canopy holes at very high densities. It is common to have ten to twenty thousand seedlings per acre in scattered openings. Recurrent wildfires and competition for sunlight, moisture and nutrients favor the strongest, fastest growing pine saplings. The rest die off continually over the life of a stand of trees until the trees mature and another opening is created that replaces the survivors with young seedlings again. The result is an uneven aged MU where each group of trees created by a canopy opening is about the same age. However, the MU is a mosaic of clusters that have different ages and densities. The long-term BA will fluctuate around a constant figure depending on soil productivity (as low as 20 square feet per acre on extremely poor sites, up to 80 square feet per acre on highly productive sites). The goal of ecologically based timber management is to mimic these natural processes and still be able to harvest trees that are destined to die anyway. The challenge is to capture the value of the timber while minimizing any negative impact on the system.

Thinning type harvests in pine MU help maintain the health and vigor of the stand by removing weak,

diseased, and deformed trees. Enough co-dominant trees are removed during thinning to insure crown retention and continued growth in the remaining trees. To create uneven aged pine MU, group selection openings are cut during thinning activities. These openings allow young trees to become established by seed falling from nearby trees or by planting seedlings. Since pine seedlings require direct sunlight to grow, all trees within the opening must be removed. However, to minimize the visual impact, openings can be as small as one-half acre. For natural regeneration, the minimum width of the openings is about two to three chains (1 chain = 66 feet). Lack of cover followed by dense stands of young pine trees created by large openings can become impediments to animal foraging and migration patterns. For example: To prevent saplings growing in these openings from becoming barriers to RCW flight patterns, group selections should not exceed five acres in size.

Combined acreage of all openings cut within a MU during each thinning is kept to no more than five to ten percent of the total MU acreage. Since each MU only gets thinned every ten-plus years, over-harvesting of old-growth trees is avoided, and a steady supply of young trees is ensured. For example: suppose that today there is a MU of 20-year-old pine trees. Every 10 years 95 percent of a MU gets thinned to keep the canopy open and 5 percent clearcut to allow regeneration of young pines. At the end of the tenth cutting cycle (100 years from now) 50 percent of a MU would have 120 plus year-old trees and 50 percent would range from seedlings to 100-year-old trees. If the cutting cycle is extended to 20 years (which is more likely on poorer soils) and 10 percent is cut for openings, the age distribution at the end of 100 years is the same as for the 10-year cycle.

Planting activities, group selection openings, hardwood control measures, and natural regeneration in thin stands will produce young tree stands of various sizes. A well-stocked MU of young pine trees will usually require the removal of weak, diseased, and some overcrowded trees beginning by the age of 15 to 20 years. By this time, the crowns have grown together and ground cover begins to get shaded out and hardwoods can begin to compete with shade intolerant pine seedlings. Harvesting a portion of the timber maintains healthy pine growth and provides sunlight to the forest floor. Trees removed in the thinning process can be sold to generate revenue to be used in other land management projects. Likely markets for early thinnings from pine stands currently include pulpwood, fence posts and landscape mulch.

Due to shading effects, trees grown in tight spacing produce fewer and smaller lower limbs. The shedding of the lower limbs makes them more desirable for fence posts and later, more valuable products. Planting at least 500 seedlings per acre also helps ensure the marketability of the pine trees and increases future management options.

The need for second and later thinnings depend on how low the BA was taken in the first thinning and successive growth rate. If the BA is reduced to 50 to 70 square feet per acre in the first cut, another harvest will probably be needed in ten to fifteen years. Trees removed from the second and succeeding operations produce ever more valuable products and therefore more money. Current market conditions have some second thinning products worth at least five times as much as the original wood that was cut. Third thinning trees can be worth twice as much as the second thin. Revenue can be generated, and the MU can still have a healthy ecosystem.

TIMBER MANAGEMENT RECOMENDATIONS

GASP is a large tract of land. Identifying individual MU and defining exact acres requiring a specific management practice is beyond the scope of this timber assessment. A more detailed timber inventory of all the MU would be required to properly plan long-term timber management recommendations. The following are general descriptions and management recommendations. The main goal of HC managers is to preserve, restore, enhance, and maintain GASP's natural plant communities. Most of the objectives for GASP comes down to establishing and maintaining a healthy ground cover of grasses and forbs.

Adequate sunlight must reach the ground to achieve these objectives. From a timber management standpoint, this means that in general pine-stocking levels should be maintained at a BA range of 40 to 60 square feet per acre.

LONG TERM RECOMENDATIONS

Many factors affect the need for and timing of future thinnings. These include initial planting density, number of trees surviving to merchantable size, crown closure (ground cover shading), and a live crown ratio below 40 percent. The following recommendations are guidelines to be used in areas where the described conditions exist on newly acquired lands, currently unknown stands, and in the distant future as planted seedlings, and natural regeneration matures.

BA < 10- These MU have insufficient pine trees to regenerate themselves. Control the saw palmetto and woody species using roller drum choppers and prescribed fire. Plant forest source LLP or SP as described under the *Artificial Regeneration* section below.

10 to 30 BA– These MU may or may not have enough seed trees to regenerate themselves. Though for certain, any further loss of mature trees could preclude a healthy future. MU with these marginally low BA should be included in the regeneration plan. See *Natural* and *Artificial Regeneration* sections below.

40 to 70 BA– These MU have an adequate number of pine trees to utilize the growing space without overcrowding. No harvests are necessary in these MU unless thinning is required to allow access for roller drum chopping of palmettos, or overgrown woody vegetation. If chopping is needed, follow spacing recommendations as described in the *Natural Regeneration* section. In large stands with little regeneration, some group selection openings may be cut to promote seedling establishment.

80 BA & UP– These MU with this level of stocking is probably beginning to shade out the ground cover. These MU should be thinned to 40 to 60 square feet BA. If chopping for palmetto control is needed, follow spacing recommendations as described in the natural regeneration section. Group selection openings should be scattered throughout these MU to promote seedling establishment.

SALVAGE SALES

On occasion, small volumes of wood may need to be removed due to fire, windstorm, insect, or other damage. The decision whether to harvest the affected timber depends on the threat to the surrounding MU and the volume/value of the trees involved. For example, small, isolated lightning-strike beetle kills are a natural part of a healthy ecosystem and normally would not be cut. However, if a drought caused the insect infestation to spread, the infected trees and a buffer zone might have to be removed. *Note: due to forest health and timber market factors, it is recommended contacting the FFS Forester as soon as possible.* Many times, a salvage sale may be added to an existing sale to expedite the removal of dead and dying trees.

<u>REFORESTATION</u>

NATURAL REGENERATION (ONLY USED WITH MATURE, CONE BEARING TREES)

Most of the MU on GASP can utilize natural regeneration. The following methods of natural regeneration should be applied to current and future MU that have adequate number of seed trees. SP and LLP require 30 square feet BA per acre of seed trees. That would be a minimum of 12 trees per acre at 10" DBH. SP generally produce seeds on a three-year cycle. LLP produce seed from three to nine years. When a good seed crop is anticipated by flower or cone crop counts the previous year, the MU should be treated with one of the following site preparation methods described below**.**

10 to 30 BA- In these MU Control saw palmetto height, and density. This can be accomplished by burning the MU in late winter or early spring to remove most of the fronds. Then roller drum chop the palmettos prior to the summer rainy season with a chopper heavy enough to sever their stems (probably a medium or heavy, single, or tandem, but not offset). A second burn in the summer after the chopping is complete would be beneficial if a fire will carry.

If for any reason an adequate number of young seedlings are not established by the second summer following the initial chopping, burn the stand again prior to end of the rainy season. This will allow some grasses to re-grow enough to protect the seeds and fragile seedlings from the hot sun.

30 to 50 BA- In these MU, again control saw palmetto as above. These MU may require thinning alone or in combination with group selection cuts to allow the roller choppers to treat the palmettos without killing remnant pine trees. Spacing between leave trees or clusters of leave trees should be at least 20 to 30 feet to give room for the tractor and chopper to operate. Group selection openings should be at least two chains (132 feet) wide to allow adequate sunlight for sapling growth. Follow the fire regime as described above.

> 50 BA- These MU need reforestation treatments only where saw palmetto must be controlled or additional age classes are desired (i.e., insufficient number of trees younger than ten years old). Where palmetto control is a priority, thin pines to 30 to 40 sq. ft. per acre (at least 20 to 30 feet between leave trees or clusters if chopping is required). Scatter group selection openings throughout the MU. Roller chop the MU, evaluate success, and implement fire regime as above. If palmetto is not a problem, skip the chopping, then evaluate success and burn as above.
Successful establishment of SP MU requires 1,000 or more seedlings per acre to have seeded in and begin growing. Successful establishment of LLP stand requires 4,500 seedlings per acre. Timing of reintroduction of prescribed fire into regenerated MU depends on seedling height growth and fuel loads. Generally, 400 or more trees per acre should be at least head-high in light fuels before the MU is burned. With short trees and heavier fuels, the first burn might have to be accomplished at night to prevent excessive scorch and mortality. These MU can probably be returned to the normal burn rotation following the first post-establishment burn if fuels are light and fire frequent enough. See the section*; Artificial Regeneration*, if more consistent and quicker results are required.

ARTIFICIAL REGENERATION
The altered communities and portions of the mesic flatwoods MU on GASP will require artificial regeneration to restore the land back to historical natural communities of; mesic, wet, and scrubby flatwoods. Forest source LLP or SP seedlings should be planted in meandering strips to make a more natural appearance to the stands. Cattle should not be allowed to graze pastures for two to five years after planting pine seedlings. To minimize damage from reproduction weevils, do not plant pine seedlings where pine stumps are present until at least one growing season has passed since the harvest.

The following recommendations are designed to generate the highest possible revenue stream while maintaining healthy ground cover. In areas where native ground cover is to be restored, consider planting pine seedlings immediately after sowing the seed and packing of the soil. This should help reduce losses due to moisture competition from established grasses during dry weather. Follow the fire regime described above in the *Natural Regeneration* section.

SITE PREPARATION
Prescribed fire may be used to prepare the planting site for hand planting or machine planting. Burn in the fall to provide access for planters, reduce groundcover competition (short term), hardwood and palmetto control, and allow adequate sunlight to the ground. Negative aspects of fall burning include lack of suitable habitat for wildlife until the spring growing season, and if not performed under the correct

weather conditions, scorching of mature pine over-story can occur.

Mowing and roller chopping have also been used for site preparation; these techniques allow sunlight to reach the germinating seed or planted seedlings. Negative impacts include mowed/chopped debris on the ground, which can inhibit good soil to seed contact, and potentially the buildup of too much fuel for burning that can be damaging to new seedlings. Mowing "selects" for grasses, but like disking, roller chopping selects for forbs resulting in reduced fine fuels and soil disturbance of native groundcover.

A word of caution about planting in established pastures. To ensure adequate survival and avoid the expense of replanting, some form of herbicidal control, scalping, or deep discing of heavy grasses may be necessary. Competition from grass for soil moisture during hot, dry weather can cause severe losses of young seedlings. Applying a contact herbicide such as Roundup either in two-foot-wide strips or in spots can control these grasses. The herbicide should be applied far enough in advance of planting time, so the grasses have time to "brown up" and indicate where to plant the seedlings.

If deep discing is used on heavy grass pasture, it should be accomplished during dry weather. The upturned earth should remain dry for about one month. Then the soil should be roller packed or have sufficient rainfall to settle and remove air pockets prior to planting. This method of grass control may be less expensive than herbicide treatments. However, the potential exists for poor survival due to inadequate grass control and improperly compacted soil. In addition, noxious weed seeds are often brought to the surface where they germinate and out-compete with the young pines or cause other problems. Therefore, this method is not recommended.

A release treatment of herbicide can be applied after planting to aid in the new seedlings survival. Once seedlings have started root growth apply a six-ft. band over planted rows in mid-April to mid-May. For either SP or LLP seedlings, use 2 oz./acre of sulfometuron + 24 oz./acre hexazinone for herbaceous weed control (wiregrass is tolerant). This could be used for example if the site prep could not be completed before planting. If the site has extra dense hardwoods that should be controlled apply a broadcast foliar spray in June to October, 40-48 oz. imazapyr + 2-3 quarts of glyphosate. Alternatively, a spring treatment with hexazinone 2-6 quarts could be applied to treat the hardwoods to allow the seedlings adequate growth before regular prescribed burning can resume. Some units may require a combination of chemical then prescribed burn or mowing/chopping then prescribed burn to prepare the site for planting and ensure good survival in the subsequent years.

HAND PLANTING

Hand planting of containerized (tubeling) forest source LLP or SP seedlings is one option for reestablishment in areas where an inadequate number of seed trees exist. Bare-root trees are planted in the winter. Tubelings can be planted in winter or summer, thereby extending the planting season. Plant approximately 600 bare root seedlings per acre at varying spacing but averaging 6' X 12' overall. Due to the increased likelihood of survival and higher cost of containerized seedlings, as few as 500 seedlings per acre can be planted (8' X 11'). Still, for fear of not being able to reestablish essential grasses, land managers may insist on planting less than the recommended number of pine seedlings overall. To ameliorate these concerns, 400 seedlings per acre can be hand planted in small, irregularly shaped clusters (2 to 5 acres) with two to five chains between clusters. If machine planting is employed, plant three to five curved rows (9' X 12'). Leave 2 to 5 chains unplanted between sets of rows. The entire area can be inoculated with native grass seed prior to planting the SP or LLP seedlings. However, tremendous cost savings can be made by only sowing the area between tree plantings and relying on these areas to seed the rest over time.

MACHINE PLANTING

Meander planting containerized LLP or SP seedlings at an average spacing of 6' X 12' yields about 600

trees per acre. It is more difficult to vary the spacing and make the planting look random with machine planting. This is due primarily to the inability of tree planters to make sharp turns and still pack the soil around the seedlings roots. Tight turns are also hard on the planter's bearings. The desired effect can be obtained by gradually curving the planting rows and varying the distance between and within the rows. Another way to create the random look is to locate the planting rows twice as far apart as normal (averaging approximately 24'). Then, plant a second set of rows at some angle approaching 90 degrees to the first set of rows spaced about the same distance apart.

Again, competition for soil moisture during dry weather can cause heavy losses of seedlings and waste of planting costs. Where grass is thick, it is best to either herbicide strips as described above or use a combination planter/scalper to plant the seedlings. The scalper should be set to no more than 2 to 3 inches deep and 18 to 24 inches wide. These settings will minimize soil disturbance and maintain continuity of fuels for future prescribed burns, but the seedlings will have a decent chance of survival.

GROUND COVER RESTORATION

Portions of the ground cover on of GASP have been severely impact by past management practices. Approximately 1% of the current GASP MU acreage is altered landcover. The historical natural communities would have been either; wet flatwoods, mesic flatwoods, scrubby flatwoods, or scrub. The native ground cover has been altered, converted, or invaded by non-native and weedy plant species. Native grasses and forbs were partially or entirely replaced by non-natives and weedy species that usually will not burn during the natural lightning-induced fire season.

Reestablishment of native groundcovers can be extremely expensive. Many methods have been tried with varying degrees of success. The following describes an alternative method to the expensive direct planting of containerized seedlings. It has worked on similar sites across the region. To get the ground ready to accept the seed, improved pastures often require multiple treatments with high priced herbicides. One or more passes with a heavy disc usually follow the herbicide applications. Depending on the ground cover, pastures may only need a single disking and one or no herbicide spraying prior to seeding. The altered landcover on GASP that have non-native and weedy species should be removed through a combination of mechanical, chemical and prescribed fire before the planting of native ground cover begins.

Undisturbed donor sites are chosen that have similar soil types as the area to be re-vegetated. Sites are burned at the right time (usually spring to early summer) to produce viable seed from a broad spectrum of native plants. Mechanical harvesters are used to gather the seeds. More than one trip maybe required, over a period of weeks, and with the machine set at different heights to get seeds from all the species found at the donor site. This precious cargo is hauled to the treatment site and scattered across the field using a hay blower. Some form of roller, light disc or packer should then be used to insure close contact with the soil. Results vary, but if everything goes well, at least some of each species becomes established. Following the planting with well-timed prescribed burns should stimulate seed production in the newly established vegetation and further spread each species.

PRESCRIBED FIRE

Frequent lightning induced fires are natural to most Florida's natural communities. Prior to European settlement, they occurred at regular intervals of one to five years. Without fire, native habitats would probably have turned into densely shaded hardwood hammocks. Introduction of effective fire suppression in the mid-1900's resulted in thick MU of saw-palmetto and subsequent loss of other grassy and herbaceous ground covers. Use of prescribed fire is essential to the maintenance of open healthy, pine-dominated ecosystems. The needles shed by pine trees planted in old pastures help carry fire across the

landscape which in turn helps maintain fire dependent communities.

Caution must be exercised when reintroducing fire into these systems, as desirable as burning is. Survival of (expensive, newly planted seedlings or time intensive, natural seedlings) as well as valuable mature timber depends on timing and careful execution of burns. To prevent damage to delicate root systems and avoid smoky duff fires, be sure that there is adequate moisture in any organic matter thicker than approximately one inch. In stands with heavy duff layers, try to burn no more than one inch of duff at a time on approximately two to three-year intervals. At least the first burn should be at nighttime, during the dormant season after the seedlings have reached six feet or more in height and there is enough needle litter to carry the fire. If ground fuels are not too heavy, succeeding burns can be switched to the growing season.

The Florida Department of Environmental Protection (DEP) use three criteria to evaluate prescribed burning of natural communities during a Land Management Review; number of acres burned, frequency of burn, and quality of burn (appropriate season). Using DEP's criteria as guidance in evaluation of the GASP prescribed burn program, the following observations have been made.

- **Number of acres burned**: There are 949 fire adapted acres on GASP. Managers have prescribed burned 155.69 acres in the past five years. This is 16% of burnable acres. This number of acres burned is considered insufficient.
- **Frequency**: It appears from field observations and reviewing the Management Plan that of the BU burned in the past five years GASP has a fire frequency ranging from two and a half years to five and a half years. Most of the BU haven't received any burns in the past 5 years. This level of burn frequency is considered insufficient.
- **Quality of Burn (appropriate season)**: GASP Burn Plan varies the season of the prescribed burn based on fuel buildup and overstory tree and plant densities. Burn boss objectives are to control understory woody plants while minimizing overstory pine mortality. This quality of burning is considered good. One suggestion would be to consider adjusting the season of burning (growing or dormant) for BU based on results of the previous burns. The season to burn in depends on the objectives for the prescribed burn. Dormant season; fuels reduction, wildlife management (some), and duff removal in fire suppressed BU. Growing Season; stimulate herbaceous seeding, site prep for planting, gopher tortoise forage requirements and killing woody vegetation. Grassy fueled fires produce less lingering smoke than woody fuels. Mechanical or chemical treatments followed by frequent prescribed burns should stimulate grasses and decrease the amount of woody understory.

ACCESS

The public access gate and parking lot is located on the northeast corner of the property at 12181 East Bay Road Gibsonton, FL 3354. Maintenance access points are illustrated on the *2022 Timber Assessment Map.* There are 20.7 miles of mowed roads and trails and disked firebreaks on GASP. Approximately 70%of the roads are accessible throughout the year.

Hillsborough County should increase the network of improved roads on GASP to expand access for all management activities during all seasons. Culverts and low water crossings should be installed to aid in the accessibility to MU during wet periods. It would be beneficial to establish a few primary roads for access to the MU identified as having timber resources. Many of these roads may require reinforcement with rock or shell to support the heavy trucks used in timber operations. These road improvements will also benefit other activities including public access, wildfire control, and prescribed burning operations. Also, road improvements will reduce wear and tear on county vehicles, and equipment, while reducing travel time across GASP.

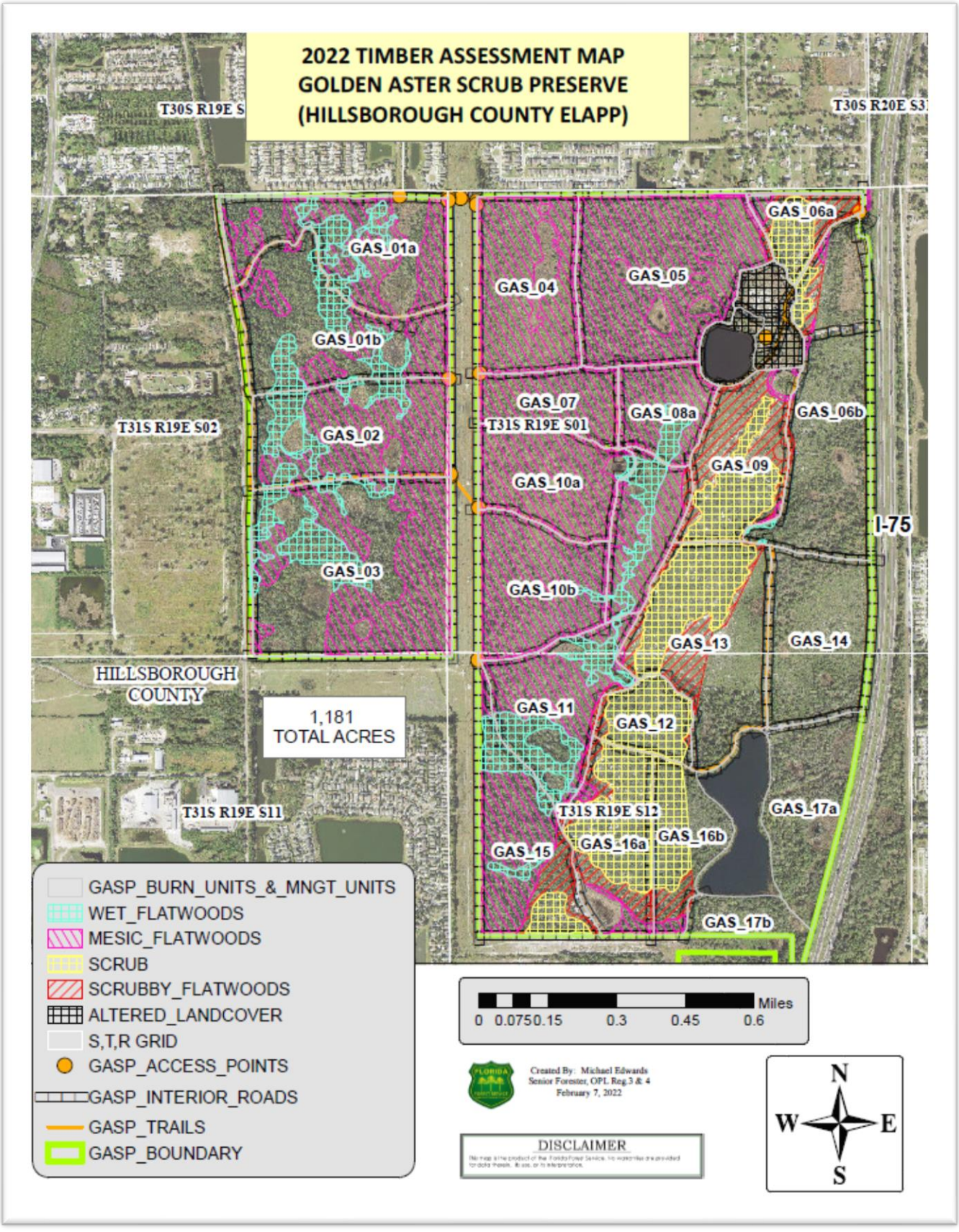
SUMMARY

The wet and mesic flatwoods natural communities assessed at GASP have a good uneven aged pine component with varying degree of native understory grasses and forbs. Currently GASP doesn't have any timber stands that can be commercially harvested. GASP managers are advised to reevaluate the timber at GASP every ten years, or whenever the management plan is revised. Timber stands are dynamic, many factors contribute to what determines the merchantability of a timber stand. Likely purchasers of forest products from GASP include a fence post company, a pole mill, and multiple mulch mills. There are seven pine straw purchasers that work in Hillsborough County. GASP is located 160 or more miles from the closest pulpwood mills. More timber is sold in the region than might be expected. Timber harvests have taken place on nearby Hillsborough County ELAPP lands, State Forests, and State Parks. The cost of hauling the trees to the larger, north Florida mills could keep timber prices down and reduce interest in timber offered for sale. Therefore, successful timber sales may require timing to match the market. When north Florida woodlands are inundated with water and south Florida is dry, loggers tend to drive long distances to obtain wood from drier land. These circumstances would allow GASP land managers to take advantage of the opportunity to sell timber that otherwise might be hard to sell. The secret to timing the markets is to be flexible about when stands should be cut and keeping up with market factors throughout the state.

In rapidly urbanizing areas of the state, public lands are often the only refuges for native plant and animal communities. Restoring and maintaining these ecosystems is an important function of land managers. Saleable timber is a byproduct of good ecosystem management. Carefully designed timber harvests protect water quality, create openings in the tree canopy allowing sunlight to reach the forest floor, promote herbaceous growth and pine regeneration. The seedlings then grow to replace trees killed by lightning, wind damage and insects or disease. Mechanical equipment involved in timber harvests helps reduce dense understory vegetation such as saw palmetto and undesirable hardwoods. Thinning of dense timber stands can result in enough space between trees to allow a tractor pulled roller-drum chopper to be used, further reducing the understory vegetation. This fuels reduction results with easier, safer, and more effective prescribed fire application. The ability for Hillsborough County to maintain a frequent burn schedule is essential to maintaining a healthy ground cover. These clearings and their ecotones are favorite spots used by wildlife for feeding, resting, mating, nesting, and rearing of offspring.

Hillsborough County land managers of GASP have expressed an in interest in restoration native groundcover. Just as important to these natural communities is the reestablishment of vertical structure provided by trees and the reintroduction of periodic fires. Needle litter from growing pines helps carry these frequent, low intensity burns. In all restoration scenarios the exact methods and results will be guided by the best available ecological information to conserve biodiversity of the affected habitats.

Clearly, managing trees for timber as part of the overall management strategy is worthwhile for many reasons. Timber sale revenues can relieve the long-term burden on taxpayers for much needed management activities. As general revenue funds become more difficult to secure, revenues generated from the sale of timber thinnings could be used to help pay for GASP Management Plan's projects like, habitat restoration, reforestation, prescribed burning, and road repair.


2022 TIMBER ASSESSMENT MAP
GOLDEN ASTER SCRUB PRESERVE
(HILLSBOROUGH COUNTY ELAPP)
T30S R19E S
T30S R20E S3
GAS_01a
GAS_01b
GAS_02
GAS_03
GAS_04
GAS_05
GAS_06a
GAS_06b
GAS_07
GAS_08a
GAS_09
GAS_10a
GAS_10b
GAS_11
GAS_12
GAS_13
GAS_14
GAS_15
GAS_16a
GAS_16b
GAS_17a
GAS_17b
T31S R19E S02
T31S R19E S01
T31S R19E S11
T31S R19E S12
I-75
HILLSBOROUGH COUNTY
1,181 TOTAL ACRES
GASP_BURN_UNITS_&_MNGT_UNITS
WET_FLATWOODS
MESIC_FLATWOODS
SCRUB
SCRUBBY_FLATWOODS
ALTERED_LANDCOVER
S,T,R GRID
GASP_ACCESS_POINTS
GASP_INTERIOR_ROADS
GASP_TRAILS
GASP_BOUNDARY
Miles
0 0.0750.15 0.3 0.45 0.6
Created By: Michael Edwards
Senior Forester, OPL Reg.3 & 4
February 7, 2022
DISCLAIMER
N
W
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S

Appendix C
Appendix C Land Management Review Reports, 2015 and 2020

2015 Land Management Review Team Report for Golden Aster Scrub Preserve

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1. Introduction

Section 259.036, F.S. requires a periodic on-site review of conservation and recreation lands titled in the name of the Board of Trustees to determine (1) whether the lands are being managed for the purposes for which they were acquired and (2) whether they are being managed in accordance with their land management plan adopted pursuant to s. 259.032, F.S. In case where the managed areas exceed 1,000 acres in size, such a review must be scheduled at least every five years. In conducting this review, a statutorily constructed review team "shall evaluate the extent to which the existing management plan provides sufficient protection to threatened or endangered species, unique or important natural or physical features, geological or hydrological functions or archaeological features. The review shall also evaluate the extent to which the land is being managed for the purposes for which it was acquired and the degree to which actual management practices, including public access, are in compliance with the adopted management plan."

The land management review teams are coordinated by the Division of State Lands and consist of representatives from the Division of Recreation and Parks (DEP), the Florida Forest Service (DACS), the Fish and Wildlife Conservation Commission, the local government in which the property is located, the DEP District in which the parcel is located, the local soil and water conservation district, a conservation organization member, and a local private land manager.

Each Land Management Review Report is divided into three sections. Section 1 provides the details of the property being reviewed as well as the overall results of the report. Section 2 provides details of the Field Review, in which the Review Team inspects the results of management actions on the site. Section 3 provides details of the Land Management Plan Review, in which the team determines the extent to which the Management Plan provides for and documents adequate natural and recreational resource protection.

Finally, each report may also contain an Appendix that lists individual team member comments. This is a compilation of feedback, concerns or other thoughts raised by individual team members, but not necessarily indicative of the final consensus reached by the Land Management Review Team.

1.1. Property Reviewed in this Report

Name of Site: Golden Aster Scrub Preserve

Managed by: Hillsborough County

Acres: 1,235.80 **County(ies):** Hillsborough County

Purpose(s) for Acquisition: To protect environmentally unique and irreplaceable lands that contain native relatively unaltered flora and fauna representing a natural area unique to, or scarce within, this region of the state.

Acquisition Program(s): CARL/P2000/Florida Forever **Original Acquisition Date:** 2/5/96

Area Reviewed: Entire Property **Last Management Plan Approval Date:** 6/13/08

Review Date: 3/19/15

Agency Manager and Key Staff Present:

- Ken Bradshaw, Manager
- Bernie Kaiser
- Ross Dickerson
- Sheryl Bowman

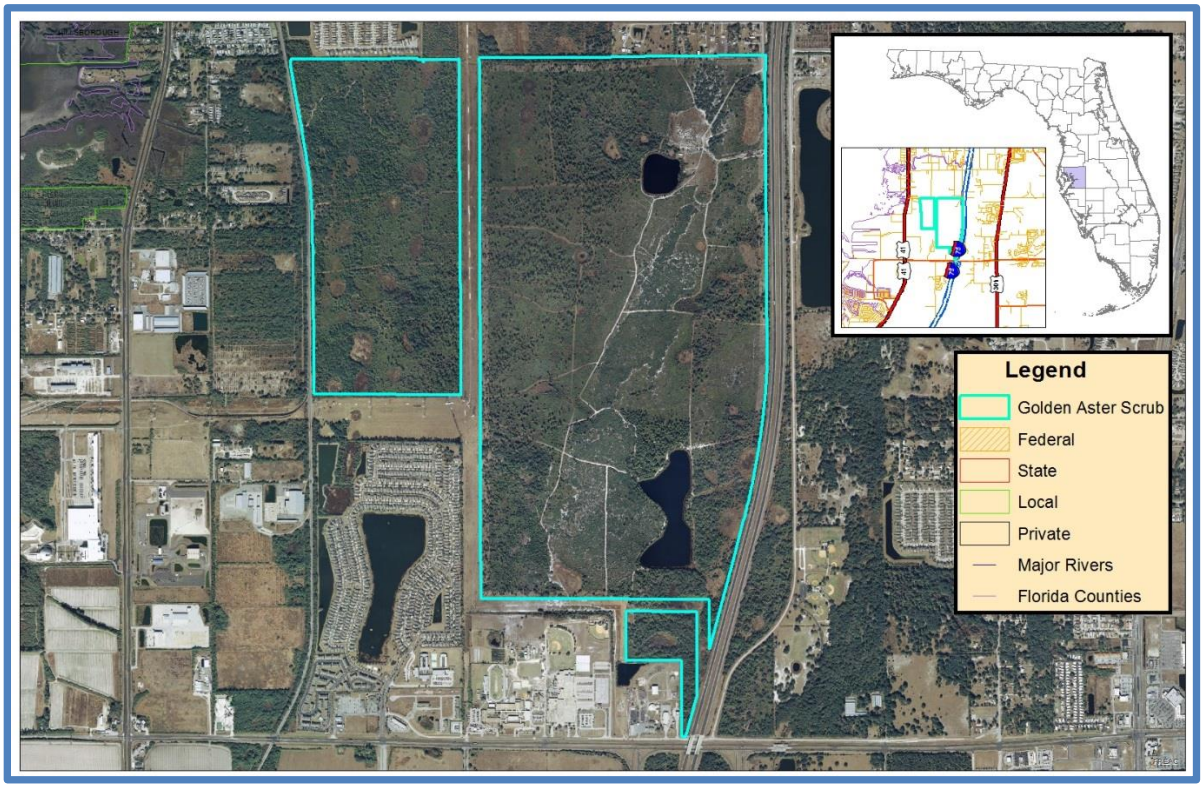
Review Team Members Present (voting)

- DRP: Mathew Hodge
- FWC: Chad Allison
- FFS: Butch Mallett
- DEP: Sara Gonzalez
- SWCD:
- Local gov't: Jason Chilson
- Conservation organization: Kevin Love
- Private land manager:

Other Non-Team Members Present (attending)

- Aric Larson, DEP/DSL
- Michael Sowinski, FWC-IPM

1.2 Property Map



1.3. Overview of Land Management Review Results

Is the property managed in accordance with the purposes for which it was acquired?

Yes = 6, No = 0

Are the management practices, including public access, in compliance with the management plan?

Yes = 6, No = 0

Table 1 shows the average scores received for each applicable category of review. *Field Review* scores refer to the adequacy of management actions in the field, while *Management Plan Review* scores refer to adequacy of discussion of these topics in the management plan. Scores range from 1 to 5 with 5 signifying excellence. For a more detailed key to the scores, please see *Appendix A*.

Table 1: Results at a glance.

Major Land Management Categories	Field Review	Management Plan Review
Natural Communities / Forest Management	2.61	2.18
Prescribed Fire / Habitat Restoration	4.11	4.24
Hydrology	3.94	2.72
Imperiled Species	4.53	4.41
Exotic / Invasive Species	3.93	3.58
Cultural Resources	3.17	3.50
Public Access / Education / Law Enforcement	4.12	3.80
Infrastructure / Equipment / Staffing	3.22	N/A

Color Code (See Appendix A for detail)

1.3.1 Consensus Commendations for the Managing Agency

The following commendations resulted from discussion and vote of the review team members:

1. The team commends the Hillsborough County staff for utilizing a variety of mechanical applications (chopping, shredding, mowing) both pre- and post-fire, accomplishing positive results through both timings. (6+, 0-)

2. The team commends the Hillsborough County staff for an aggressive management approach especially in scrub, scrubby flatwoods, and mesic flatwoods. (6+, 0-)

3. The team commends the Hillsborough County staff for their prescribed fire program, specifically for frequency and quality of burns. (6+, 0-)

4. The team commends the Hillsborough County staff for a successful and welcoming public access component. (6+, 0-)

1.3.2. Consensus Recommendations to the Managing Agency

The following recommendations resulted from a discussion and vote of review team members. The next management plan update should include information about how these recommendations have been addressed:

1. The team recommends that the Hillsborough County staff implement some form of standardized monitoring / record keeping of vegetative response to management activities, such as photo plots. (6+, 0-)

   Managing Agency Response: *A program to monitor plant communities will begin in 2016. This monitoring program will in part be based on methods described in the Florida Fish and Wildlife Conservation Commission's (FWC) Objective Based Vegetation Monitoring. It is anticipated that certain species-specific methods will be needed to address certain questions such as how management practices may affect the demography of the resident Florida golden aster population. Data will be stored in the form of Excel spreadsheets and GIS shapefiles.*

2. The team recommends that the Hillsborough County staff engage TECO, FDOT, and CSX to form a partnership (i.e. cost sharing or in-kind services) to control exotics within the utility and transportation corridors. (6+, 0-)

   Managing Agency Response: *The County is currently working with TECO to broadly allow Hillsborough County to control exotic invasive species on TECO property where adjacent to, or near, County conservation lands. TECO generally focuses on woody species, and does not eradicate herbaceous exotics from their power line ROW. Staff will reach out to FDOT and CSX to try and form a partnership.*

3. The team recommends that the Hillsborough County staff be proactive to anticipate potential impacts of a proposed greenway along the powerline right-of-way, and potential changes to the current alignment. (6+, 0-)

   Managing Agency Response: *Environmental Lands Management Division staff will remain appraised of any changes in the proposed greenway status, and will be involved in the decision making process to protect the integrity of the Preserve.*

4. The team recommends that the Hillsborough County staff pursue funding to obtain a tractor plow unit for prescribed burning to help increase burn opportunities, prevent wildfire, and promote private property protection. (6+, 0-)

   Managing Agency Response: *Staff agrees with the panel's recommendation, although it does not appear likely that funding will be available through at least fiscal year 2018.*

5. The team recommends that the Hillsborough County staff increase efforts for monitoring of listed species to help document environmentally / biologically important habitats. (6+, 0-)

Managing Agency Response: *Monitoring of imperiled plant species will be accomplished as part of the standardized vegetation monitoring mentioned in #1 above. Imperiled vertebrate species will be monitored as part of a vertebrate monitoring program. Standardized sampling methods will be used to assess overall vertebrate species diversity within the Preserve (e.g., drift fence arrays, funnel trapping gopher tortoise burrows, pedestrian surveys for birds, and etc.). Passive sampling techniques, such as camera-trapping or acoustic monitoring for frogs, bats, and birds may used provided these methods are feasible. Specific surveys for imperiled species, such as for scrub jays, gopher tortoises and cavity-nesting species (e.g. Southeastern American kestrels), will be conducted on a regular basis to assess the responses of these species to various maintenance practices and restoration efforts. Any state or federal permits necessary to conduct this monitoring will be obtained before monitoring is initiated. All collected data will be stored in the form of Excel spreadsheets and GIS shapefiles.*

2. Field Review Details

2.1 Field Review Checklist Findings

The following items received high scores on the review team checklist, which indicates that management actions exceeded expectations.

1. **Natural Communities; specifically mesic hammock, scrubby flatwoods, wet prairie/depression marsh, baygall and seepage stream**:
2. **Listed Species Protection and Preservation; specifically scrub jay, bald eagle, southeastern American kestrel, gopher tortoise and golden aster**:
3. **Natural Resources Survey/Monitoring Resources, specifically invasive species survey and monitoring**:
4. **Prescribed Fire, specifically frequency and quality**:
5. **Non-Native, Invasive & Problem Species, specifically prevention and control of plants and animals**:
6. **Ground Water Monitoring, specifically quality**:
7. **Surface Water Monitoring, specifically quality**:
8. **Resource Protection; specifically boundary survey, gates and fencing, signage and law enforcement presence**:
9. **Adjacent Property Concerns, specifically expanding development**:

2.2. Items Requiring Improvement Actions in the Field

The following items received low scores on the review team checklist, which indicates that management actions noted during the Field Review were not considered sufficient (less than 3.0 score on average). Please note that overall good scores do not preclude specific recommendations by the review team requiring remediation. **The management plan update should include information on how these items have been addressed**:

1. **Forest Management, specifically timber inventory, received a below average score. The review team is asked to evaluate, based on information provided by the managing agency, whether forest management is sufficient.**

   Managing Agency Response: *Hillsborough County will coordinate with the Florida Forest Service to have a timber inventory completed. Results will be included in the next plan update.*

2. **Management Resources, specifically waste disposal and staffing, received below average scores. The review team is asked to evaluate, based on information provided by the managing agency, whether management resources are sufficient.**

   Managing Agency Response: *The picnic pavilion will be equipped with a raccoon proof trash bin. Trash removal will be incorporated into current site access maintenance..*

2.3. Field Review Checklist and Scores

Field Review Item	Reference #	Anonymous Team Members								Average
		1	2	3	4	5	6	7	8	
Natural Communities (I.A)										
Mesic Hammock	I.A.1	5	5	5	5	5	5			5.00
Mesic/Wet Flatwoods	I.A.3	3	3	3	3	3	3			3.00
Scrubby Flatwoods	I.A.5	3	4	4	5	5	5			4.33
Wet Prairie/Depression Marsh	I.A.6	5	5	4	4	5	4			4.50
Baygall	I.A.8	4	5	5	4	4	4			4.33
Seepage Stream	I.A.9	4	5	5	4	5	4			4.50
Sinkhole Lake	I.A.10	4	4	5	3	2	5			3.83
									Natural Communities Average Score	4.21
Listed Species: Protection & Preservation (I.B)										
Animals	I.B.1	5	4	5		5	4			4.60
Scrub Jay	I.B.1.a	4	5	5	5	5	5			4.83
Bald Eagle	I.B.1.b		5	5	5	4	5			4.80
SE American Kestrel	I.B.1.c	3	5	4	4		4			4.00
Gopher Tortoise	I.B.1.d	4	3	5	5	4				4.20
Plants	I.B.2		3	5	5		4			4.25
Golden Aster	I.B.2.a	5	5	5		5	5			5.00
									Listed Species Average Score	4.53
Natural Resources Survey/Management Resources (I.C)										
Listed species or their habitat monitoring	I.C.2	4	2	4	4	4	3			3.50
Other non-game species or their habitat monitoring	I.C.3	3	3	3	4	4	3			3.33
Fire effects monitoring	I.C.4	3	4	3	5	5	3			3.83
Other habitat management effects monitoring	I.C.5	3	4	3	4	5	3			3.67

Invasive species survey / monitoring	I.C.6	5	3	4	5	4	4			4.17
Cultural Resources (Archeological & Historic sites) (II.A, II.B)										
Cultural Res. Survey	II.A	3	3	X	X	3	X			3.00
Protection and preservation	II.B	4	3	X	X	3	X			3.33
								Cultural Resources Average Score		3.17
Resource Management, Prescribed Fire (III.A)										
Area Being Burned (no. acres)	III.A1	3	3	4	4	3	3			3.33
Frequency	III.A.2	4	4	4	4	4	4			4.00
Quality	III.A.3	5	5	5	5	5	5			5.00
								Resource Management, Prescribed Fire Average Score		4.11
Restoration (III.B)										
Forest Management (III.C)										
Timber Inventory	III.C.1	1	1	1	1	1	1			1.00
								Forest Management Average Score		1.00
Non-Native, Invasive & Problem Species (III.D)										
Prevention										
prevention - plants	III.D.1.a	4	5	5	5	5	4			4.67
prevention - animals	III.D.1.b	3		4	4	5	4			4.00
prevention - pests/pathogens	III.D.1.c			3	X		X			3.00
Control										
control - plants	III.D.2.a	4	4	5	5	5	4			4.50
control - animals	III.D.2.b	4		4	5	5	4			4.40
control - pest/pathogens	III.D.2.c	2		3	X	4	X			3.00
								Non-Native, Invasive & Problem Species Average Score		3.93
Hydrologic/Geologic function Hydro-Alteration (III.E.1)										
Roads/culverts	III.E.1.a	3	4	4	4	4	4			3.83
								Hydrologic/Geologic function, Hydro-Alteration Average Score		3.83
Ground Water Monitoring (III.E.2)										
Ground water quality	III.E.2.a	X	4	3	5	4	4			4.00
								Ground Water Monitoring Average Score		4.00
Surface Water Monitoring (III.E.3)										
Surface water quality	III.E.3.a	X	4	3	5	4	X			4.00
								Surface Water Monitoring Average Score		4.00
Resource Protection (III.F)										
Boundary survey	III.F.1	5	5	5	5	5	4			4.83
Gates & fencing	III.F.2	5	5	4	5	5	4			4.67
Signage	III.F.3	4	5	4	4	5	4			4.33
Law enforcement presence	III.F.4	5		4	5	5	4			4.60
								Resource Protection Average Score		4.61
Adjacent Property Concerns (III.G)										
Land Use										
Expanding development	III.G.1.a	5	5	3	5	3	4			4.17

Proposed Greenway	III.G.1.b	3	3	3	4	4	4			3.50
Adjacent Corridors	III.G.1.c	3	3	3	4	4	X			3.40
Inholdings/additions	III.G.2	3	3	3	5	4	4			3.67
Public Access & Education (IV.1, IV.2, IV.3, IV.4, IV.5)										
Public Access										
Roads	IV.1.a	4	5	3	3	4	4			3.83
Parking	IV.1.b	4	5	3	3	4	4			3.83
Boat Access	IV.1.c	3	5	3	3	4	4			3.67
Environmental Education & Outreach										
Wildlife	IV.2.a	3	4	4	4	3	3			3.50
Invasive Species	IV.2.b	3	4	4	4	3	3			3.50
Habitat Management Activities	IV.2.c	3	4	4	4	3	3			3.50
Interpretive facilities and signs	IV.3	3	4	4	3	3	3			3.33
Recreational Opportunities	IV.4	4	5	4	3	3	3			3.67
Management of Visitor Impacts	IV.5	4	3	3	5	4	4			3.83
							Public Access & Education Average Score			3.63
Management Resources (V.1, V.2, V.3. V.4)										
Maintenance										
Waste disposal	V.1.a	4	3	2	2	3	3			2.83
Sanitary facilities	V.1.b	3	3	4	3	3	3			3.17
Infrastructure										
Buildings	V.2.a	3	4	3	5	4	3			3.67
Equipment	V.2.b	3	4	4	5	4	3			3.83
Staff	V.3	3	4	2	2	4	3			3.00
Funding	V.4	3	4	2	2	4	2			2.83
							Management Resources Average Score			3.22

Color Code:	Excellent	Above Average	Below Average	Poor	See Appendix A for detail
		Missing Vote	Insufficient Information		

3. Land Management Plan Review Details

3.1 Items Requiring Improvements in the Management Plan

The following items received low scores on the review team checklist, which indicates that the text noted in the Management Plan Review does not sufficiently address this issue (less than 3.0 score on average.). Please note that overall good scores do not preclude specific recommendations by the review team requiring remediation. The next management plan update should address the checklist items identified below:

1. **Natural Communities, specifically sinkhole lake, received a below average score. This is an indication that the management plan does not sufficiently address current or desired condition and/or future management actions to protect or restore.**

   Managing Agency Response: *Sinkhole lake will be included as a community type in the next management plan update. Text and maps will be updated to reflect the change.*

2. **Forest Management, specifically timber inventory, received a below average score. This is an indication that the management plan does not sufficiently address a timber inventory.**

   Managing Agency Response: *Results of the timber inventory provided by the Florida Forest Service will be included in the next plan update.*

3. **Non-native / Invasive & Problem Species, specifically prevention of pests/pathogens, received a below average score. This is an indication that the management plan does not sufficiently address prevention of invasive species.**

   Managing Agency Response: *This item will be addressed in the next management plan update. The County seeks to designate the Preserve as exempt from broad treatment for mosquitoes (e.g., aerial spraying).*

4. **Ground Water Monitoring, specifically ground water quality, received a below average score. This is an indication that the management plan does not sufficiently address ground water quality monitoring.**

   Managing Agency Response: *This will be included in the next management plan update.*

5. **Surface Water Monitoring, specifically water quality, received a below average score. This is an indication that the management plan does not sufficiently address surface water quality monitoring.**

   Managing Agency Response: *This will be included in the next management plan update.*

6. **Adjacent Property Concerns; specifically adjacent corridors, discussion of potential surplus land determination and identification of surplus lands, received below average scores. This is an indication that the management plan does not sufficiently address adjacent property concerns.**

   Managing Agency Response: *This will be addressed in the next management plan update.*

3.2 Management Plan Review Checklist and Scores

Plan Review Item	Reference #	Anonymous Team Members								Average
		1	2	3	4	5	6	7	8	

Natural Communities (I.A)										
Mesic Hammock	I.A.1	4	4	1	4	4	4			3.50
Mesic/Wet Flatwoods	I.A.3	5	4	1	4	4	4			3.67
Scrubby Flatwoods	I.A.5	5	4	4	5	4	4			4.33
Wet Prairie/Depression Marsh	I.A.6	5	4	4	4	4	4			4.17
Baygall	I.A.8	4	4	1	3	4	4			3.33
Seepage Stream	I.A.9	4	4	1	3	4	4			3.33
Sinkhole Lake	I.A.10	2	1	1	1	1	1			1.17
								Natural Communities Average Score		3.36
Listed species: Protection & Preservation (I.B)										
Animals	I.B.1	5	5	4	5	4				4.60
Scrub Jay	I.B.1.a	5	4	4	5	4				4.40
Bald Eagle	I.B.1.b		4	3	5	4				4.00
SE American Kestrel	I.B.1.c	4	5	4	5					4.50
Gopher Tortoise	I.B.1.d	4	4	4	5	4				4.20
Plants	I.B.2		5	4	5					4.67
Golden Aster	I.B.2.a	5	5	4		4				4.50
								Listed Species Average Score		4.41
Natural Resources Survey/Management Resources (I.C)										
Listed species or their habitat monitoring	I.C.2	5	4	4	5	4	4			4.33
Other non-game species or their habitat monitoring	I.C.3	3	4	3	3	4	3			3.33
Fire effects monitoring	I.C.4	3	4	2	4	4	3			3.33
Other habitat management effects monitoring	I.C.5	3	4	2	4	4	3			3.33
Invasive species survey / monitoring	I.C.6	5	4	2	5	4	4			4.00
Cultural Resources (Archeological & Historic sites) (II.A,II.B)										
Cultural Res. Survey	II.A	3	4	3	4	4	3			3.50
Protection and preservation	II.B	3	4	3	4	4	3			3.50
								Cultural Resources Average Score		3.50
Resource Management, Prescribed Fire (III.A)										
Area Being Burned (no. acres)	III.A.1	5	5	3	4	5	4			4.33
Frequency	III.A.2		5	3	4	5	4			4.20
Quality	III.A.3		5	3	5	4	4			4.20
								Resource Management, Prescribed Fire Average Score		4.24
Restoration (III.B)										
Forest Management (III.C)										
Timber Inventory	III.C.1	1	1	1	1	1	1			1.00
								Forest Management Average Score		1.00
Non-Native, Invasive & Problem Species (III.D)										
Prevention										
prevention - plants	III.E.1.a	5		3	5	5	3			4.20
prevention - animals	III.E.1.b	3		3	4	5	3			3.60
prevention - pests/pathogens	III.E.1.c	3		3	2		2			2.50

Control										
control - plants	III.E.2.a	5		3	5	5	3			4.20
control - animals	III.E.2.b	5		3	4	5	3			4.00
control - pest/pathogens	III.E.2.c	4		3	2	4	2			3.00
								Non-Native, Invasive & Problem Species Average Score		3.58
Hydrologic/Geologic function, Hydro-Alteration (III.E.1)										
Roads/culverts	III.F.1.a	3	4	2	4	4	3			3.33
								Hydrologic/Geologic function, Hydro-Alteration Average Score		3.33
Ground Water Monitoring (III.E.2)										
Ground water quality	III.F.2.a	1	3	3	3	3	1			2.33
								Ground Water Monitoring Average Score		2.33
Surface Water Monitoring (III.E.3)										
Surface water quality	III.F.3.a	1	3	3	3	4	1			2.50
								Surface Water Monitoring Average Score		2.50
Resource Protection (III.F)										
Boundary survey	III.G.1	3	4	3	5	5	3			3.83
Gates & fencing	III.G.2	4	4	3	5	5	3			4.00
Signage	III.G.3	3	4	3	5	5	3			3.83
Law enforcement presence	III.G.4	5		3	3	5	3			3.80
								Resource Protection Average Score		3.87
Adjacent Property Concerns (III.G)										
Land Use										
Expanding development	III.H.1.a	4	4	3	4	4	3			3.67
Proposed Greenway	III.H.1.b	1	4	3	4	4	3			3.17
Adjacent Corridors	III.H.1.c	1	4	1	4	4	1			2.50
Inholdings/additions	III.H.2	3	4	3	5	4	4			3.83
Discussion of Potential Surplus Land Determination	III.H.3	1				1	4			2.00
Surplus Lands Identified?	III.H.4	1			5	1	4			2.75
Public Access & Education (IV.1, IV.2, IV.3, IV.4, IV.5)										
Public Access										
Roads	IV.1.a	4	5	3	4	5	3			4.00
Parking	IV.1.b	4	5	3	4	5	3			4.00
Boat Access	IV.1.c	4	5	3	4	5	3			4.00
Environmental Education & Outreach										
Wildlife	IV.2.a	3	4	3	4	4	3			3.50
Invasive Species	IV.2.b	3	4	3	4	4	3			3.50
Habitat Management Activities	IV.2.c	3	4	3	4	4	3			3.50
Interpretive facilities and signs	IV.3	3	4	4	4	4	3			3.67
Recreational Opportunities	IV.4	4	5	4	3	4	3			3.83
Management of Visitor Impacts	IV.5	4	4	3	4	4	3			3.67
								Public Access & Education Average Score		3.74
Managed Area Uses (VI.A, VI.B)										
Existing Uses										

Hiking	VI.A.1	5	5	5	5	4	5			4.83
Birding	VI.A.2	5	5	5	5	4	5			4.83
Nature Study	VI.A.3	5	5	4	5	4	5			4.67
Guided Interpretive Tours	VI.A.4	4	5	4	3	4	5			4.17
Proposed Uses										
Environmental Ed. Center	VI.B.1	3	5	3	5	4	4			4.00

Color Code: Excellent | Above Average | Below Average | Poor | Missing Vote | Insufficient Information

See Appendix A for detail

Appendix A: Scoring System Detail

Explanation of Consensus Commendations:

Often, the exceptional condition of some of the property's attributes impress review team members. In those instances, team members are encouraged to offer positive feedback to the managing agency in the form of a commendation. The teams develop commendations generally by standard consensus processes or by majority vote if they cannot obtain a true consensus.

Explanation of Consensus Recommendations:

Subsection 259.036(2), F.S., specifically states that the managing entity shall consider the findings and recommendations of the land management review. We ask team members to provide general recommendations for improving the management or public access and use of the property. The teams discuss these recommendations and develop consensus recommendations as described above. We provide these recommendations to the managing agency to consider when finalizing the required ten-year management plan update. We encourage the manager to respond directly to these recommendations and include their responses in the final report when received in a timely manner.

Explanation of Field Review Checklist and Scores, and Management Plan Review Checklist and Scores:

We provide team members with a checklist to fill out during the evaluation workshop phase of the Land Management Review. The checklist is the uniform tool used to evaluate both the management actions and condition of the managed area, and the sufficiency of the management plan elements. During the evaluation workshop, team members individually provide scores on each issue on the checklist, from their individual perspective. Team members also base their evaluations on information provided by the managing agency staff as well as other team member discussions. Staff averages these scores to evaluate the overall conditions on the ground, and how the management plan addresses the issues. Team members must score each management issue 1 to 5: 1 being the management practices are clearly insufficient, and 5 being that the management practices are excellent. Members may choose to abstain if they have inadequate expertise or information to make a cardinal numeric choice, as indicated by an "X" on the checklist scores, or they may not provide a vote for other unknown reasons, as indicated by a blank. If a majority of members failed to vote on any issue, that issue is determined to be irrelevant to management of that property or it was inadequately reviewed by the team to make an intelligent choice. In either case staff eliminated the issue from the report to the manager.

Average scores are interpreted as follows:

Scores 4.0 to 5.0 are *Excellent*

Scores 3.0 to 3.99 are *Above Average*

Scores 2.0 to 2.99 are *Below Average*

Scores 1.0 to 1.99 are considered *Poor*

2020 Land Management Review Team Report for Golden Aster Scrub Nature Preserve

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Introduction

Section 259.036, F.S. requires a periodic on-site review of conservation and recreation lands titled in the name of the Board of Trustees to determine (1) whether the lands are being managed for the purposes for which they were acquired and (2) whether they are being managed in accordance with their land management plan adopted pursuant to s. 259.032, F.S. In cases where the managed areas exceed 1,000 acres in size, such a review must be scheduled at least every five years. In conducting this review, a statutorily constructed review team "shall evaluate the extent to which the existing management plan provides sufficient protection to threatened or endangered species, unique or important natural or physical features, geological or hydrological functions or archaeological features. The review shall also evaluate the extent to which the land is being managed for the purposes for which it was acquired and the degree to which actual management practices, including public access, are in compliance with the adopted management plan."

The land management review teams are coordinated by the Division of State Lands and consist of representatives from the Division of Recreation and Parks (DEP), the Florida Forest Service (DACS), the Fish and Wildlife Conservation Commission, the local government in which the property is located, the DEP District in which the parcel is located, the local soil and water conservation district or jurisdictional water management district, a conservation organization member, and a local private land manager.

Each Land Management Review Report is divided into three sections. Section 1 provides the details of the property being reviewed as well as the overall results of the report. Section 2 provides details of the Field Review, in which the Review Team inspects the results of management actions on the site. Section 3 provides details of the Land Management Plan Review, in which the team determines the extent to which the Management Plan provides for and documents adequate natural and recreational resource protection.

Finally, each report may also contain an Appendix that lists individual team member comments. This is a compilation of feedback, concerns or other thoughts raised by individual team members, but not necessarily indicative of the final consensus reached by the Land Management Review Team.

Property Reviewed in this Report

Name of Site: Golden Aster Scrub Nature Preserve
Managed by: Hillsborough County
Acres: 1,236 **County:** Hillsborough
Purpose(s) for Acquisition: To protect environmentally unique and irreplaceable lands that contain native relatively unaltered flora and fauna representing a natural area unique to, or scarce within, this region of the state.
Acquisition Program(s): CARL/P2000 **Original Acquisition Date:** 2/5/96
Area Reviewed: Entire property **Last Management Plan Approval Date:** 6/13/08
Review Date: 1/9/20

Agency Manager and Key Staff:

- Danielle Ivey, Manager
- Bernard Kaiser
- Gillian Seymour

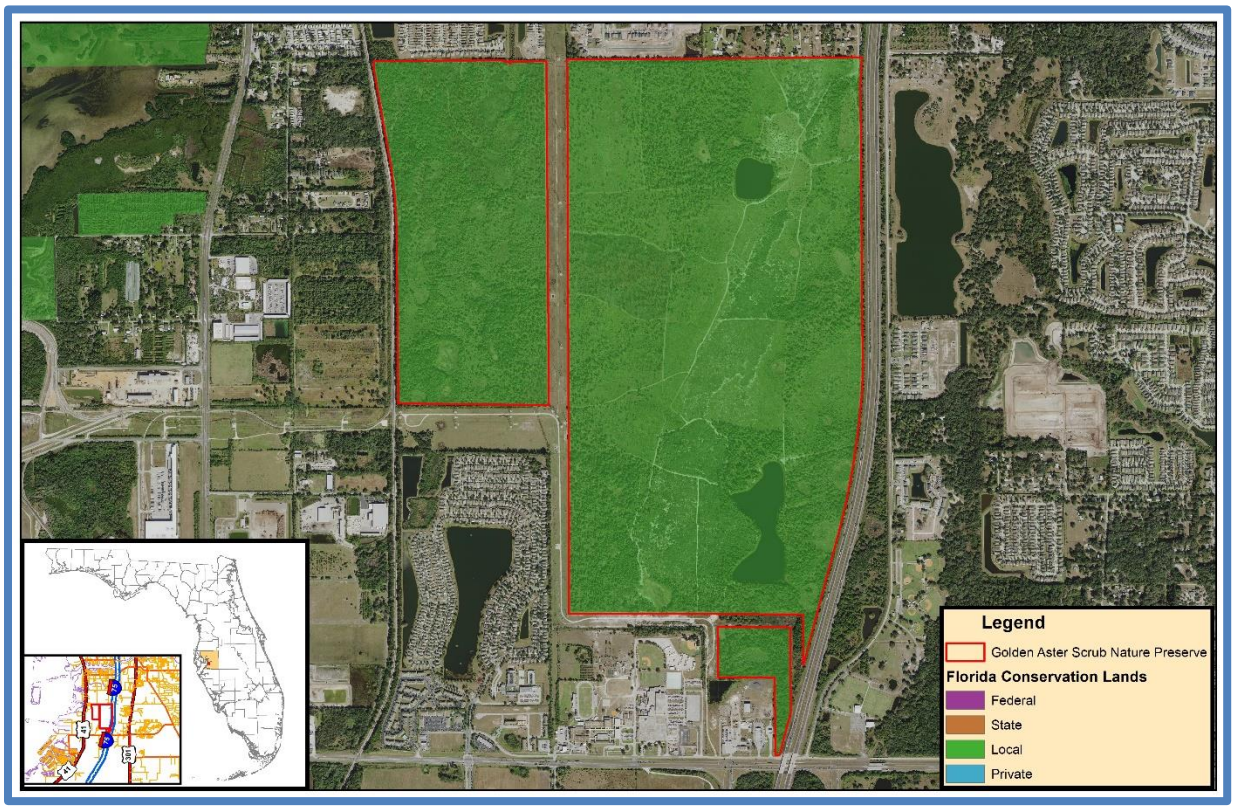
Review Team Members (voting)

- Rosalind Rowe, DRP District
- Ken Bradshaw, Local Gov't.
- Jennifer Myers, FWC
- Michael Lynch, DEP District
- Michael Edwards, FFS
- SWFWMD, None
- Virginia Overstreet, Conservation Org.
- Private Land Manager, None

Non-Team Members (attending)

- Keith Singleton, DEP/DSL

Property Map



Overview of Land Management Review Results

Is the property managed for purposes that are compatible with conservation, preservation, or recreation?

Yes = 6, No = 0

Are the management practices, including public access, in compliance with the management plan?

Yes = 5, No = 1

Table 1 shows the average scores received for each applicable category of review. *Field Review* scores refer to the adequacy of management actions in the field, while *Management Plan Review* scores refer to adequacy of discussion of these topics in the management plan. Scores range from 1 to 5 with 5 signifying excellence. For a more detailed key to the scores, please see *Appendix A*.

Table 1: Results at a glance.

Major Land Management Categories	Field Review	Management Plan Review
Natural Communities / Forest Management	2.84	1.87
Prescribed Fire / Habitat Restoration	3.22	3.11
Hydrology	N/A	N/A
Imperiled Species	4.10	3.36
Exotic / Invasive Species	3.72	3.03
Cultural Resources	4.00	3.67
Public Access / Education / Law Enforcement	3.63	3.14
Infrastructure / Equipment / Staffing	3.67	N/A

Color Code (See Appendix A for detail)

Excellent	Above Average	Below Average	Poor

Consensus Commendations for the Managing Agency

The following commendations resulted from discussion and vote of the review team members:

1. The team commends the County for utilizing a variety of techniques to restore and maintain natural communities on Golden Aster Scrub Nature Preserve, despite increasing development in the surrounding landscape. (6+, 0-)
2. The team commends the County for providing a quality public recreation experience, including ADA compliant access to the pavilion and lake, as well as hiking and wildlife viewing opportunities. (6+, 0-)
3. The team commends the County for effectively reducing exotic invasive plant infestations across much of the natural communities on Golden Aster Scrub Nature Preserve. (6+, 0-)

Consensus Recommendations to the Managing Agency

The following recommendations resulted from a discussion and vote of review team members. The next management plan update should include information about how these recommendations have been addressed:

1. The team recommends the County update the natural communities descriptions and map/GIS to reflect what is in the field for the next management plan (there were many omissions and confusing terminology in the current plan). (6+, 0-)

   Managing Agency Response: We are in the process of updating our Management plan for Golden Aster Preserve and are in the process of obtaining contractual services to perform natural community mapping based on the Cooperative Land Cover (CLC) system. This will reduce the confusing terminology.

Field Review Details

Field Review Checklist Findings

The following items received high scores on the review team checklist, which indicates that management actions exceeded expectations.

1. **Natural communities, specifically mesic hammock, scrubby flatwoods, wet prairie/depression marsh, baygall, sinkhole lake, and scrub.**
2. **Listed species, animals in general, and specifically scrub jay and gopher tortoise, plants in general, and specifically golden aster.**
3. **Natural resource survey/monitoring resources, specifically invasive species survey and monitoring.**
4. **Cultural Resources, specifically cultural resource survey, and protection and preservation.**
5. **Resource management (prescribed fire), specifically quality.**
6. **Non-native, invasive, and problem species, specifically prevention and control of plants.**
7. **Resource protection, specifically boundary survey, and gates and fencing.**
8. **Public access, specifically roads.**
9. **Management resources, specifically sanitary facilities, and buildings.**

Items Requiring Improvement Actions in the Field

The following items received low scores on the review team checklist, which indicates that management actions noted during the Field Review were not considered sufficient (less than 3.0 score on average). Please note that overall good scores do not preclude specific recommendations by the review team requiring remediation. The management plan update should include information on how these items have been addressed:

1. ***Resource Management, Prescribed Fire, specifically area being burned, received a below average score. The review team is asked to evaluate, based on information provided by the managing agency, to what degree prescribed fire is accomplished according to the objectives for prescribed fire management. The scores range from 1 to 5, with 1 being 0-20% accomplished, 2 being 21-40%, 3 being 41-60%, 4 being 61-80% and 5 being 81-100%.***

   Managing Agency Response: We are aware that our use of fire on this preserve is not meeting the desired fire return interval in many burn units. Our management asked for and received funding for a burn team. This team will focus solely on burning, including areas that are more challenging to burn. We will be focused on applying more fire with in the next few years to bring the prescribed burning back into rotation.

2. ***Forest Management, specifically timber inventory, received a below average score. The review team is asked to evaluate, based on information provided by the managing agency, whether forest management is sufficient.***

   Managing Agency Response: We have approached our local FFS Forester about getting a timber inventory to be included in the forthcoming management plan update.

3. ***Management Resources, specifically funding, received a below average score. The review team is asked to evaluate, based on information provided by the managing agency, whether management resources are sufficient.***

   Managing Agency Response: It was suggested by the review team that one staff member be dedicated to the preserve. At this time our staffing is not structured to have specific staff dedicated to a preserve(s). We will revisit this idea.

Field Review Checklist and Scores

Field Review Item	Reference #	Anonymous Team Members								Average
		1	2	3	4	5	6	7	8	
Natural Communities (I.A)										
Mesic Hammock	I.A.1	5	4	x	4	4	5			4.40
Mesic/Wet Flatwoods	I.A.2	3	3	5	3	3	4			3.50
Scrubby Flatwoods	I.A.3	5	4	4	4	3	5			4.17
Wet Prairie/Depression Marsh	I.A.4	4	4	4	5	4	4			4.17
Baygall	I.A.5	5	4	x	5	4	4			4.40
Sinkhole Lake	I.A.7	5	x	x	5	4	X			4.67
Scrub	I.A.8	4	4	4	4	4	4			4.00
									Natural Communities Average Score	4.19
Listed species: Protection & Preservation (I.B)										
Animals	I.B.1	3	4	4	5	4	4			4.00
Scrub Jay	I.B.1.a	4	4	4	5	4	4			4.17
SE American Kestrel	I.B.1.c	3	4	3	5	4	4			3.83
Gopher Tortoise	I.B.1.d	3	4	3	5	5	4			4.00
Plants	I.B.2	4	4	3	5	4	4			4.00
Golden Aster	I.B.2.a	4	4	5	5	5	X			4.60
									Listed Species Average Score	4.10
Natural Resources Survey/Management Resources (I.C)										
Listed species or their habitat monitoring	I.C.2	3	4	4	4	4	3			3.67
Other non-game species or their habitat monitoring	I.C.3	3	4	3	3	4	3			3.33
Fire effects monitoring	I.C.4	3	4	3	3	4	3			3.33
Other habitat management effects monitoring	I.C.5	3	4	3	3	4	3			3.33
Invasive species survey / monitoring	I.C.6	4	4	4	4	4	5			4.17
Cultural Resources (Archeological & Historic sites) (II.A, II.B)										
Cultural Res. Survey	II.A	4	4	x	4	x	X			4.00
Protection and preservation	II.B	4	4	x	4	x	X			4.00
									Cultural Resources Average Score	4.00
Resource Management, Prescribed Fire (III.A)										
Area Being Burned (no. acres)	III.A.1	2	2	2	2	4	2			2.33
Frequency	III.A.2	3	3	3	3	3	3			3.00

Quality	III.A.3	4	5	4	5	4	4			4.33
								Resource Management, Prescribed Fire Average Score		3.22
Forest Management (III.C)										
Timber Inventory	III.C.1		x	x	2	x	1			1.50
								Forest Management Average Score		1.50
Non-Native, Invasive & Problem Species (III.D)										
Prevention										
prevention - plants	III.D.1.a	4	4	4	4	4	4			4.00
prevention - animals	III.D.1.b	3	4	2	4	4	4			3.50
prevention - pests/pathogens	III.D.1.c	3	4	3	4	4	3			3.50
Control										
control - plants	III.D.2.a	4	5	5	4	4	5			4.50
control - animals	III.D.2.b	3	3	2	3	4	3			3.00
control - pest/pathogens	III.D.2.c	3	4	x	4	4	4			3.80
								Non-Native, Invasive & Problem Species Average Score		3.72
Resource Protection (III.F)										
Boundary survey	III.F.1	5	4	4	4	5	3			4.17
Gates & fencing	III.F.2	5	4	4	4	4	3			4.00
Signage	III.F.3	4	4	3	4	4	3			3.67
Law enforcement presence	III.F.4	3	4	3	4	4	3			3.50
								Resource Protection Average Score		3.83
Adjacent Property Concerns (III.G)										
Land Use										
Expanding development	III.G.1.a	4	4	3	4	x	3			3.60
Proposed Greenway	III.G.1.b	4	4	3	4	x	3			3.60
Adjacent Corridors	III.G.1.c	3	4	3	4	x	3			3.40
Public Access & Education (IV.1, IV.2, IV.3, IV.4, IV.5)										
Public Access										
Roads	IV.1.a	4	4	4	5	4	3			4.00
Parking	IV.1.b	3	4	4	5	4	3			3.83
Environmental Education & Outreach										
Wildlife	IV.2.a	3	4	x	1	4	3			3.00
Invasive Species	IV.2.b	3	4	x	1	4	3			3.00
Habitat Management Activities	IV.2.c	3	4	x	3	4	3			3.40
Interpretive facilities and signs	IV.3	3	3	x	4	3	3			3.20
Recreational Opportunities	IV.4	3	4	3	4	4	3			3.50
Management of Visitor Impacts	IV.5	4	4	4	3	3	3			3.50
								Public Access & Education Average Score		3.43
Management Resources (V.1, V.2, V.3. V.4)										
Maintenance										
Waste disposal	V.1.a	4	4	3	4	5	3			3.83
Sanitary facilities	V.1.b	4	4	3	5	5	4			4.17
Infrastructure										
Buildings	V.2.a	5	5	4	5	4	3			4.33
Equipment	V.2.b	4	4	3	5	4	3			3.83

Staff	V.3	3	4	2	2	3	4			3.00
Funding	V.4	3	3	2	3	3	3			2.83
								Management Resources Average Score		3.67

Color Code:	Excellent	Above Average	Below Average	Poor	See Appendix A for detail
		Missing Vote	Insufficient Information		

Land Management Plan Review Details

Items Requiring Improvements in the Management Plan

The following items received low scores on the review team checklist, which indicates that the text noted in the Management Plan Review does not sufficiently address this issue (less than 3.0 score on average.). Please note that overall good scores do not preclude specific recommendations by the review team requiring remediation. The next management plan update should address the checklist items identified below:

1. ***Natural Communities, specifically mesic hammock, mesic/wet flatwoods, baygall, and sinkhole lake, received below average scores. This is an indication that the management plan does not sufficiently address current or desired condition and/or future management actions to protect or restore.***

   Managing Agency Response: We are currently working on an update to our management plan and will add our desired future conditions and management actions needed in these habitats. Our monitoring team is already working with the land manager on identifying specific areas we can address for protection and/or restoration.

2. ***Natural Resources Survey and Monitoring Resources, specifically listed species or their habitat monitoring, other non-game species or their habitat monitoring, fire effects monitoring, and other habitat management effects monitoring, received below average scores. This is an indication that the management plan does not sufficiently address survey or monitoring.***

   Managing Agency Response: We will address this in our management plan update. Our department has just acquired more staff to make up our monitoring team. We will look at the needs of the preserve and try to find a balance that will allow monitoring species and habitat effects across all of our preserves.

3. ***Forest Management, specifically timber inventory, received a below average score. This is an indication that the management plan does not sufficiently address forest management.***

   Managing Agency Response: We have already made contact with a Forester from FFS and there will be a Timber assessment in the updated management plan.

4. ***Non-native, Invasive & Problem Species, specifically prevention of pests/pathogens, received a below average score. This is an indication that the management plan does not sufficiently address prevention of invasive species.***

   Managing Agency Response: We will address non-native species and pathogens more in depth in our management plan update.

5. ***Resource Protection, specifically signage, received a below average score. This is an indication that the management plan does not sufficiently address resource protection.***

   Managing Agency Response: We will discuss putting up educational kiosks, boundary signage, and other signage for resource protection in the coming plan update. We have an outreach team that also leads hikes on GAS and other preserves to talk about the resources and the protection we are doing (acquisition, security, prescribed fire, etc.).

6. ***Adjacent Property Concerns, specifically discussion of potential surplus land determination, and surplus lands identified, received below average scores. This is an indication that the management plan does not sufficiently address adjacent property.***

   Managing Agency Response: *The potential surplus portion will be addressed in the coming plan update.*

Management Plan Review Checklist and Scores

Plan Review Item	Reference #	Anonymous Team Members								Average
		1	2	3	4	5	6	7	8	
Natural Communities (I.A)										
Mesic Hammock	I.A.1	3	1		1	2	1			1.60
Mesic/Wet Flatwoods	I.A.2	3	3	2	3	2	3			2.67
Scrubby Flatwoods	I.A.3	3	3	2	4	4	5			3.50
Wet Prairie/Depression Marsh	I.A.4	3	3	2	3	4	4			3.17
Baygall	I.A.5	3	1	1	1	3	3			2.00
Sinkhole Lake	I.A.7	1	1	1	1	4	1			1.50
Scrub	I.A.8	3	3	2	3	4	3			3.00
								Natural Communities Average Score		2.49
Listed species: Protection & Preservation (I.B)										
Animals	I.B.1	3	3	2	4	4	4			3.33
Scrub Jay	I.B.1.a	3	3	2	3	4	4			3.17
SE American Kestrel	I.B.1.c	3	3	2	4	4	4			3.33
Gopher Tortoise	I.B.1.d	3	3	2	4	5	4			3.50
Plants	I.B.2	3	3	2	4	4	4			3.33
Golden Aster	I.B.2.a	3	3	3	3	5	4			3.50
								Listed Species Average Score		3.36
Natural Resources Survey/Management Resources (I.C)										
Listed species or their habitat monitoring	I.C.2	4	2	2	2	4	3			2.83
Other non-game species or their habitat monitoring	I.C.3	3	2	2	2	4	3			2.67
Fire effects monitoring	I.C.4	3	2	2	2	4	3			2.67
Other habitat management effects monitoring	I.C.5	3	2	2	2	4	3			2.67
Invasive species survey / monitoring	I.C.6	3	2	2	3	5	4			3.17
Cultural Resources (Archeological & Historic sites) (II.A, II.B)										

Cultural Res. Survey	II.A	4	3	4	4	3	4			3.67
Protection and preservation	II.B	4	3	4	4	3	4			3.67
									Cultural Resources Average Score	3.67
Resource Management, Prescribed Fire (III.A)										
Area Being Burned (no. acres)	III.A.1	2	2	2	4	4	4			3.00
Frequency	III.A.2	3	2	2	4	4	4			3.17
Quality	III.A.3	3	2	2	4	4	4			3.17
									Resource Management, Prescribed Fire Average Score	3.11
Forest Management (III.C)										
Timber Inventory	III.C.1		1		1	2	1			1.25
									Forest Management Average Score	1.25
Non-Native, Invasive & Problem Species (III.D)										
Prevention										
prevention - plants	III.E.1.a	4	2	1	4	4	4			3.17
prevention - animals	III.E.1.b	3	2	1	4	5	4			3.17
prevention - pests/pathogens	III.E.1.c	2	2	1	4	4	3			2.67
Control										
control - plants	III.E.2.a	3	2	2	4	4	4			3.17
control - animals	III.E.2.b	3	2	2	4	3	4			3.00
control - pest/pathogens	III.E.2.c	2	2	2	4	4	4			3.00
									Non-Native, Invasive & Problem Species Average Score	3.03
Resource Protection (III.F)										
Boundary survey	III.G.1	4	3		1	5	3			3.20
Gates & fencing	III.G.2	4	3		2	5	3			3.40
Signage	III.G.3	3	3		1	4	3			2.80
Law enforcement presence	III.G.4	3	3		3	4	3			3.20
									Resource Protection Average Score	3.15
Adjacent Property Concerns (III.G)										
Land Use										
Expanding development	III.H.1.a	3	3	2	3	4	3			3.00
Proposed Greenway	III.H.1.b	3	3	2	3	4	3			3.00
Adjacent Corridors	III.H.1.c	3	3	2	3	4	3			3.00
Discussion of Potential Surplus Land Determination	III.H.3	2	1	1	1	3	1			1.50
Surplus Lands Identified?	III.H.4	2	1	1	1	3	1			1.50
Public Access & Education (IV.1, IV.2, IV.3, IV.4, IV.5)										
Public Access										
Roads	IV.1.a	4	2	2	3	4	3			3.00
Parking	IV.1.b	4	2	2	3	4	3			3.00
Environmental Education & Outreach										
Wildlife	IV.2.a	4	3	2	3	4	2			3.00
Invasive Species	IV.2.b	4	3	2	3	4	3			3.17
Habitat Management Activities	IV.2.c	4	3	2	3	4	3			3.17
Interpretive facilities and signs	IV.3	4	3	2	3	4	3			3.17
Recreational Opportunities	IV.4	4	3		4	4	3			3.60

Management of Visitor Impacts	IV.5	3	3		3	3	3			3.00
							Public Access & Education Average Score			3.14
Managed Area Uses (VI.A, VI.B)										
Existing Uses										
Hiking	VI.A.1	5	5	5	5	5	5			5.00
Birding	VI.A.2	5	5	5	5	5	5			5.00
Nature Study	VI.A.3	5	5	5	5	5	3			4.67
Guided Interpretive Tours	VI.A.4	5	3	5	5	4	3			4.17
Proposed Uses										
Environmental Education Center	VI.B.1	4	1	x	5	4	2			3.20

Color Code:	Excellent	Above Average	Below Average	Poor	See Appendix A for detail
		Missing Vote	Insufficient Information		

Appendix A: Scoring System Detail

Explanation of Consensus Commendations:

Often, the exceptional condition of some of the property's attributes impress review team members. In those instances, team members are encouraged to offer positive feedback to the managing agency in the form of a commendation. The teams develop commendations generally by standard consensus processes or by majority vote if they cannot obtain a true consensus.

Explanation of Consensus Recommendations:

Subsection 259.036(2), F.S., specifically states that the managing entity shall consider the findings and recommendations of the land management review. We ask team members to provide general recommendations for improving the management or public access and use of the property. The teams discuss these recommendations and develop consensus recommendations as described above. We provide these recommendations to the managing agency to consider when finalizing the required ten-year management plan update. We encourage the manager to respond directly to these recommendations and include their responses in the final report when received in a timely manner.

Explanation of Field Review Checklist and Scores, and Management Plan Review Checklist and Scores:

We provide team members with a checklist to fill out during the evaluation workshop phase of the Land Management Review. The checklist is the uniform tool used to evaluate both the management actions and condition of the managed area, and the sufficiency of the management plan elements. During the evaluation workshop, team members individually provide scores on each issue on the checklist, from their individual perspective. Team members also base their evaluations on information provided by the managing agency staff as well as other team member discussions. Staff averages these scores to evaluate the overall conditions on the ground, and how the management plan addresses the issues. Team members must score each management issue 1 to 5: 1 being the management practices are clearly insufficient, and 5 being that the management practices are excellent. Members may choose to abstain if they have inadequate expertise or information to make a cardinal numeric choice, as indicated by an "X" on the checklist scores, or they may not provide a vote for other unknown reasons, as indicated by a blank. If a majority of members failed to vote on any issue, that issue is determined to be irrelevant to management of that property or it was inadequately reviewed by the team to make an intelligent choice. In either case staff eliminated the issue from the report to the manager.

Average scores are interpreted as follows:

Scores 4.0 to 5.0 are *Excellent*

Scores 3.0 to 3.99 are *Above Average*

Scores 2.0 to 2.99 are *Below Average*

Scores 1.0 to 1.99 are considered *Poor*

Appendix D
Summaries of advisory group and public meeting comments, and compliance with the Comprehensive Growth Management Plan

Advisory Group

A draft of this management plan was provided to an advisory group of environmental professionals for their review and comment. A list of the agencies and individuals contacted are provided in Table 1 (below). The advisory group was contacted by email on 19 Jan. 2023 and provided a link to a shared internet drive where they could access and download a copy of the draft plan.

Table 1 Environmental professionals invited to be part of the advisory group.

Name	Agency
Maya Burke	Tampa Bay Estuary Program
Elysia Dytrych	Florida Fish and Wildlife Conservation Commission
Mark Maggard	Southwest Florida Water Management District
Tina Miller	Florida Dept. of Environmental Protection
Rob Northrop	University of Florida / County Extension Office
Ann Paul	Florida Audubon
Joe Sumner	Private landowner
Kimberly Tapley	Hillsborough County Environmental Protection Commission

Subsequently, one meeting was scheduled for the advisory group to meet in person and discuss the plan. An announcement for the meeting was posted on the Hillsborough County calendar on 24 Feb. 2023 (Attachments 1 & 2). The meeting was held on 3 Mar. 2023 between 10:00 am – 12:00 pm at the Bell Creek office of CELM and all attendees signed in (Attachment 3). For this meeting, a PowerPoint slideshow summarizing the major topics within the draft management plan was presented to prompt an open discussion of both the draft plan and feasibility of its implementation.

Input from the advisory group was provided in one of two formats; electronically by way of email or comments inserted into a reviewed copy of the draft, or verbally during the 3 Mar. 2023 advisory group meeting. Only two agencies submitted comments electronically. Swiftmud submitted comments by email (see Attachment 4), and FWC submitted comments within a reviewed copy of the plan. All other comments by the advisory group were offered during the meeting.

A summary of the comments is provided in the following paragraphs, organized by section and subsection of the management plan. The source of each electronically submitted comment is identified as either FWC or Swiftmud. Those comments made during the meeting are identified as coming from the whole advisory group. CELM's responses are provided immediately following each comment. Where appropriate, the text of the plan has been revised.

SECTION A: GENERAL INFORMATION

Swiftmud:

A scaled-out map of GAS in relation to the greater network of surrounding conservation lands would be useful. I also think a map showing the water resources on GAS and surrounding properties would be nice. I understand there are few, but showing the headwaters of the Kitchen Branch would be important and any other features on neighboring properties that the Preserve offers protection to.

CELM response:

A map showing the entire network of ELAPP site as well as other conservation areas is available on the Hillsborough County website. CELM decided that a map covering such a large area would be difficult to read when reduced to the size necessary to include in a management plan such as this.

For similar reasons, it was decided to forego a map showing the extent of wetlands in the surrounding area. Additionally, with an absence of data, CELM does not wish to imply the presence of GAS is directly responsible for certain levels of protection to surrounding wetlands. The study necessary to ascertain the degree to which the GAS preserve conveys benefits on surrounding wetlands is beyond the scope of this plan and would be more effectively addressed by studies conducted at the scale of the entire watershed or, at the very least, the drainage basin(s) that GAS is part of.

Regarding headwaters of Kitchen Branch, accurately depicting the location and extent of the headwaters will require detailed, on-the-ground mapping. Such an exercise will be considered during the lifespan of this management plan.

SECTION B: USES OF THE SITE

Summary of Accomplishments 2008 - 2021

FWC:

What is the wildfire management plan? Both for mitigation and response.

Potentially add some language somewhere in the management plan articulating point of contact in event of wildfire. We've been able to work well with our local Forestry office so that if they respond to a wildfire on our area they'll reach out and if we can provide assistance. They're much less likely to plow out a wildfire. This reduces the compounding impacts of aggressive fire suppression.

Also, you can POTENTIALLY apply aggressive mitigation/counter fire to combat the wildfire, allowing you to burn fuels under the banner of wildfire in conditions that you normally wouldn't be able to get an authorization under.

CELM response:

CELM defers to the Florida Forest Service (FFS) when a wildfire erupts on CELM-managed lands. Burnouts to control wildfires are done at the discretion of FFS and CELM may assist in these endeavors at the request of FFS.

CELM also maintains a list of contacts to notify before beginning a prescribed fire and will also use this list of contacts during and after a response to a wildfire. A copy of this contact list is included as part of Appendix M.

Advisory Group:

Consider establishing partnerships with local academic institutions (e.g., Eckerd College, University of South Florida, University of Tampa, University of Florida, etc.) to conduct wildlife surveys.

CELM response:

The department has collaborated with academic institutions for several projects on other preserves and will explore doing so on GAS.

Advisory Group:

Consider using other resources such as E-Bird, I-Naturalist, bioblitzes, and citizen scientist to help develop comprehensive species lists for GAS and other preserves.

CELM response:

The department has consulted E-bird and I-Naturalist for information in the past. There are concerns regarding the vetting process for information made available through these resources. CELM needs to become more familiar with the vetting process for these sites and, once that is accomplished, refer to these resources when appropriate.

Regarding bioblitzes, CELM has strong reservations about this method out of concern it may result in adverse consequences for a variety of taxa. For example, the approach may be detrimental to herpetofauna by damaging habitats during the search for specimens, or unintended harm to animals resulting from unnecessary handling. Similarly, the department has reservations about this method for conducting inventories of plant species; bioblitzes may result in trampling of flora as volunteers search for rare plants, damage to individual specimens caused by collecting portions of plants to examine using dichotomous keys, and revealing locations of rare and imperiled plants that subsequently may become targets for poaching. Bioblitzes may be useful, however, when using properly vetted individuals with expertise about certain taxa that CELM staff lacks (e.g., fungi).

Use of information collected by citizen scientists potentially has merit like the social media-based sources (e.g., E-Bird or I-Naturalist), but still requires a robust process of vetting the information.

Advisory Group:

Methods for the collection and management of data should be consistent both internally (within CELM) and externally (with other agencies).

CELM response:

As the department expands its repertoire of monitoring, staff research to find methods that are practicable for the department and consistent with other agencies. For examples, the department contracts with the Florida Natural Areas Inventory (FNAI) to update habitat maps for CELM-managed preserves so these are consistent with the state-wide standard, and the department uses the North American Bat (NABat) data management format protocols for its ultrasonic monitoring. The department is actively exploring data management procedures for methods that generate large amounts of data, such as camera trapping and other forms of acoustic monitoring.

Advisory Group:

Consider joining the Open Science Working Group hosted by the Tampa Bay Estuary Program (TBEP). This organization hosts a GIT Hub site where data are shared amongst the members.

CELM response:

The department will investigate and consider this opportunity.

Swiftmud:

Several management activities (specifically invasive plant removal) listed significant accomplishments in 'events' instead of acreages. It was hard to discern if entire blocks were treated or if individual spots were.

CELM response:

Control of invasive plants are described as events because individual infestations are treated. CELM refrains from reporting acreages to avoid implying management units or preserves were treated in the entirety.

Swiftmud:

I think a detailed section highlighting the management challenges you face at the Preserve would go a long way. Everything from habitat types to proximity to I-75, to the TECO easement all present significant hurdles to accomplish everyday management activities out there. I know you touch on them a little bit, but an entire section highlighting these challenges could help garner more support down the line.

CELM response:

The suggestion is appreciated, but GAS is not the only preserve faced with such challenges to successful management. Therefore, CELM prefers to address these difficulties at the County-wide level instead of on a case-by-case basis.

(Comments on) Table 3 summary of total acreage burned in prescribed fires and wildfires by year, 2008 – 2021.

Advisory Group:

Regarding Table 3, the group made several recommendations regarding use of prescribed fire.

- Increase the number of prescribed burns per year.
- Make use of interagency coordination and assistance.
- Consider mechanical treatment of fire suppressed areas.
- Consider amending the Land Development Code (LDC) to be exempt from permitting when conducting mechanical treatments, and also to establish "smoke easements" for better legal protection when conducting burns.
- Consider collaborating with the Tampa Bay Estuary Program, Agency on Bay Management, and the Habitat Restoration Consortium for assistance with funding and legal advocacy to amend the LDC.
- Increase interactions with Homeowner's Associations, public outreach in general, making more use of social media.

CELM response:

CELM has a long-term goal of having all management units on the seasonally and ecologically appropriate fire return interval, based on the habitats currently present in each management unit, or the desired future conditions for that management unit and preserve. CELM is hampered by a lack of staff to take advantage of all days with the weather is conducive to safe prescribed fires. CELM does collaborate with FFS on large or technically difficult burns.

While amending the LDC may prove beneficial to CELM successfully carrying out its mission, doing so is a long process that requires a substantial amount of political support. CELM will, however, consider its options in this regard.

CELM has an Outreach Coordinator who regularly meets with Homeowner's Associations and other groups to educate members on the benefits of prescribed fire as well as the benefits of protecting natural areas.

SECTIONS D & E: NATURAL RESOURCES (Soils, Habitats and Water Resources, Plants, and Wildlife)

Advisory Group:

The group discussed at length the need to increase efforts to control feral hogs on GAS as well as ELAPP sites in general and offered several recommendations.

- Increase funding for control of feral hogs.
- Consider use of a non-profit organization to cull hogs and donate the meat.
- Investigate the ways other conservation organizations are controlling hogs on their sites (e.g., Babcock Webb's program of limited hog hunts).

- Consider approaching the U.S. Department of Agriculture for funding to control hogs because of the species role as a disease vector.

CELM response:

CELM currently does not have funding for removal of feral hogs. In fact, leases are awarded to hog contractors based on the value of bids submitted by private individuals to gain access to preserves and trap hogs. That is, contractors pay Hillsborough County for the right to remove hogs from preserves. CELM may consider limited hunts in the future, but the proximity of residential and commercial areas raises significant questions about safety. CELM also will investigate the possibility of funding from the U.S. Department of Agriculture.

Advisory Group:

The group recommended applying ecosystems services analyses to plant communities and entire preserves to justify increased funding.

CELM response:

CELM will investigate this opportunity.

Soils Management Measures

FWC:

Regarding soil management, add something about what fill is authorized to be brought in site to improve access to mitigate not only invasive plant infiltration but also alteration of soil chemistry. (Much more expensive but we use granite in our sensitive wetlands to prevent soil pH alteration).

CELM response:

Only clean fill, as described in the Hillsborough County Land Development Code (LDC), is used on CELM-managed sites. Granite is used for wetland crossings and parking lots to reduce changes to soil or water chemistry and pH.

FWC:

Regarding soil management and mechanical treatments to habitats, consider using low-impact equipment during the winter months to avoid adverse impacts to herpetofauna, especially soil-dwelling reptiles such as sand skinks.

CELM response:

CELM does attempt to schedule mechanical work for winter months as a way of reducing possible adverse impacts to the herpetofauna. Regarding sand skinks, Hillsborough County is beyond the known, documented range of sand skinks; no evidence of this species, such as tracks in the sand, has been seen on GAS or any other CELM-managed preserve supporting sandhill, scrub or scrubby flatwoods habitats. Other soil-dwelling herpetofauna, such as crown snakes, scarlet snakes, or short tailed snakes have known distributions that overlap several CELM-managed preserves, likely do occur on at least some of these preserves, and could be negatively affected by use of equipment that causes significant disturbance to the soil. In addition to trying to limit mechanical treatments to winter months,

CELM also endeavors to use low-impact equipment to reduce damage to soil on the sites.

Management measures for baygalls

FWC:

Regarding baygalls, consider making a note about the encroaching nature of bayheads when fire suppression occurs, and that staff will attempt to target areas where bay trees are proliferating.

CELM response:

Baygalls occurring within management units subjected to prescribed fire are allowed to burn as far as the fire will spread into the habitat, provided this does not cause safety issues such as smoke spreading into adjacent residential areas or onto Interstate 75.

Depression marsh

FWC:

The soil complex of the depression marshes seems to be supportive of cutthroat grass. Has this species been documented on GAS?

CELM response:

Cutthroat grass has not been documented on GAS.

Management measures for depression marshes

FWC:

For the management of depression marshes, note that the best time to burn these is late spring or early summer. This is especially important for scrub species that need bare, sandy-bottom ponds for breeding, such as gopher frogs.

CELM response:

Burning of depression marshes is done in conjunction with the burning of the surrounding upland habitats. As noted in the description in the management plan, CELM is aware that the lightning season (spring and early summer) is the best time to burn these habitats. Considering surrounding land uses and related safety issues, it is not always feasible to burn these habitats during the ideal time.

Scrub, and management measures for scrub

FWC and Advisory Group:

FWC individually, and the advisory group, recommended more growing season burn in scrub habitat and the application of mechanical treatments to fire-suppressed areas, such as scrub habitat overrun with coppice-growing oaks, or using chainsaws in habitat now dominated by sand pines. FWC strongly disagrees with use of roller chopping in scrub.

CELM response:

CELM concurs that growing season burns are best for scrub habitats, but the ability to conduct such burns is hampered by safety issues, most notably

dispersion of smoke. Regarding the application of mechanical treatments, CELM may consider use of low-impact equipment to reduce coppice-growing oaks. Roller chopping will no longer be used. The department will not begin this type of restoration activity unless it is confident of an opportunity to burn the reduced material in a timely manner. Regarding the dropping of sand pines with chainsaws, CELM thinks this may lead to even more severe smoke management issues compared to leaving these trees upright to burn *in situ*.

FWC:

Which spurge (*Euphorbia* sp.) occurs in the scrub on GAS? Is it *E. rosescens*?

CELM response:

Euphorbia has not been documented on GAS. The reference in the management plan is an error and has been removed.

Scrubby flatwoods and management measures for scrubby flatwoods

FWC:

Regarding management of scrub, scrubby flatwoods, and flatwoods habitats, old plow lines can be seen in some of the photographs. These old lines can create "legacy firebreaks".

CELM response:

Old plow lines are throughout the preserve, some are quite old and now covered in native vegetation. Considering the age and the extent of vegetative cover on many of the plow lines, trying to recontour these may have unintended adverse consequences such as the spread of invasive plant species. Rather than attempt to recontour these old lines to match the existing grade, CELM will instead take the locations of the lines into consideration as prescribed burns are planned.

Management measures for wet flatwoods

FWC:

Regarding management of wet flatwoods, the stated fire return interval (FRI) of 3 to 10 years may be too long, and an interval of 2 to 5 years is recommended.

CELM response:

The FRI for the management plan was chiefly based on FNAI which stipulates a wide range for wet flatwoods. The site tends to be more on the shrubbier side which would be a longer FRI to maintain, but a shorter FRI would support grassier systems. An interval of around 4 years is better for slash pine in our area.

While a FRI of 2-5 or 2-7 years seems within reason, per FNAI, "The general historic fire frequency in pinelands across the southeastern U.S. coastal plain is estimated to be every 1-3 years… Wet flatwoods that are naturally shrubbier and dominated by slash pine or pond pine may have had longer fire return intervals, or perhaps a few periods of longer intervals, on the order of 5-7 years, or up to 5-10 years, in order to allow the pines to establish and shrubs to proliferate...Wet

flatwoods supporting South Florida slash pines burned at intervals of around 4 years."

CELM wants the flexibility to allow this habitat to be maintained, which may include allowing this habitat to avoid fire for up to 10 years in certain circumstances.

Wet Prairie

FWC:

Regarding the wet prairie habitat, two questions were raised; 1) is yellow butterwort (*Pinguicula lutea*) listed, and 2) does pine lily (*Lilium catesbaei*) occur on GAS?

CELM response:

The listed status of yellow butterwort is presented in Table 7. To date, the pine lily has not been documented on GAS.

Successional Hardwood Forest

FWC:

A question was raised about restoration of the successional hardwood forest, as this may be a hinderance to dispersing Florida scrub jays, should the birds visit GAS.

CELM response:

There are no plans to conduct restoration in this area within the lifespan of this management plan. This decision is based on concerns about smoke management issues if this portion of the preserve were subjected to a fuel reduction fire, either while the trees are standing or after being subjected to a mechanical reduction. The overall net benefit of restoring this area is questionable. Although habitat is available to Florida scrub jays the site is relatively isolated from other, more sizeable tracts of scrub. Additionally, GAS is not a site targeted for scrub jay recovery by the United States Fish and Wildlife Service.

Water Resource Management Measures

FWC:

Have there been any biocontrol releases to combat invasive flora or fauna?

CELM response:

To date, there have been no biocontrol releases on GAS.

FWC:

Suggested establishing a set distance around wetlands to avoid disturbance.

CELM response:

A 30 ft. buffer is already notated in the first sentence of this section.

Listed Flora and Management Measures

FWC:

A general question regarding the long-term usefulness and functionality of the data base used for photo-documentation of rare and imperiled plant species was raised.

CELM response:

Text describing the use of the FieldMap app was added to the introductory paragraph for this section.

Management measures for Curtiss' milkweed

FWC:

Soil disturbance within scrub habitat should be avoided because detectability of this species is limited seasonally.

CELM response:

Text stating soil disturbance will be avoided within scrub habitat.

Management measures for Treat's zephyrlily

FWC:

Address hydrological restoration objectives here or somewhere else. Management plan needs an overall cohesive restoration plan for hydrology on the site.

CELM response:

There are no hydrological restoration plans for the GAS preserve.

Listed Fauna and Management Measures

Sandhill Cranes

FWC:

Add to burn prescription template that any nesting or upland foraging habitat located within or adjacent to a management unit scheduled for a prescribed burn will be surveyed immediately prior to the burn to search for fledglings too young to fly.

CELM response:

Noted. Precautions will be taken to protect fledgling sandhill cranes during prescribed burns.

Management measures for the Florida scrub jay

FWC:

A suggestion to add a discussion regarding the carrying capacity of GAS for the Florida scrub jay.

CELM response:

A paragraph discussing the estimated carrying capacity of the site was added.

FWC:

Avoid roller chopping in the scrub because of its deleterious effects to the soil, herpetofauna, imperiled plant species (e.g., Curtiss' milkweed), and the coppice growth of oaks following this type of treatment. Instead, consider hand crews with saws and chemical treatments.

CELM response:

Noted. CELM will likely avoid use of a roller chopper in the scrub for future restoration efforts. Use of hand crews and chemical treatments will be considered, but negative impacts of herbicides to imperiled plants also need to be considered.

FWC:

Band the scrub jays that are on GAS.

CELM response:

Noted. CELM has banded scrub jays on GAS in the past. Additional efforts to band individuals will be considered in the future.

Eastern indigo snake

FWC:

Trap for exotic fauna that could adversely impact this species, such as hogs and tegu lizards; avoid dormant season burns.

CELM response:

CELM currently has at least one contractor to trap and remove hogs from GAS (see discussion regarding hogs, below). Tegu lizards have not yet been documented on GAS. If documented, CELM will consider an effort to trap and remove this species either via contractual services or in conjunction with other agencies such as FWC or the USFWS.

Gopher tortoise

FWC:

Is GAS already at capacity? Is the abundance of forbs sufficient to support tortoises? What is the disease monitoring protocol for tortoises?

CELM response:

A survey to estimate the size of the resident gopher tortoise population has not yet been done. Neither has an overall assessment of the herbaceous strata, regarding needs of gopher tortoises, been completed. Both surveys likely will take place between 2023 – 2025. There is no disease monitoring protocol, such a collection of blood samples or biopsies, currently in place. All CELM staff know to report observations suggesting a die off gopher tortoise, such as a large number of shells on the ground throughout the preserve.

SECTION F: HISTORICAL, ARCHEOLOGICAL, AND CULTURAL RESOURCES
No comments were made on this section.

SECTION G: FACILITIES
Proposed Recreational Facilities (nature center)
FWC:

Consider funding an environmental interpreter position.

CELM response:

The department currently has an outreach coordinator on staff.

Greenways and Trails
FWC:

- "Consider if this will open the area to trespassers and other illegal activity. Should put interpretive signs around gas boundary to inform public and hopefully prevent resource degradation. Ensure signs are posted stating what activities are illegal and phone numbers to call if bad stuff is being seen. Also, ensure (Florida scrub jays) don't become tame, good intentions can result in malnutrition. No gt waif site. Post boundary."
- Any money raised from permitted takings, such as relocation of gopher tortoises, should be placed in a fund for management of GAS.
- Consider installing nest boxes for Southeastern American kestrels.

CELM response:

The proposed route for the Greenways trail has been withdrawn and another route that does not involve GAS is being considered. Should the route through GAS again be considered, FWC's suggestions regarding posting of signs and deposition of fees paid for takings will be considered. Regarding the installation of nest boxes for kestrels, this has been done in the past and is being considered again.

Public Meeting

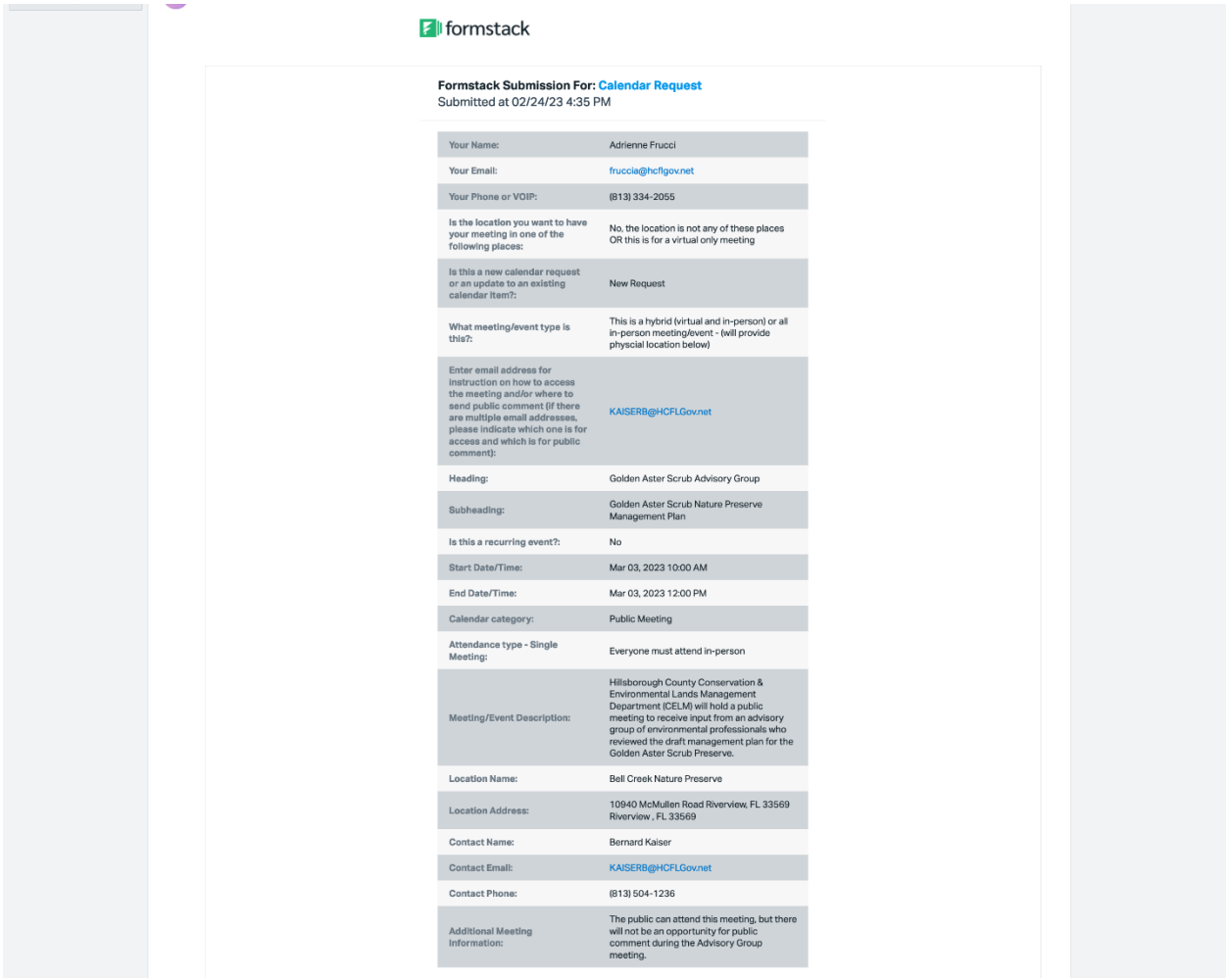
On 10 April 2023 a copy of the draft management plan was posted to the Hillsborough County website for public input, along with a summary of the plan and invitation for public comment. The opportunity for the public to submit comments remained open from 10 Apr. – 10 May 2023. A copy of the introductory material and submitted public comments can be found in Attachment 5.

In addition to the posting on the Hillsborough County website, an announcement for a 10 May 2023 public meeting to receive public input on the GAS management plan was posted in the Tampa Bay Times on 12 Apr. 2023 (Attachment 6). The meeting was held at the Bell Creek Nature Preserve office and began a 6:00 pm. A PowerPoint presentation summarizing the main points of the plan was presented and the floor was then opened for comments.

The comments received on the website (Attachment 5) were overall positive in nature. Those who commented encouraged more efforts to control exotic species and increase the number of burns taking place. Some public comments also supported CELM's position that the proposed route of the Greenways Trail is inappropriate for the GAS preserve.

At the public meeting, after the presentation attendees asked general questions about the natural history of some species and the extent of exotic species on the preserve. Attendees also expressed support for Hillsborough County to continue acquiring lands through ELAPP.

Attachment 1 Request to post advisory group meeting on Hillsborough County calendar.

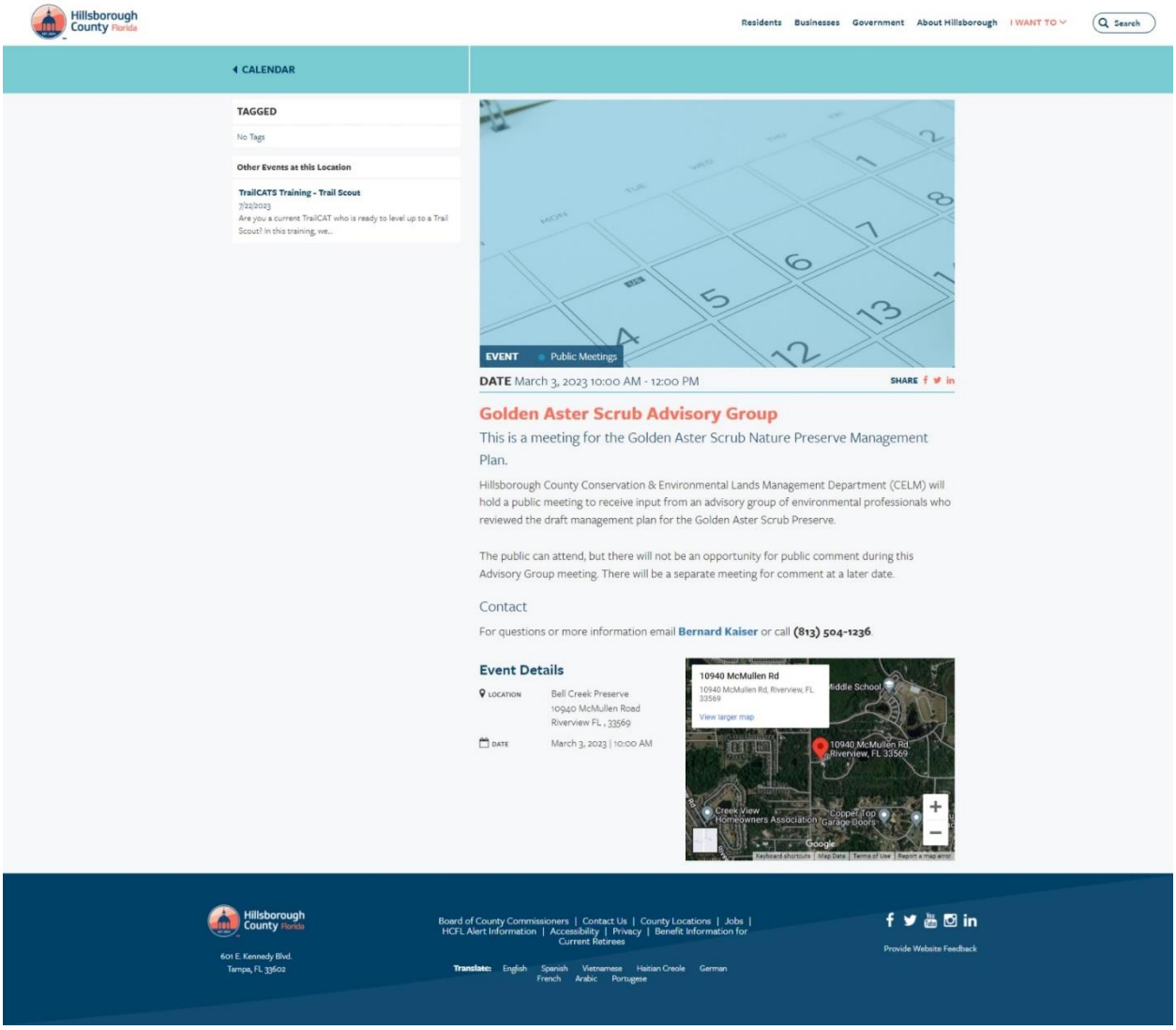


formstack

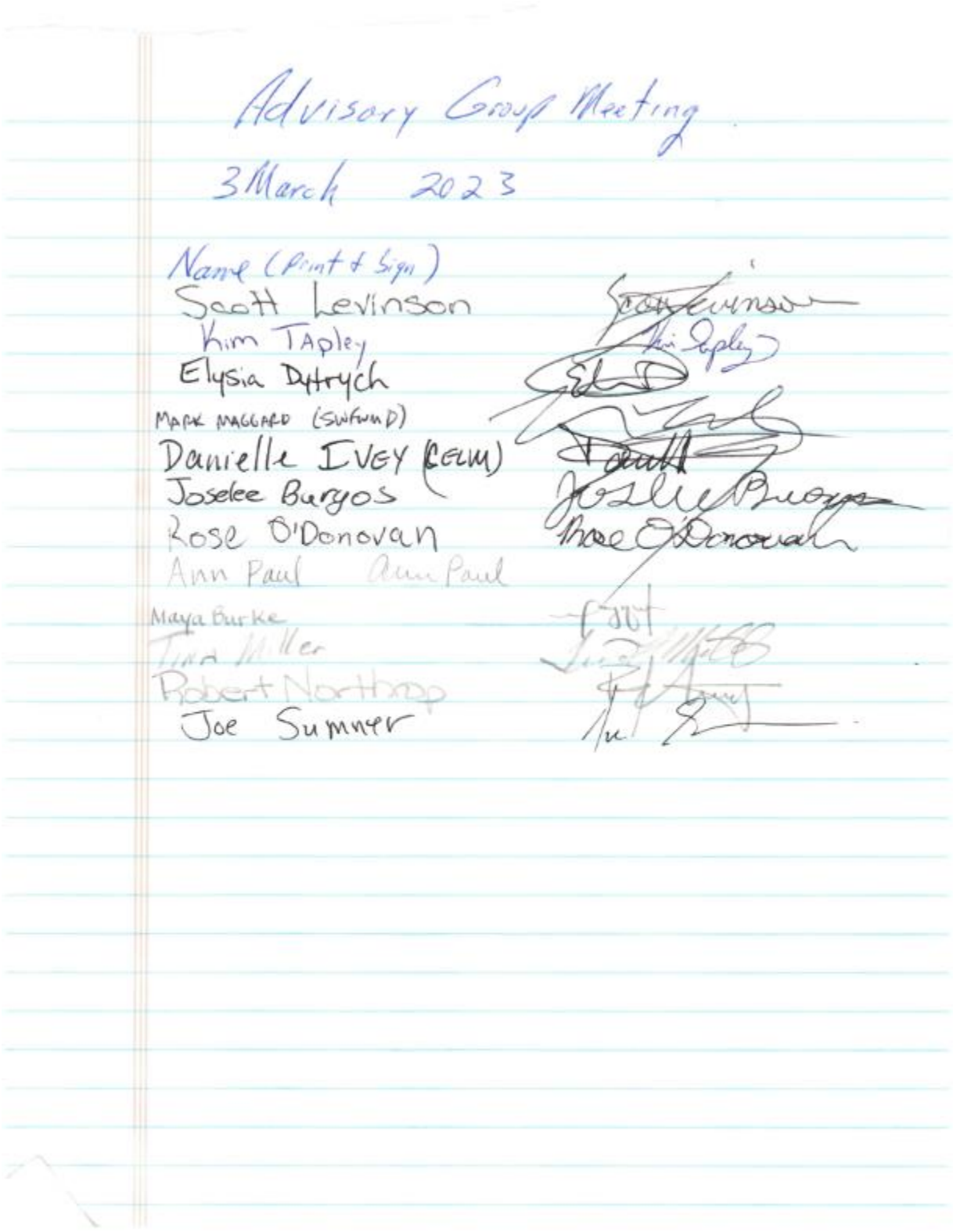
Formstack Submission For: Calendar Request
Submitted at 02/24/23 4:35 PM

Your Name:	Adrienne Frucci
Your Email:	fruccia@hcflgov.net
Your Phone or VOIP:	(813) 334-2055
Is the location you want to have your meeting in one of the following places:	No, the location is not any of these places OR this is for a virtual only meeting
Is this a new calendar request or an update to an existing calendar item?:	New Request
What meeting/event type is this?:	This is a hybrid (virtual and in-person) or all in-person meeting/event - (will provide physcial location below)
Enter email address for instruction on how to access the meeting and/or where to send public comment (if there are multiple email addresses, please indicate which one is for access and which is for public comment):	KAISERB@HCFLGov.net
Heading:	Golden Aster Scrub Advisory Group
Subheading:	Golden Aster Scrub Nature Preserve Management Plan
Is this a recurring event?:	No
Start Date/Time:	Mar 03, 2023 10:00 AM
End Date/Time:	Mar 03, 2023 12:00 PM
Calendar category:	Public Meeting
Attendance type - Single Meeting:	Everyone must attend in-person
Meeting/Event Description:	Hillsborough County Conservation & Environmental Lands Management Department (CELM) will hold a public meeting to receive input from an advisory group of environmental professionals who reviewed the draft management plan for the Golden Aster Scrub Preserve.
Location Name:	Bell Creek Nature Preserve
Location Address:	10940 McMullen Road Riverview, FL 33569 Riverview , FL 33569
Contact Name:	Bernard Kaiser
Contact Email:	KAISERB@HCFLGov.net
Contact Phone:	(813) 504-1236
Additional Meeting Information:	The public can attend this meeting, but there will not be an opportunity for public comment during the Advisory Group meeting.

Attachment 2 Screen capture of advisory group meeting announcement on Hillsborough County calendar.



Attachment 3 Scanned sign-in sheet for advisory group meeting.



Advisory Group Meeting

3 March 2023

Name (Print & Sign)

Scott Levinson

Kim TApley

Elysia Dytrych

MARK MAGGARD (SWFWMD)

Danielle IVEY (FGCU)

Joselee Burgos

Rose O'Donovan

Ann Paul

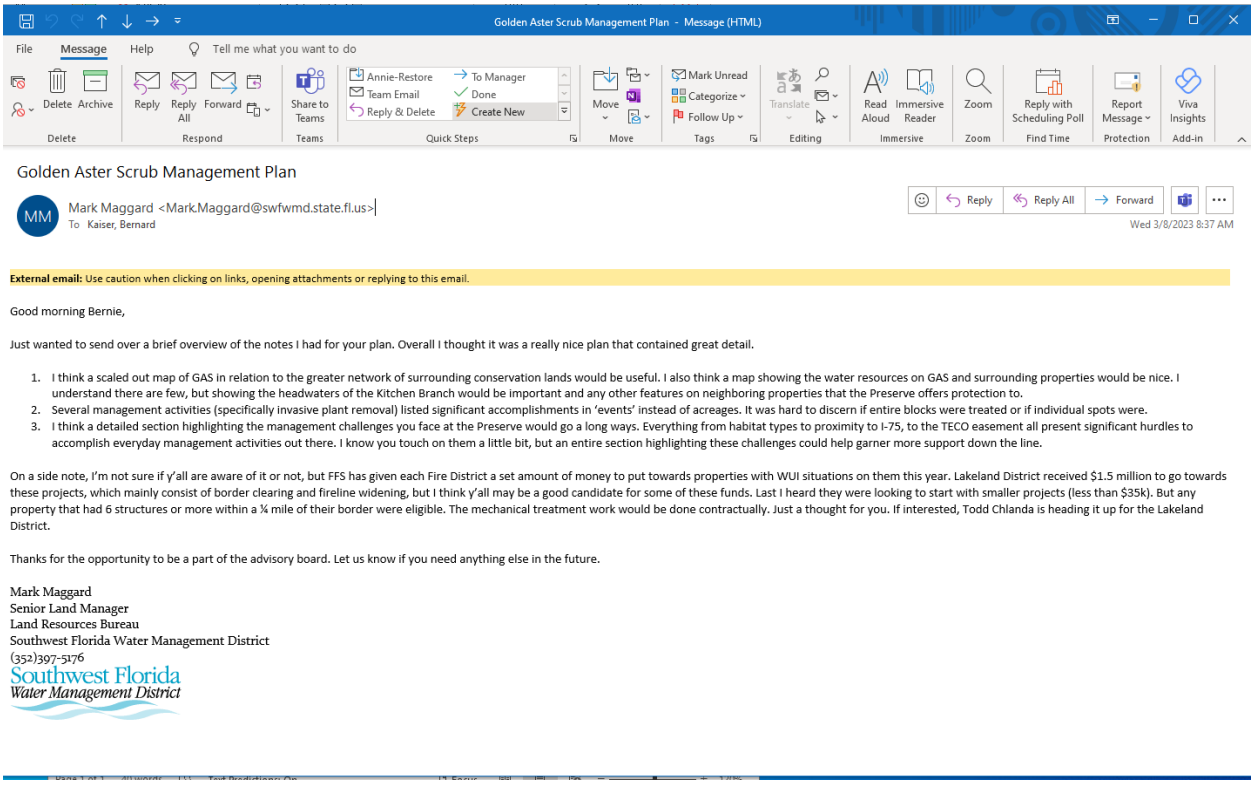
Maya Burke

Tina Miller

Robert Northrop

Joe Sumner

Attachment 4 Comments by Southwest Florida Water Management District submitted via email.



Golden Aster Scrub Management Plan

MM Mark Maggard <Mark.Maggard@swfwmd.state.fl.us>
To Kaiser, Bernard

Reply | Reply All | Forward

Wed 3/8/2023 8:37 AM

External email: Use caution when clicking on links, opening attachments or replying to this email.

Good morning Bernie,

Just wanted to send over a brief overview of the notes I had for your plan. Overall I thought it was a really nice plan that contained great detail.

1. I think a scaled out map of GAS in relation to the greater network of surrounding conservation lands would be useful. I also think a map showing the water resources on GAS and surrounding properties would be nice. I understand there are few, but showing the headwaters of the Kitchen Branch would be important and any other features on neighboring properties that the Preserve offers protection to.
2. Several management activities (specifically invasive plant removal) listed significant accomplishments in 'events' instead of acreages. It was hard to discern if entire blocks were treated or if individual spots were.
3. I think a detailed section highlighting the management challenges you face at the Preserve would go a long ways. Everything from habitat types to proximity to I-75, to the TECO easement all present significant hurdles to accomplish everyday management activities out there. I know you touch on them a little bit, but an entire section highlighting these challenges could help garner more support down the line.

On a side note, I'm not sure if y'all are aware of it or not, but FFS has given each Fire District a set amount of money to put towards properties with WUI situations on them this year. Lakeland District received $1.5 million to go towards these projects, which mainly consist of border clearing and fireline widening, but I think y'all may be a good candidate for some of these funds. Last I heard they were looking to start with smaller projects (less than $35k). But any property that had 6 structures or more within a ¼ mile of their border were eligible. The mechanical treatment work would be done contractually. Just a thought for you. If interested, Todd Chlanda is heading it up for the Lakeland District.

Thanks for the opportunity to be a part of the advisory board. Let us know if you need anything else in the future.

Mark Maggard
Senior Land Manager
Land Resources Bureau
Southwest Florida Water Management District
(352)397-5176
Southwest Florida
Water Management District

Attachment 5 Hillsborough County website invitation to the public to review and comment on the GAS management plan.

Golden Aster Scrub Nature Preserve Land Management and Land Use Plan Public Input

Golden Aster Scrub Preserve Management Plan – Public Input

Welcome to the Hillsborough County Conservation & Environmental Lands Management public engagement opportunity for the Golden Aster Scrub Nature Preserve Management Plan. This virtual engagement is offered as an option for residents who cannot attend an in-person meeting on Wednesday, May 10, at 6 p.m. at Bell Creek Nature Preserve, 10940 McMullen Rd., Riverview, FL 33569. This opportunity will remain open from April 10 to May 10, 2023.

The management plan is comprised of several sections, each addressing strategies to keep the preserve thriving and healthy for decades to come. This is your opportunity to review the plan and provide comment.

Introduction

The management plan for Golden Aster Scrub Nature Preserve is updated every 10 years. Each time the plan is updated, the public is invited to review and comment on the management of natural habitats and recreational resources on the preserve. The current draft was shared with an advisory group of environmental professionals who also provided comment.

Background

Golden Aster Scrub Nature Preserve is an approximately 1,181-acre nature preserve within the Bullfrog Creek Watershed in southern Hillsborough County. It was purchased from the Emil C. Marquardt, Jr. land trust in 1995 and subsequently sold to the Preservation 2000/CARL Program. Hillsborough County now leases and manages the site.

Upland and wetland communities within the preserve include scrub, scrubby flatwoods, mesic and wet flatwoods, mesic and hydric hammocks, wet prairie, and depression marshes. These natural communities support a diverse array of native plant and animal species and are relatively undisturbed by previous land uses.

The Florida golden aster, federally listed as endangered, is found throughout much of the scrub habitat. Other imperiled plant species such as yellow butterwort, red margin zephyr lily, and Treat's zephyr lily have been found on the site. At least two Florida scrub endemic plants, Curtiss' milkweed and nodding pinweed, also have been documented on this preserve.

Imperiled animal species found on the preserve include the gopher tortoise, eastern indigo snake, Florida scrub-jay, Southeastern American kestrel, Florida sandhill crane, and several species of wading birds.

The water resources on the preserve are limited to the wetland habitats, artificial ponds, and the headwaters of Kitchen Branch stream.

Recreational use of the preserve is limited to hiking on marked trails, guided tours, and passive wildlife observation. The site has minimal facilities in the form of a composting toilet and picnic pavilion.

View the Golden Aster Scrub Nature Preserve Management Plan.

Comments

We have beautiful preserves and need to protect them to the fullest and continue to add to them. We need to increase our Wildlife Corridors before its too late

This critical natural habitat that must be preserved to ensure that these species will continue to thrive in their natural habitat. The preserve provides opportunities for outdoor recreation and education, allowing people to connect with nature and learn about the importance of environmental conservation and maintaining the natural balance of ecosystems. Preserving these habitats ensures that future generations can enjoy the beauty and benefits of these We must continue to prioritize the preservation of these important areas to ensure that they remain intact for years to come.

This land needs to be preserved. I live on east bay road close to the preserve. Me, my children, and grandchildren go hiking in this area. It's a wonderful.place to be with nature. Please dont turn it into another housing area.

It doesn't say how much money is going to the work. I didn't download each item. Recently Elapp spent 32 and another 11 million in south county. I understand this is separate money from some discretionary spending. Thing is the urban core and also our rural areas are suffering for jobs , housing and transportation. In difficult times is it prudent to spend so much. Can we solicit funds from the governors 110 billion budget he says is overflowing with cash??

I think the Scrub preserve is a vital part of the gibsonton area and I would not support any development to the land, as far as improvements perhaps a repaving of the road is due.

I am a resident of Hillsborough County, and a member of Florida Audubon. I strongly support protection of the Golden Aster Scrub Nature Preserve for the primary purpose of preserving the unique flora and fauna of south Hillsborough County that reside in the preserve. Management of the Preserve must include controlling invasive species, intelligently designing prescribed fires and guarding the property from unlawful use.

As a resident of Hillsborough County, birder (member of TAS), hiker, and advocate for environmental and land preservation, I strongly encourage continued efforts at preserving and protecting this land and invasive plant and animal control. This area is an important part of the overall habitat in the county for resident and migratory birds. Additionally, looking at the potential impacts of the proposed Greenway Trail, I agree that an alternate route should be found. Thank you for the opportunity to let our voices be heard. What really matters is that these comments are taken into serious consideration and account. Please listen and take heed to our plead for continued protection and our strong advocacy for natural FL.

As an avid hiker, birder and member of the Florida Native Plant Society, I urge continued efforts to control invasive plant and animal species within the Golden Aster Scrub (GAS) Nature Preserve. I also strongly recommend that an alternate route be found for the proposed Greenway Trail to avoid potential negative environmental impacts on the GAS Preserve. This area is an important habitat for resident and migratory birds within the county and it must be protected from encroachment. Local government and community leaders working with knowledgeable subject matter experts can ensure the GAS Preserve remains a healthy and viable environment - this includes the necessary and judicious use of prescribed burns.

Having reviewed the documents, and having hiked many of the trails in GAS, on behalf of Tampa Audubon Society, I strongly encourage continued efforts at invasive plant and animal control. I also encourage as much monitoring as possible by the Sheriff's Dept. to discourage the dumping of trash, use of parts of the property for parties, camps and such, and the use of drones over the area. This area is an important part of the overall habitat in the county for resident and migratory birds. Encroachment by subdivisions around it should not eliminate the possibility of good management, including prescribed burns, which are needed at an increased frequency than have been done in the past. Additionally, looking at the potential impacts of the proposed Greenway Trail, I agree completely that it should not be routed as proposed around the perimeter of GAS, but an alternate route should be found.

We must be good stewards of our environment everywhere.

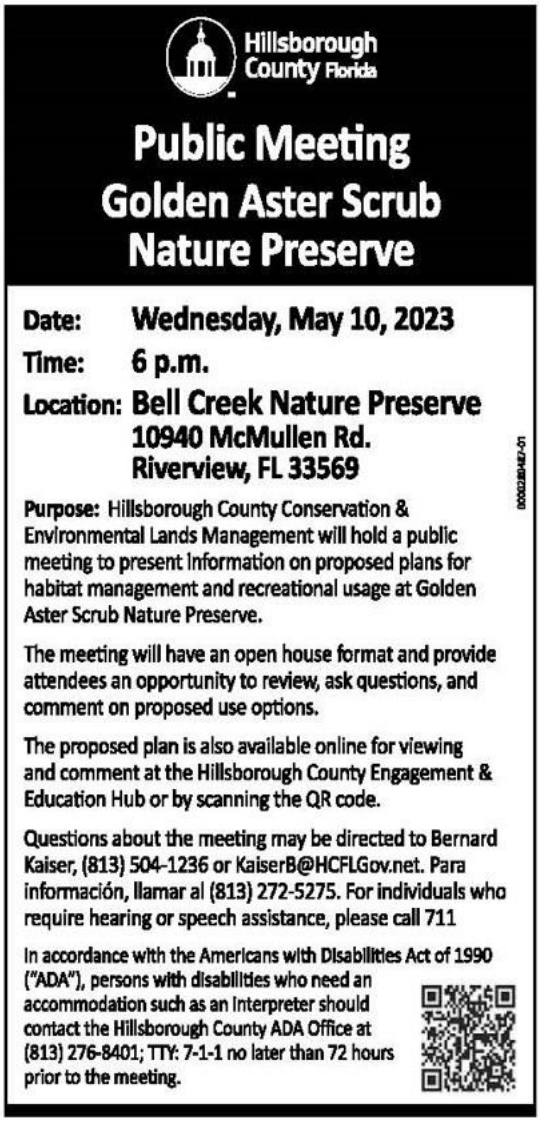
I think this is great. We need to have areas saved where people can't destroy it. It's also land where more houses can't be built in an already overcrowded area. If you can find even more area to preserve I world support it too.

Our community needs to have preserves that honor how beautiful Florida is. We also need to ensure green spaces, not concrete and pavement. Places where nature rules.

Thank you for preserving some of the nature in Florida. We need so much more!
We need no more concrete or cars or homes.
A great plan for our area. I’m sure the entire community appreciates keeping nature as it should be.

Whatever you do...Please don't allow our Planning Commission to change the underlying Future Land Use or allow developers to try any Comprehensive Plan Amendments in this area...
You have 100% power to stop any development from happening in this area...just do it!

Attachment 6 Advertisement posted in the Tampa Bay Times to announce time, date, and location of the public meeting for the GAS management plan.



Hillsborough County Florida

Public Meeting
Golden Aster Scrub Nature Preserve

Date: **Wednesday, May 10, 2023**

Time: **6 p.m.**

Location: **Bell Creek Nature Preserve**
10940 McMullen Rd.
Riverview, FL 33569

Purpose: Hillsborough County Conservation & Environmental Lands Management will hold a public meeting to present information on proposed plans for habitat management and recreational usage at Golden Aster Scrub Nature Preserve.

The meeting will have an open house format and provide attendees an opportunity to review, ask questions, and comment on proposed use options.

The proposed plan is also available online for viewing and comment at the Hillsborough County Engagement & Education Hub or by scanning the QR code.

Questions about the meeting may be directed to Bernard Kaiser, (813) 504-1236 or KaiserB@HCFLGov.net. Para información, llamar al (813) 272-5275. For individuals who require hearing or speech assistance, please call 711

In accordance with the Americans with Disabilities Act of 1990 ("ADA"), persons with disabilities who need an accommodation such as an interpreter should contact the Hillsborough County ADA Office at (813) 276-8401; TTY: 7-1-1 no later than 72 hours prior to the meeting.

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Hillsborough County
City-County
Planning Commission

Resolution: Golden Aster Scrub Nature Preserve Land Management and Land Use Plan Update

August 14, 2023

WHEREAS, the Hillsborough County City-County Planning Commission developed a Comprehensive Plan for Unincorporated Hillsborough County; and

WHEREAS, the Hillsborough County City-County Planning Commission is the Local Planning Agency responsible for long-range comprehensive planning in Hillsborough County;

WHEREAS, the Hillsborough County City-County Planning Commission staff reviewed the Golden Aster Scrub Nature Preserve Land Management and Land Use Plan (September 2022); and

WHEREAS, the Golden Aster Scrub Nature Preserve Land Management and Land Use Plan focuses on natural resource protection and restoration and providing outdoor, natural, resource-based recreational opportunities; and

WHEREAS, Hillsborough County is experiencing rapid population growth and development; and

WHEREAS, the Golden Aster Scrub Nature Preserve has a Future Land Use designation of Natural Preservation (N) which recognizes lands of significant environmental importance set aside primarily for conservation and natural resource-based recreation purposes; and

WHEREAS, the site is zoned for Agricultural – Industrial (AI) which protects agricultural activities within areas designated for industrial uses on parcels of at least one (1) acre and prohibits new residential development; and

WHEREAS, the site is also zoned for Agricultural Rural (AR), which protect agricultural lands from potential suburban and urban development encroachment by encouraging agricultural, and related uses on parcels of at least five (5); and

WHEREAS, the management and land use plan provides an inventory of resources on site and documents ongoing and needed management activities and facilities; and

WHEREAS, Hillsborough County City-County Planning Commission reviewed the draft management plan update, and considered the adopted Goals, Objectives, and Policies of the Comprehensive Plan of Unincorporated Hillsborough County as follows:

Environmental & Sustainability

Objective 3.8: *Manage flora, fauna and uplands to ensure a healthy, functioning environment, economy and quality of life.*

Policy 3.8.1: *Protect and conserve Significant Wildlife Habitat and ensure a no net loss of Essential Wildlife Habitat.*

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Policy 3.8.2: *Continue to prohibit unmitigated encroachment into the 100-year floodplain to protect and conserve the functions and natural wildlife habitat attributes where they exist within the 100-year floodplains of rivers and streams as provided under local rules and regulations including mitigation as required.*

Policy 3.8.3: *Maintain local wildlife and wildlife habitat protection and management programs to protect native plants and wildlife.*

Policy 3.8.4: *Continue to apply adopted criteria, procedures standards, methodologies, and that require the development and implementation of management plans for Significant or Essential Wildlife Habitat determined to provide particularly valuable and manageable habitat qualities.*

Policy 3.8.6: *The abundance and distribution of Listed Species shall be maintained and/or increased.*

Policy 3.8.7: *Coordinate with the Florida Fish and Wildlife Conservation Commission and the U.S. Fish and Wildlife Service, in the management of natural preserve lands owned or managed by the County when appropriate.*

Policy 3.8.8: *Collaborate with the U. S. Fish and Wildlife Service, the Florida Fish and Wildlife Conservation Commission, Florida Department of Agriculture and Consumer Services and the FDEP in the implementation of protection and recovery programs for Listed Species.*

Policy 3.8.9: *Control the spread of exotic and nuisance species on County managed land by at least 90% from previously uncontrolled levels.*

Policy 3.8.10 *Collaborate with the Florida Department of Agriculture and Consumer Services, FWC, SWFWMD, and the FDEP to control and/or eliminate exotic and nuisance species on County owned or management land and incorporate these efforts into the management plans of natural preserve lands.*

Objective 3.9: *Manage natural preserves to ensure a healthy, functioning environment, economy and quality of life.*

Policy: 3.9.1 *Consider residents and visitors in the governance of natural resources to ensure equitable access and distribution.*

Policy 3.9.5: *Provide multiple use opportunities on County-owned natural preserve lands consistent and compatible with natural resource protection and conservation.*

Policy 3.9.10: *Preserve rare and threatened native vegetative communities and protect Listed Species from development and associated impacts of development, such as habitat fragmentation, noise, light and domestic animals as provided under local rules and regulations including mitigation as required.*

Policy 3.9.11: *Restore and enhance degraded natural areas on lands acquired for preservation, including removal of noxious exotics, reforestation, aquatic grass bed restoration, reintroduction of fire through prescribed burns and restoration of Shorelines and natural hydrology, as needed.*

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Recreation and Open Space

Objective 1.2: *Integrate Active Recreational Parks, Regional Parks, preserves and trails with other aspects of the built environment in a manner that enhances the overall community.*

Policy 1.2.1: *Utilize parks to inspire a sense of place and as gathering spaces for the community.*

Policy 1.2.4: *Ensure the preservation of cultural, historical, archeological, scenic, and natural resources to promote resource-based recreation; provide public access where such access does not impact the resource.*

Policy 1.2.5: *Integrate environmentally sensitive and natural areas into parks, preserves and recreation amenities while retaining natural character and function.*

Future Land Use

Objective 9: *All existing and future land development regulations shall be made consistent with the Comprehensive Plan, and all development approvals shall be consistent with those development regulations as per the timeframe provided for withing Chapter 163, Florida Statutes. Whenever feasible and consistent with Comprehensive Plan policies, land development regulations shall be designed to provide flexible, alternative solutions to problems.*

Policy 9.1: *Each land use plan category shall have a set of zoning districts that may be permitted within that land use plan category, and development shall not be approved for zoning that is inconsistent with the plan.*

Policy 9.2*: Developments must meet or exceed the requirements of all land development regulations as established and adopted by Hillsborough County, the state of Florida and the federal government unless such requirements have been previously waived by those governmental bodies.*

Objective 13: *New development and redevelopment shall not adversely impact Environmentally Sensitive Areas and other significant natural systems as described and required within the Conservation and Aquifer Recharge Element and the Coastal Management Element of the Comprehensive Plan.*

Policy 13.6: *The County shall protect significant wildlife habitat, and shall prevent any further net loss of essential wildlife habitat in Hillsborough County, consistent with the policies in the Conservation and Aquifer Recharge Element and Land Development Code.*

WHEREAS, Planning Commission staff determined that the Golden Aster Scrub Nature Preserve Land Management and Land Use Plan update is consistent with the goals, objectives, and policies of the Comprehensive Plan for Unincorporated Hillsborough County.

NOW, THEREFORE, BE IT RESOLVED, that the Hillsborough County City-County Planning Commission finds the Golden Aster Scrub Nature Preserve Land Management and Land Use Plan update **CONSISTENT** with the Comprehensive Plan for Unincorporated Hillsborough County.

The above resolution for the Golden Aster Scrub Nature Preserve Land Management and Land Use Plan update was adopted by the Planning Commission on August 14, 2023.

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By motion of Commissioner Saria
Seconded by Commissioner Louk

Commissioner Joseph, Chair	**Aye**
Commissioner Bernstein	**Absent**
Commissioner Bowden	**Aye**
Commissioner Buzza, Vice-Chair	**Absent**
Commissioner Cardenas	**Absent**
Commissioner Fernandez	**Aye**
Commissioner Handy	**Aye**
Commissioner Kress, AICP, Member-at-Large	**Aye**
Commissioner Louk	**Aye**
Commissioner Saria	**Aye**

DocuSigned by:
63DCAB39B571461...
Commissioner Joseph, ***Chairman***

DocuSigned by:
944A2D6F9DB0485...
Melissa Zornitta, FAICP
Executive Director

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Appendix E
Florida Natural Areas Inventory Habitat Mapping of Golden Aster Scrub

FNAI NATURAL COMMUNITY MAPPING METHODOLOGY
2020 Hillsborough County

The primary purpose of Natural Community Mapping is to inform land management staff about the type, composition, and structure of natural communities. ArcGIS polygon maps as well as supporting groundtruthing GPS points form the basis of the product. Descriptive narratives accompany maps for clarification and additional information.

Up to eight products are typically provided for each natural community map:

(1) a point shapefile that identifies the natural community type observed at each point; a polygon shapefile containing the boundaries of the current natural communities on the study area with attributes that list the FNAI natural community type or an altered landcover type if the area is heavily disturbed as well as any natural communities or other landcover types that may occur as inclusions within the delineated polygon;
(2) a polygon shapefile containing the boundaries of the historical natural communities on the study area as determined from historical aerial photography, field evidence, or original public land survey notes;
(3) a brief written description of the natural communities that occur on site, including a list of the dominant or characteristic plant species;
(4) a point shapefile with locations and descriptions of FNAI-tracked, rare plant occurrences;
(5) a point shapefile with locations and descriptions of FNAI-tracked, rare animal occurrences;
(6) a point shapefile with locations and descriptions of invasive exotic plant occurrences.
(7) geo-referenced historical aerial photography.

PRELIMINARY METHODS

FNAI scientists developed preliminary natural community maps using these resources:

- natural community element occurrence records from the FNAI database
- Florida Land Use, Cover, and Forms Classification System (FLUCCS) shapefiles
- aerial photography from 1995 to present
- Soil Conservation Service county soil maps
- USGS 7.5 minute topographic quadrangles
- geo-referenced historical black and white DOT aerial photographs

For Golden Aster Scrub Preserve, a 1957 aerial photograph was obtained through the University of Florida and geo-referenced for use in mapping. For Balm-Boyette Scrub Preserve, 1938 and 1939 aerial photographs were also obtained through UF and geo-referenced for use in mapping.

Preliminary polygon maps were created using ArcGIS. The historical natural community maps were produced first. Natural community delineations were made based on visual inspection of the historical and current photographs as well as the other resources listed above. The typical minimum mapping unit is 0.5 acres; however, smaller communities (such as sinkholes, dome swamps, depression marshes, etc.) may be mapped to a finer scale, down to 0.1 acres. A draft map of the current natural communities was then created by modifying the historical map.

Ground-truth field work aimed to observe at least 60% of all historical polygons over 10 acres. Preliminary maps with draft polygons and/or go-to points were printed for use and correction in the field. Digital maps were loaded onto dataloggers for navigation.

FIELD METHODS

FNAI scientists surveyed ("ground-truth") a percentage of mapped natural community polygons on foot to assess the community type, and also to note variation in topography, hydrology, vegetation composition and structure, and to determine the types of disturbance present in each polygon. Each ground-truthed polygon should have at least one GPS point recorded inside the polygon, with, at a minimum, the FNAI Natural Community type recorded.

Ground-truth points are selected in an area determined to be representative of the polygon. If a polygon is large and heterogeneous, multiple ground-truth points may be collected to capture the variability. Temporary, circular data collection plots with a radius of 65.6 feet (20 meters) are estimated at each point. Scientists enter data on vegetation, hydrology, and other ecological and physical attributes within the plot and enter these data into field computers ("dataloggers"). For repetitive natural community types, a smaller data set may be recorded. A list of the attributes and their definitions is provided in Appendix 1.

Additional data regarding the extent of natural communities or other details may be recorded in miscellaneous GPS points or written on field maps to assist with production of the final map. Additionally, incidental observations of rare, FNAI-tracked plant and animal species are recorded using the dataloggers. The attributes for rare species are described in Appendix 2. Observations of exotic pest plant species were also recorded; these attributes are described in Appendix 3.

MAPPING AND REPORTING METHODS

GPS Pathfinder Office software was used to design data dictionaries, transfer files to and from dataloggers, and export the data as ESRI shapefiles.

The natural community polygon boundaries were edited in ArcGIS based on field observations and data points. The attributes for current and historical natural community polygons are described in Appendices 4 and 5. All data are reviewed and corrected for consistency. Data values of "ZZ" indicate that data were not collected or were not applicable for that attribute. The projection parameters for all shapefiles are as follows:

NAD_1983_StatePlane_Florida_West_FIPS_0902_Feet
WKID: 2237 Authority: EPSG

Projection: Transverse_Mercator
False_Easting: 656166.6666666665
False_Northing: 0.0
Central_Meridian: -82.0
Scale_Factor: 0.9999411764705882
Latitude_Of_Origin: 24.33333333333333

Linear Unit: Foot_US (0.3048006096012192)

Map and point shapefiles were inspected for errors and consistency before products were finalized and metadata added to GIS files.

Brief descriptions of natural communities on each study area were written based on data points with detailed composition information, and other observations made in the field. Acreage summaries for historical and current natural communities and landcover were created from the final maps.

APPENDIX 1. NATURAL COMMUNITY POINTS: DATA ATTRIBUTES, DEFINITIONS, AND VALUES

ATTRIBUTE	VALUE
SITE	Name of managed area where data collection is occurring.
DATE	Date of data collection.
SURVEYOR	Name of FNAI field surveyor.
FIELD_ID	Number assigned to point by FNAI scientist during field work; not necessarily unique.
POINT_ID	Unique number assigned to each point.
DATA_TYPE	Data collection methods: • **Datalogger**: polygon was assessed in the field and ecological data were collected using a datalogger. • **Ground-truthed**: polygon was assessed in the field and a natural community type was assigned based on visual observations. The scientist was confident of location without taking a GPS point. No additional ecological data were collected. • **Ground-truthed+gps**: polygon was assessed in the field and a natural community type was assigned based on visual observations. A GPS point was taken. No additional ecological data were collected.
FNAI_NC	Current natural community observed at point using FNAI classification and following additional communities. Additional communities: • **Pine plantation**: planted pines are having an ongoing detrimental effect on native groundcover, the history of planted pines has damaged ground cover to the point where further restoration beyond thinning and burning is required, or where the method of planting (e.g., bedding) has severely impacted groundcover. • **Pasture improved**: pasture grass-dominated with little or no native species remaining and evidence of current or recent pasture activity (mowing, grazing, and burning). • **Pasture semi-improved**: contains a mix of pasture grasses and native groundcover (due to incomplete conversion to pasture, not regeneration). This category should apply regardless of pasture maintenance.

ATTRIBUTE VALUE

- **Successional hardwood forest**: closed canopied forest dominated by fast growing hardwoods such as laurel oak (*Quercus hemisphaerica*), water oak (*Quercus nigra*), and/or sweetgum (*Liquidambar styraciflua*), often with remnant pines. These forests are either invaded natural habitat (i.e. mesic flatwoods, sandhill, upland pine, upland mixed woodland) due to lengthy fire-suppression or old fields that have succeeded to forest. The subcanopy and shrub layers of these forests are often dense and dominated by smaller individuals of the canopy species. Successional hardwood forests can contain remnant species of the former natural community such as turkey oak (*Quercus laevis*), saw palmetto (*Serenoa repens*), gallberry (*Ilex glabra*), and infrequent wiregrass (*Aristida stricta* var. *beyrichiana*). Additionally, species such as beautyberry (*Callicarpa americana*), muscadine (*Vitis rotundifolia*), and sparkleberry (*Vaccinium arboreum*) are common. Restoration of these forests includes mechanical tree removal and reintroduction of fire. Where characteristic herbaceous species (e.g., wiregrass) have been lost, reintroduction via seed or plants may be necessary to restore natural species composition and community function.

- **Successional hydric shrubland/forest**: shrubland or closed canopied forest occupying disturbed areas and dominated by fast growing hydrophilic hardwoods such as titi (*Cyrilla racemiflora*), black titi (*Cliftonia monophylla*), sweet gallberry (*Ilex coriacea*), sweet gum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), water oak *(Quercus nigra),* swamp laurel oak *(Quercus laurifolia),* wax myrtle (*Morella cerifera*), blackberry (*Rubus argutus*), and groundsel tree (*Baccharis halimifolia*). Weedy vines such as smilax (*Smilax* spp.) and muscadine (*Vitis rotundifolia*), and invasive exotic plants including Peruvian primrose willow (*Ludwigia peruviana*) and Brazilian pepper (*Schinus terebinthifolius*) may be common in the subcanopy and shrub layers. These shrubland/forests may invade herbaceous habitats (i.e., wet prairie, wet flatwoods, seepage slope, depression marsh, basin marsh, floodplain marsh) due to lengthy fire-suppression and/or hydrological alterations OR forested wetlands (dome swamp, basin swamp, strand swamp) that have been cleared and are not succeeding to swamp but to highly disturbed shrubland or forest dominated by hydrophilic hardwoods. Successional hydric shrubland/forests are often shrub thickets with few of the characteristic herbaceous or canopy (e.g. *Taxodium* spp.) species from the former community remaining. They can resemble naturally occurring shrub bogs and can be distinguished from them by occurring in areas of historically herbaceous communities, where fire suppression and/or hydrological alterations have taken place or in former forested swamps that have been logged or undergone severe hydroperiod disruptions. Although some shifts in community type may be better described with a natural community designation, the use of "successional hydric shrubland/forest" is suitable to label areas that are known to be highly disturbed and altered, and where restoration efforts of hydrology restoration and/or re-introduction of fire would be particularly beneficial.
- **Restoration natural community**: former altered land cover type or successional natural community (pine plantation, xeric hammock, etc.) where active restoration is ongoing to return the community to its historic state. Examples of restoration activities include pine thinning, longleaf pine planting, groundcover restoration, hydrology restoration, and removal of

ATTRIBUTE	VALUE
	exotics and other undesirable vegetation. In historically pyrogenic restoration natural communities, restoration activities are accompanied by the application of prescribed fire.
FNAI_NC	Additional ruderal communities: • **Abandoned field/abandoned pasture**: old fields, fallow pastures, early successional areas formerly grazed or in agriculture without recent activity to maintain the area as pasture or planted field. These areas are often dominated by weedy native (e.g., *Rubus* spp., *Morella cerifera*) and non-native species (e.g., *Indigofera hirsuta*). Generally designated for old pastures when weedy cover from woody species (*Rubus* spp., *Myrica cerifera*, etc.) is greater than 20 percent. • **Agriculture**: row crops, citrus groves, and sod fields that are generally being maintained to grow products for human or domesticated animal use. • **Artificial pond**: water retention ponds, cattle ponds, etc. • **Borrow area**: dry or wet depression resulting from past or present mining operation including phosphate pits and upland borrow pits (sand pits, clay pits, etc.). • **Canal/ditch**: artificial drainage way. • **Clear-cut pine plantation**: areas of pine plantation that have been clear-cut of pine canopy but have not yet been replanted with pine trees. These areas are often dominated by weedy native and non-native species. Natural pine dominated communities that have been clear-cut but not further altered should be classified as this natural community. • **Clearing**: recent or historic clearings that have significantly altered the groundcover and/or overstory of the original natural community (old homesites, etc.); clearings of unknown origin. • **Developed**: check stations, ORV use areas, parking lots, buildings, maintained lawns (as part of recreational, business, or residential areas), botanical or ornamental gardens, campgrounds, recreational, industrial, and residential areas. • **Invasive exotic monoculture**: stand of invasive exotic plant species that have eliminated the native vegetation or nearly so. • **Impoundment**: stream or watershed impoundment. • **Road**: paved or unpaved. • **Spoil area**: area where dredge or spoil material is deposited, may be re-colonized by plants. • **Utility corridor**: electric, gas, telephone right-of-ways. • **Wildlife food plot**: planted or unplanted areas to benefit wildlife or game species; dove fields are included. If not maintained these areas are often dominated by weedy native and non-native species.
INCLUDEDNC	Natural community less than 0.5 acres that is included within the described polygon.
INCLUDEDNC2	A second natural community less than 0.5 acres that is included within the described polygon. If more than two included communities then recorded in COMMENTS.
HISTORICNC	Historic natural community type, i.e. the type of natural community that occurred at this point prior to disturbance or alteration.
CANOPY_COV	Canopy cover as percentage of ground covered by canopy, when the edges of the canopy are mentally projected down to the ground. Exclude light gaps between individual leaves from percent canopy cover. Canopy is defined by height (greater

ATTRIBUTE	VALUE
	than 6 feet), habit (single stemmed trees), and functional role (top vegetation layer with one or more defined layers underneath). Canopy cover values: • None • <1% • 1-5% • 6-15% • 16-25% • 26-35% • 36-45% • 46-55% • 56-65% • 66-75% • 76-85% • 86-95% • 96-100%
CANOPY_HT	Canopy height determined by visual estimate or using a clinometer when practical. Canopy height classes: • <6 ft (applies only to dwarf cypress) • >6-15 ft • >15-30 ft • >30-45 ft • >45-60 ft • >60-100 • >100 ft
CANOPYDOM	Dominant canopy species listed in order of abundance.
BASALAREA	Basal area of pine canopy trees taken using a 10-factor prism in pine-dominated communities, such as mesic and wet flatwoods, and in pine plantations.
CANOPY_AGE	Canopy age determined by visual estimate. Canopy age classes: • **Old growth**: average dbh of canopy trees is very large and/or old growth tree morphology is prevalent in the canopy (e.g. "flat top" morphology in pines or cypress). If tree ages are known, average canopy tree age should be 100+ years old. • **Older mature**: average dbh of canopy trees is medium to large, and some old-age tree morphology (as described in "old growth" above) may be present in the canopy, but is not the norm for most canopy trees. If tree ages are known, average canopy tree age should be 50+ years old. • **Mature**: average dbh of canopy trees is medium size, and may have reached the typical height for a mature forest, but no trees exhibit old age morphology, and there are no trees of very large dbh present. If tree ages are known, average canopy tree age should be 30 years old. • **Younger mature**: average dbh for canopy trees is small, and trees may not have reached full height. The majority of canopy trees have reached reproductive status. If tree ages are known, average canopy tree age should be 5-30 years.

ATTRIBUTE	VALUE
	• **Pre-reproductive**: average canopy tree is small in stature and little or no reproduction is evident because the trees are too young.
SUBCAN_COV	Subcanopy trees are single-stemmed woody plants taller than 6 feet but shorter than the canopy layer, including saplings of canopy species, and typical subcanopy trees. Subcanopy cover values: • None • <1% • 1-5% • 6-15% • 16-25% • 26-35% • 36-45% • 46-55% • 56-65% • 66-75% • 76-85% • 86-95% • 96-100%
SUBCAN_HT	Subcanopy height classes: • <6 ft • 6-15 ft • >15-30 ft • >30-45 ft • >45-60 ft • >60-100 ft • >100 ft
SUBCANDOM	Dominant subcanopy species listed in order of abundance.
TSHRUB_COV	Tall shrubs include multi-stem woody plants and saw palmetto that are taller than 6 feet, plus tree saplings that have not entered the sub-canopy. Tall shrub cover values: • None • <1% • 1-5% • 6-15% • 16-25% • 26-35% • 36-45% • 46-55% • 56-65% • 66-75% • 76-85% • 86-95% • 96-100%
TSHRUB_HT	Tall shrub height classes: • 6-9 ft • >9-15 ft • >15-30 ft

ATTRIBUTE	VALUE
	• >30-45 ft • >45-60 ft • >60 ft
TSHRUBDOM	Dominant tall shrub species listed in order of abundance.
SSHRUB_COV	All woody plants, single or multi-stemmed, less than 6 feet tall, including woody seedlings, tree saplings, saw palmetto, and woody ground-vining plants. Short shrub cover values: • None • <1% • 1-5% • 6-15% • 16-25% • 26-35% • 36-45% • 46-55% • 56-65% • 66-75% • 76-85% • 86-95% • 96-100%
SSHRUB_HT	Short shrub height values: • <1 ft • 1-3 ft • >3-6 ft
SSHRUBDOM	Dominant short shrub species listed in order of abundance.
DWARFSHRUB	Dwarf shrub cover is a subset of SSHRUB_COV and includes shrubs that are genetically of short stature and rarely if ever exceed 1 meter/3 feet in height, e.g. runner oak (*Quercus pumila*), dwarf live oak (*Q. minima*), Darrow's blueberry (*Vaccinium darrowii*), dwarf shiny blueberry (*V. myrsinites*), gopher apple (*Licania michauxii*), and dwarf huckleberry (*Gaylussacia mosieri*). Dwarf shrub cover values: • None • <1% • 1-5% • 6-15% • 16-25% • 26-35% • 36-45% • 46-55% • 56-65% • 66-75% • 76-85% • 86-95% • 96-100%
PALMETTO	Palmetto cover is a subset of SSHRUB_COV and includes saw palmetto (*Serenoa repens*) and scrub palmetto (*Sabal etonia*). It is intended to convey information

ATTRIBUTE	VALUE
	about inflammability of the shrub layer. It does not include needle palm (*Rhapidophyllum hystrix*), blue palm (*Sabal minor*), or cabbage palm (*Sabal palmetto*), unless they occur in fire-maintained communities and carry fire like saw palmetto. Palmetto cover values: • None • <1% • 1-5% • 6-15% • 16-25% • 26-35% • 36-45% • 46-55% • 56-65% • 66-75% • 76-85% • 86-95% • 96-100%
TOTALSHRUB	Total shrub cover includes all multi-stemmed woody plants regardless of height; plus all saplings, woody seedlings, and woody non-aerial vines. Total shrub cover values: • None • <1% • 1-5% • 6-15% • 16-25% • 26-35% • 36-45% • 46-55% • 56-65% • 66-75% • 76-85% • 86-95% • 96-100%
HERB_COVER	Herb cover includes all non-woody, soft-tissue plants regardless of height, including non-woody vines, legumes, and graminoids (grasses, sedges, rushes). Herb cover values: • None • <1% • 1-5% • 6-15% • 16-25% • 26-35% • 36-45% • 46-55% • 56-65% • 66-75% • 76-85%

ATTRIBUTE	VALUE
	• 86-95% • 96-100%
HERBDOM	Dominant herbaceous species listed in order of abundance.
ALL_GRAMIN	All graminoid cover includes all non-woody grasses (Graminae/Poaceae), sedges (Cyperaceae), and rushes (Juncaceae). Graminoid cover values: • None • <1% • 1-5% • 6-15% • 16-25% • 26-35% • 36-45% • 46-55% • 56-65% • 66-75% • 76-85% • 86-95% • 96-100%
WIRYGRAMIN	Wiry graminoid cover includes all grasses, sedges, and rushes that resemble wiregrass (*Aristida stricta*), i.e. have wiry, involute leaves, and that function as wiregrass in a fire, e.g. *Sporobolus junceus, Rhynchospora chapmanii*, and *Muhlenbergia capillaris*. Not included: *Panicum abscissum, Sporobolus floridanus, Aristida rhizomophora*, and *Cladium jamaicense*. Wiry graminoid cover values: • None • <1% • 1-5% • 6-15% • 16-25% • 26-35% • 36-45% • 46-55% • 56-65% • 66-75% • 76-85% • 86-95% • 96-100%
PYROGRAM	Pyrogenic graminoids (Poaceae, Juncaceae, Cyperaceae) that potentially carry fire in a manner similar to wiregrass. This includes *Panicum abscissum, Sporobolus floridanus, Aristida rhizomophora,* and *Cladium jamaicense*. Pyrogenic graminoid cover values: • None • <1% • 1-5% • 6-15%

ATTRIBUTE	VALUE
	• 16-25% • 26-35% • 36-45% • 46-55% • 56-65% • 66-75% • 76-85% • 86-95% • 96-100%
LITTER_COV	Litter cover includes litter exposed between plants as well as litter under shrubs, grass clumps, or other vegetation. Litter cover values: • None • <1% • 1-5% • 6-15% • 16-25% • 26-35% • 36-45% • 46-55% • 56-65% • 66-75% • 76-85% • 86-95% • 96-100%
LICHEN_MOS	Lichen-moss cover includes all lichens and mosses, including those growing under other vegetation. Lichen-moss cover values: • None • <1% • 1-5% • 6-15% • 16-25% • 26-35% • 36-45% • 46-55% • 56-65% • 66-75% • 76-85% • 86-95% • 96-100%
EPIPHYTE	Epiphyte abundance refers to ferns, bromeliads, and orchids that typically occur as epiphytes as well as other species that may inhabit tree trunks just above the water line in swamps. Epiphyte abundance values: • **Infrequent**: one to two trees or branches in the plot have a few epiphytes.

ATTRIBUTE	VALUE
	• **Occasional**: several trees or branches support epiphytes. • **Common**: approximately half the trees or branches in the plot carry epiphytes, or a few trees or branches are dense with them. • **Abundant**: more than half of the trees or branches have epiphytes, or several trees/branches are especially dense.
EPIPHYTDOM	Dominant epiphytic plants listed in order of abundance.
VINE_ABUND	Vine abundance refers to climbing, sprawling, or twining woody vines. This field is independent of any other field that may include vines, e.g. WEEDY_COV or EXOTICS. For example, information on Old World climbing fern is entered here AND under EXOTICS. Vine abundance values: • **None** • **Infrequent**: one or two vines occur in the plot. • **Occasional**: several trees or branches support vines. • **Common**: approximately half the trees or branches in the plot support vines. • **Abundant**: more than half of the trees or branches support vines.
VINEDOM	Dominant vines listed in order of abundance.
BARE_SOIL	Bare soil coverage includes bare soil surface exposed between plants as well as the litter-free ground surface under vegetation (i.e. not "sky to ground" coverage). Bare soil cover values: • None • <1% • 1-5% • 6-15% • 16-25% • 26-35% • 36-45% • 46-55% • 56-65% • 66-75% • 76-85% • 86-95% • 96-100%
INUNDATED	Is approximately 50% or more of the plot under water? Inundated values: • Yes • No
ORGANIC	Organic layer depth includes the top surface of the soil that is still recognizable as being of plant origin and which has not fully decomposed. Does not include recognizable plant parts such as leaves and twigs, which are considered litter. Does not include sand grains stained black with organic material UNLESS there is a "greasy" feel when the sand is rubbed between your fingers and more than 75% of the grains are coated black with organic matter, as is the case in hydric soils. Organic soil depth values in inches: • <1" • 1 - 2"

ATTRIBUTE	VALUE
	• >2”
AERIALFUEL	Aerial fuel abundance includes only dead matter that is not on the ground, e.g. standing dead trees that are still capable of burning, dead lower branches of living trees, and pine needle drape. Aerial fuel bridges the gap between surface fuel (fine, medium, and heavy fuels below) and the fuel represented by the tree crowns (which is not included in this project’s data). Aerial fuel abundance values: • None • Low • Moderate • High
FINE_FUEL	Fine fuel load include all terrestrial material less than 0.25 inch in diameter or in width, e.g. small twigs, narrow-leaved grasses, and pine needles. This field is NOT exclusive from litter, and some or all of the material recorded here may also be reflected in LITTER_COV. Fine fuel load cover values: • None • Low • Moderate • High
MED_FUEL	Medium fuel load includes material greater than 0.25 inch wide or in diameter but less than or equal to 3 inches, e.g. pine cones, larger twigs, small branches. This field is NOT exclusive from litter, and some or all of the material recorded here may also be reflected in LITTER_COV. Medium fuel load values: • None • Low • Moderate • High
HEAVY_FUEL	Heavy fuel load includes material greater than 3 inches wide or in diameter, such as large branches and logs. This field is NOT exclusive from litter and some or all of the material recorded here may also be reflected in LITTER_COV. Heavy fuel load values: • None • Low • Moderate • High
FUEL_CONTI	Fuel continuity applies to the overall fuel load. Fuel continuity values: • Patchy • Continuous
LASTFIREYR	Last fire year is an estimate of the time since last fire, using field indicators such as charring and fuel load, unless better data are available from land managers. Non-pyrogenic communities are considered “>20 years” unless better information is available.

ATTRIBUTE	VALUE
	Last fire year values: • Unknown • <6 months • 6 months-2yrs • >2-5 yrs • >5-20 yrs • >20 yrs
WEEDYCOVER	Weedy cover includes **native** species present IN THE PLOT which are functioning as invasive species, early successional pioneers, or disturbance-opportunists. Species that frequently become weedy include blackberry (*Rubus* spp.), cattail (*Typha* spp.), broomsedge (*Andropogon virginicus*), catbrier (*Smilax auriculata*), muscadine (*Vitis rotundifolia*), and dog fennel (*Eupatorium capillifolium*). Data in this field are independent of any other field, e.g. a weedy stand of broomsedge is recorded here as well as in ALL_GRAMIN, invasive blackberries are recorded here as well as in short shrubs, and a disturbance-related sprawl of muscadine vines is included here and in VINE_ABUND. Weedy cover values: • None • <1% • 1-5% • 6-15% • 16-25% • 26-35% • 36-45% • 46-55% • 56-65% • 66-75% • 76-85% • 86-95% • 96-100%
EXOTICSCOV	Exotic cover includes any non-native species present in the plot. Exotic cover values: • None • <1% • 1-5% • 6-15% • 16-25% • 26-35% • 36-45% • 46-55% • 56-65% • 66-75% • 76-85% • 86-95% • 96-100%
POLYDIST_1	Polygon disturbance 1 describes the primary, or most prevalent, disturbance observed anywhere in the natural community polygon, not just in the plot. This is

ATTRIBUTE	VALUE
	one of the few attributes that describe conditions observed throughout the polygon, not just in the plot. All types of disturbance, hydrologic or otherwise, are recorded in POLYDIST_1, 2, or 3. If there is more than one type of disturbance, the most prevalent form of disturbance is entered here and lesser disturbances are entered in POLYDIST_2 and POLYDIST_3. If there are more than three disturbance types, they are entered in DISTURBCOM. Polygon disturbance values: • Not evident • Agriculture • Cattle disturbance • Clearing (includes dove fields, old fields, and food plots that are less than 0.5 acre, i.e. that are not delineated as ruderal polygons) • Ditch/canal • Exotics • Firebreaks • Fire suppression • Forestry operations (e.g., logging, loading areas, bedding, equipment rutting, slash piles, and other mechanical disturbances; does not include burning.) • Hog digging • Hydrology alteration (ditching or drawdown) • Impoundment (e.g. artificial ponds and lakes, borrow pits, dams, dikes) • Natural • ORV trail • Road • Trash dumping • Woody encroachment • Cause unknown • Other (details provided in the DISTURBCOM field)
POLYDIST_2	Polygon disturbance 2 describes secondary disturbance in the polygon. POLYDIST_2 values are the same as for POLYDIST_1.
POLYDIST_3	Polygon disturbance 3 describes the tertiary disturbance in the polygon. POLYDIST_3 values are the same as for POLYDIST_1.
DISTURBCOM	Disturbance or other related details not included in POLYDIST_1, _2, or _3, or other information about disturbance in the polygon.
POLY_SEVER	Polygon disturbance severity describes the overall impact of all combined disturbances noted in the natural community polygon. Polygon disturbance severity values: • Light • Moderate • Heavy • Severe
REF_SITE	Does the polygon represent a good quality example of the natural community compared to other polygons of that type on that WMA? Could land managers could use the polygon as a benchmark for restoration at other sites? Reference site values: • Yes

ATTRIBUTE	VALUE
	• No
VEG_NOTES	Information on dominant species. Full scientific names of species starting with the canopy and moving down through the strata (canopy, subcanopy, tall shrub, short shrub, and herb). Names are separated by commas and the strata are separated by forward slashes.
COMMENTS	Comments provide additional, optional information about the plot or polygon.
NC_RANK	Rank based on factors that reflect the present quality, condition, and landscape context of the natural community. Quality reflects species components; condition describes community structure; landscape context is the quality and condition of the surrounding communities irrespective of property ownership. Ranks reflect the degree to which people have directly or indirectly adversely impacted community composition, structure, and/or function, including alteration of natural disturbance processes. Natural community ranks: • **Excellent**: Natural community is in excellent quality and condition. Dominant components and structure are characteristic of the natural community type. Minimal restoration is needed and management is maintained. Exotic species are absent or minimal. Landscape context allows for active management of rare elements and ecological processes. • **Good**: Natural community is in good quality and condition. Many of the dominant components of the community are present but some characteristic species are noticeably missing and/or there is a minor presence of weedy or early successional species. Community structure may need aggressive fire management in order to achieve maintenance condition. Invasive exotic species may occur occasionally. Landscape context allows for active management of rare species and ecological processes. • **Fair**: Natural community is in fair quality and condition. Many dominant components of the community are missing or there is a heavy presence of weedy or early successional species. The community is in need of restoration to restore community structure (e.g., aggressive fire management or more intensive restoration or may have been converted in the past and is now in some stage of restoration). May have moderate levels of invasive exotic species OR heavy invasive exotic species infestations but is undergoing active treatment. Landscape context may hinder management of rare species and ecological processes. • **Poor**: Natural community is generally degraded but still retains some components and/or structure characteristic of the natural community. This natural community requires extensive restoration. Landscape context may prevent management of rare species and ecological processes.

FNAI-TRACKED RARE PLANT AND ANIMAL POINTS:
DATA ATTRIBUTES, DEFINITIONS, AND VALUES
(Modified 2018-09-19 to align with rare plant data merge tool)

ATTRIBUTE	VALUE
SITE	Name of managed area or potential natural site.
SURVEYDATE	**REQUIRED**. Date of data collection.
SURVEYOR	**REQUIRED**. Name of the field surveyor. Required format "Last Name, First Name"
FIELD_ID	Number assigned to this point during field work; not necessarily unique.
SPECIES	Scientific name of rare plant or animal occurring at that point.
ID_CONFIRM	**REQUIRED**. Indicates whether taxonomic identification of the species has been confirmed by a reliable individual. Only use "no" if you have found a plant/animal with questionable ID (i.e. not reproductive). Do not use "no" if the plant was not found (in this case use "ZZ"). Identification confirmed values: • Yes • No • ZZ
CONF_EXT	**REQUIRED**. Indicates confidence that the full extent of the EO is known. This will only be applied to single source EOs. Confirmation extent values are: • Yes • No • Unknown
COUNT**	Number of individuals physically counted. Count should be a specific number. "Count" **OR** the following attribute, "estimate", is **REQUIRED**, but <u>do not fill out both</u>.
ESTIMATE**	Estimated number of individuals in the population. "Estimate" **OR** the previous attribute, "count", is **REQUIRED**, but <u>do not fill out both</u>. Allowed characters in this field include the following: 0123456789-<>s. OR one of the following words: 'infrequent', 'occasional', 'common', or 'abundant'. For example: • 1000s • 10-15 • >100 • <500 • 50

ATTRIBUTE	VALUE
WHAT_CNTED	**REQUIRED FOR PLANT ONLY**. Indicates what was counted in the COUNT or ESTIMATE field. What centered values: • Plant • Stem • Reproductive stem • Clump • Patch • ZZ
OBS_AREA	**Rare plant only**. Location area (acres) observed occupied by rare species. NOTE: If you are recording an observation area >9m in diameter (larger than the "0.01ac; 2 car garage" class below) the SF_TYPE must be 'Polygon' and a polygon must be digitized for inclusion in the final deliverables and upload to Biotics. An alternative, if appropriate, is to record a smaller 'Point' observation of a smaller subset of the full observed area. If you do this, CONF_EXT has to be recorded as 'no'. Observation area values: • 0.001; 2 lg desk • 0.01; 2 car garage • 0.1; bball ct • 0.25; 4 tennis ct • 0.5; half fball field • 1.0; fball field • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9 • 10 • Other (in Comments) • ZZ
PHENOLOGY	**Rare plant only**. Characteristic phenology of the plants. Phenology values: • Flower/bud • Flower/fruit • Fruit • Sporulating • In leaf • Dormant

ATTRIBUTE	VALUE
OBS_ACTIV	**Rare animal only**. Describes the activity of rare animal. If animal is doing more than one thing, the secondary activity is described in OTH_OBSDAT. Observation activity values: • Nesting • Foraging • Loafing (idling) • Commuting • Burrow • Other (described in OTH_OBSDAT)
LOC_USE	**Migratory animal only**. Describes observed location area of migratory animal species that use geographically and seasonally disjunct locations. The location use class indicates which season or behavior is associated with a particular area. Ensures that different locations used by species throughout entire life cycle are identified and considered for protection. Location use values: • Not applicable • Breeding • Nonbreeding • Migratory stopover • Migratory corridor • Staging • Hibernaculum • Maternity colony • Bachelor colony • Non-migratory • Undetermined • Adult foraging area • Nesting area • Juvenile foraging area • Calving area • Nursery area • Wintering site • Roost
OTH_OBSDAT	Other observation data including any observations on the status, distribution, estimated occupied area, management needs, and viability of population. This is only for additional data directly related to the observation of the rare species; for interesting but not directly related comments, please use the Comments field. DO NOT repeat any information about count, phenology, observed activity, or any other field unless you are adding more specific information (ex. “7 seedlings and 2 mature plants” or “Most plants flowering, but some in fruit”). This statement should be correct in grammar and spelling. Do not put a period at the end of the statement. This entire field will be copied and concatenated, to the source feature visit notes field.
FNAI_NC	**REQUIRED**. Type of natural community, using the FNAI classification system (see FNAI website for natural community descriptions, www.fnai.org) plus disturbed and ruderal types. The value ‘flatwoods’ is also allowed.

ATTRIBUTE	VALUE
DISTURBSEV	Severity of the disturbance(s). Disturbance severity values: • Light • Moderate • Heavy • Severe • Not evident
DISTURB 1	Describes the primary disturbance in the vicinity of the rare plant or animal population. If there is more than one type of disturbance, the most prevalent form of disturbance is entered here and secondary disturbance entered in DISTURB 2. Disturbance 1 values: • Agriculture • Artificial pond/borrow pit • Cattle • Clearing (includes dove fields, old fields, and food plots) • Ditch/canal • Exotics • Firebreaks • Fire exclusion • Forestry operations (e.g., logging, loading areas, bedding, equipment rutting, slash piles, and other mechanical disturbances associated with planted tree areas; does not include burning.) • Hog digging • Impoundment (e.g. dams, dikes) • Natural causes • ORV trail • Road • Trash dumping • Utility corridor • Woody encroachment • Vehicle rutting • Cause unknown • Other (details provided in the OTH_DESC field)
DISTURB 2	Describes the secondary disturbance, if any, in the vicinity of the rare plant population. Disturbance values are the same as DISTURB 1.
OTH_DESC	A general description or "word picture" of the area where this occurrence is located (i.e., the physical setting and ecological context), including habitat, dominant plant species, topography, hydrology, soils, adjacent communities, and surrounding land use. Do not repeat NC or disturbances. This statement should be correct in grammar and spelling. This field will be copied in its entirety to the data field in the source observation.
SF_RANK	**REQUIRED**. Describes the present/absence status of the source feature. This field is used to record negative data. Source feature rank values: • Extant • Failed to find • Extirpated • Possibly extirpated

ATTRIBUTE	VALUE
SURVEY_EFF	**REQUIRED**. Indicates the effort and thoroughness of the survey. Survey effort values: • Thorough survey • Quick survey
COMMENTS	Comments is an optional field to provide additional information about the FNAI-tracked population. Do not repeat information that has already been entered in other fields, such as Count, FNAI_NC, or OTH_DESC.
SF_TYPE	**REQUIRED**. This is a field to help remind you what type of feature this should be, remembering that we should be mapping polygons when appropriate and feasible. NOTE: If you are recording an observation of an area >9m in diameter (larger than the "0.01ac; 2 car garage" class below) the SF_TYPE must be 'Polygon' and a polygon must be digitized for inclusion in the final deliverables and upload to Biotics. An alternative, if appropriate, is to record a smaller 'Point' observation of a smaller subset of the full observed area. Source feature values: • Point • Polygon
SFTYPECOM	A personal note to self, used to help draw the line or polygon. Ex. "pop extends 50m to north" or "pop throughout depression marsh". Field will not be uploaded to EO. Use miscellaneous points or extra rare points to help delineate polygon when possible.
DIRECTIONS	Precise directions to the occurrence that use a readily locatable and relatively permanent landmark on or near the site (such as a road intersection, bridge, or natural landform) as the starting point. Include distances and directions from landmarks, as appropriate. Please note: neither directions nor coordinate information will be provided to general public if the data are to be considered sensitive.
SENSITIVE	**REQUIRED**. Should the identification and location information of this population be protected (i.e. prevent disclosure to the general public)? This designation should only be used when the particular location is deemed sensitive. When recording data for an element that is considered sensitive by FNAI, it is not necessary to flag the location as sensitive unless the owner/manager specifically requests that you do so. Sensitive values: • Yes • No
SEN_REASON**	A brief description of why the EO is being classified as sensitive. In most cases, locations that are sensitive will not be given to the general public, but would be shared with public land managers. If this is not allowed by the owner, make sure to record that information here. **A reason is **REQUIRED** if "Sensitive: equals "yes".

GLOBAL AND STATE RANKS

Florida Natural Areas Inventory (FNAI) defines an **element** as any rare or exemplary component of the natural environment, such as a species, natural community, bird rookery, spring, sinkhole, cave, or other ecological feature. FNAI assigns two ranks to each element found in Florida: the **global rank**, which is based on an element's worldwide status, and the **state rank**, which is based on the status of the element within Florida. Element ranks are based on many factors, including estimated number of occurrences, estimated abundance (for species and populations) or area (for natural communities), estimated number of adequately protected occurrences, range, threats, and ecological fragility.

GLOBAL RANK DEFINITIONS

G1	Critically imperiled globally because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or human factor.
G2	Imperiled globally because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or human factor.
G3	Either, very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals), or found locally in a restricted range, or vulnerable to extinction from other factors.
G4	Apparently secure globally (may be rare in parts of range).
G5	Demonstrably secure globally.
GH	Occurred historically throughout its range, but has not been observed for many years.
GX	Believed to be extinct throughout range.
GXC	Extirpated from the wild but still known from captivity or cultivation.
GU	Unrankable

STATE RANK DEFINITIONS

State ranks (S#) follow the same system and have the same definitions as global ranks, except only apply to Florida, with the following additions:

SA	Accidental in Florida and not part of the established biota.
SE	Exotic species established in Florida (may be native elsewhere in North America).
SX	Believed to be extirpated from state.
SNR	Not ranked

FEDERAL AND STATE LEGAL STATUS

Provided by FNAI for information only.
For official definitions and lists of protected species,
consult relevant state or federal agency.

FEDERAL LEGAL STATUS

Definitions derived from U.S. Endangered Species Act of 1973, Sec. 3. Note that the federal status given by FNAI refers only to Florida populations and that federal status may differ elsewhere.

E	Endangered: species in danger of extinction throughout all or a significant portion of its range.
T	Threatened: species likely to become Endangered within the foreseeable future throughout all or a significant portion of its range.
E(S/A)	Endangered due to similarity of appearance to a species which is federally listed such that enforcement personnel have difficulty in attempting to differentiate between the listed and unlisted species.
T(S/A)	Threatened due to similarity of appearance (see above).
PE	Proposed for listing as Endangered species.
PT	Proposed for listing as Threatened species.
C	Candidate species for which federal listing agencies have sufficient information on biological vulnerability and threats to support proposing to list the species as Endangered or Threatened.
XN	Non-essential experimental population.
MC	Not currently listed, but of management concern to USFWS.
N	Not currently listed, nor currently being considered for listing as Endangered or Threatened.

FLORIDA LEGAL STATUSES

Plants**:** Definitions derived from Sections 581.011 and 581.185(2), Florida Statutes, and the Preservation of Native Flora of Florida Act, 5B-40.001. FNAI does not track all state-regulated plant species; for a complete list of state-regulated plant species, call Florida Division of Plant Industry, 352-372-3505.

E	Endangered: species of plants native to Florida that are in imminent danger of extinction within the state, the survival of which is unlikely if the causes of a decline in the number of plants continue; includes all species determined to be endangered or threatened pursuant to the U.S. Endangered Species Act.
T	Threatened: species native to the state that are in rapid decline in the number of plants within the state, but which have not so decreased in number as to cause them to be Endangered.
CE	Commercially exploited: species designated by Florida DOACS in paragraph 5B-40.0055(1)(c), F.A.C.
N	Not currently listed

Animals: Definitions derived from “Florida’s Endangered Species and Species of Special Concern, Official Lists” published by Florida Fish and Wildlife Conservation Commission, 1 August 1997, and subsequent updates.

C	Candidate for listing at the Federal level by the U. S. Fish and Wildlife Service
FE	Listed as Endangered Species at the Federal level by the U. S. Fish and Wildlife Service
FT	Listed as Threatened Species at the Federal level by the U. S. Fish and Wildlife Service
FXN	Federal listed as an experimental population in Florida
FT(S/A)	Federal Threatened due to similarity of appearance
ST	State population listed as Threatened by the FFWCC. Defined as a species, subspecies, or isolated population which is acutely vulnerable to environmental alteration, declining in number at a rapid rate, or whose range or habitat is decreasing in area at a rapid rate and as a consequence is destined or very likely to become an endangered species within the foreseeable future.
SSC	Listed as Species of Special Concern by the FFWCC. Defined as a population which warrants special protection, recognition, or consideration because it has an inherent significant vulnerability to habitat modification, environmental alteration, human disturbance, or substantial human exploitation which, in the foreseeable future, may result in its becoming a threatened species. (SSC* for *Pandion haliaetus* (Osprey) indicates that this status applies in Monroe county only.)
N	Not currently listed, nor currently being considered for listing.

APPENDIX 3

EXOTIC PLANT POINTS:
DATA ATTRIBUTES, DEFINITIONS, AND VALUES

ATTRIBUTE	VALUE
SURVEYSITE	Name of managed area or survey area.
SURVEYDATE	Date of data collection.
SURVEYOR	Name of FNAI field surveyor.
EVAL_TYPE	Type of visit to site. Evaluation values: • Initial: first observation and assessment of a species. • Revisit: observations/assessments on subsequent visits. • Pre-treatment: only an observation /assessment taken directly before treatment is applied. • Post-treatment: observation /assessment and evaluation of the targeted invasive species post-treatment
SPECIES	Scientific name of exotic plant occurring at that point.
COMMMONNAME	Common name of exotic plant occurring at that point.
FLEPPC_CD	Category of exotic species as determined by the Exotic Pest Plant Council (EPPC 2019 List of Invasive Species). EPPC categories: • Category I: invasive exotics that are altering native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives. *This definition does not relay on the economic severity or geographic range of the problem, but on the documented ecological damage caused.* • Category II: invasive exotics that have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by Category I species. • Not listed: non-native species not currently listed by EPPC.
DISTRIBUTN	Pattern of plant distribution within the gross acreage. Distribution values: • Single plant or clump: one individual plant or one small clump of a single species. • Scattered plants or clumps: multiple individual plants or small clumps of a single species scattered within the gross area infested. • Scattered dense patches: dense patches of a single species scattered within the gross area infested (*Invasive Plant* waypoints only). • Dominant cover: multiple plants or clumps of a single species that occupy a majority of the gross area infested.

ATTRIBUTE	VALUE
	• Dense monoculture: generally a dense stand of a single dominant species that not only occupies more than a majority of the gross area infested, but also covers/excludes other plants (*Invasive Plant* waypoints only). • Linearly scattered: plants or clumps of a single species generally scattered along a linear feature, such as a road, trail, property line, ditch, ridge, slough, etc. within the gross area infested (*Invasive Plant* waypoints only). • No live plants: no live plants observed (*Invasive Plant* waypoints only).
SIZE	Estimated gross area (acres) of infestation with cues to help with visual estimation. Size values: • 0.00025 ac; sq meter (in *compliance inspection* points only) • 0.0005 ac; lg desk (in *compliance inspection* points only) • 0.001 ac; 2 lg desk • 0.01 ac; 2 car garage • 0.1 ac; bball ct • 0.25 ac; 4 tennis ct • 0.5 ac; half fball field • 1.0 ac; fball field • 2 ac, etc up to 10 • Other (in Comments)
PCTCOVER	Invasive plants only. A visual estimate of the percentage of the area infested that is actually covered by the canopy (or ground cover) of the plants, including only live foliage. Percent cover classes: • <5% • 5-25% • 26-50% • 51-75% • >75%
PCTCVR_L&D	Compliance inspection only. A visual estimate of area infested with the invasive species (SIZE) including live and dead foliage covering the canopy or ground cover. Must equal the invasive species cover before treatment. Percent cover classes match FWC Invasive Plant Management Section's cover classes. Live and dead percent cover classes: • <1% • 1-5% • 6-25% • 26-50% • 51-75% • 76-95% • >95%

ATTRIBUTE	VALUE
PCTCVR_L	Compliance inspection only. A visual estimate of area infested with the invasive species (SIZE) including only live foliage covering the canopy or ground cover. Must equal the invasive plant cover after treatment. Percent cover classes match FWC Invasive Plant Management Section's coverage classes. Live percent cover classes: • 0% • <1% • 1-5% • 6-25% • 26-50% • 51-75% • 76-95% • >95%
MATURITY	Stage of plant development for the recorded infestation. Maturity values: • Mature • Immature • Both
PHENOLOGY	Characteristic phenology of the plants. Phenology values: • Flower/bud • Flower/fruit • Fruit • Sporulating • In leaf • Dormant
TREATEDB4	Invasive plant only. Indication of whether or not plants were previously subject to management efforts. Management treatment values: • Yes • No • Unknown
TX_ATTEMPT	Compliance inspection only. Indication of whether or not plants on the target treatment list for a particular compliance inspection were treated. Does not include past treatments from prior projects (e.g., climbing fern or cogon grass treated in past fiscal years under a different project and different contractor). Target treatment values: • Yes • No • Unknown
FNAI_NC	Natural community present in area of invasive plant occurrence.

ATTRIBUTE	VALUE
PHOTO_INFO	Information concerning observation, assessment, or treatment photos.
POLY_SEVER	Severity of the disturbance(s). Disturbance severity values: • None • Light • Moderate • Heavy • Severe
POLYDIST_1	Polygon disturbance 1 describes the primary, or most prevalent, disturbance observed anywhere in the natural community polygon, not just in the plot. This is one of the few attributes that describe conditions observed throughout the polygon, not just within the plot. All types of disturbance, hydrologic or otherwise, are recorded in POLYDIST_1, 2, or 3. If there is more than one type of disturbance, the most prevalent form of disturbance is entered here and lesser disturbances are entered in POLYDIST_2 and POLYDIST_3. If there are more than three disturbance types, they are entered in DISTURBCOM. Disturbance values are: • Not evident • Agriculture • Cattle disturbance • Clearing (includes dove fields, old fields, and food plots that are less than 0.5 acre, i.e. that are not delineated as ruderal polygons) • Ditch/canal • Exotics • Firebreaks • Fire suppression • Forestry operations (e.g., logging, loading areas, bedding, equipment rutting, slash piles, and other mechanical disturbances; does not include burning.) • Hog digging • Impoundment (e.g. artificial ponds and lakes, borrow pits, dams, dikes) • Natural • ORV trail • Road • Trash dumping • Woody encroachment • Cause unknown • Other (details provided in the DISTURBCOM field)
POLYDIST_2	Polygon disturbance 2 describes the secondary disturbance, if any, in the vicinity of the exotic plant record. Polygon disturbance values are the same as POLYDIST_1.
POLYDIST_3	Polygon disturbance 3 describes the tertiary disturbance, if any, in the vicinity of the exotic plant record. Polygon disturbance values are the same as POLYDIST_1.

ATTRIBUTE	VALUE
NATSPPEST	Compliance Inspection only. Quick estimate of the number of native plant species present in the Estimated Area of Infestation (SIZE). Include all native plant species as well as weedy and ruderal species. Do not include any non-native plant species regardless of whether they are categorized as FLEPPC or not. Include all species rooted and/or overhanging the SIZE plot chosen.
DISTURBCOM	Disturbances not included in POLYDIST_1, _2, or _3, or other information about disturbance in the polygon.
COMMENTS	Comments provide an optional field for additional information about the exotic pest plant population.

APPENDIX 4. DATA ATTRIBUTES, DEFINITIONS, AND VALUES FOR NATURAL COMMUNITY POLYGONS

SITE	Name of the property.
POLYGON_ID	Unique number assigned to each polygon.
FNAI_NC	Type of natural community at the point, using the Florida Natural Areas Inventory classification system plus all altered landcover types as described in Appendix 1 of this document.
INCLUDEDNC	FNAI natural community types that are included within the polygon. An inclusion may or may not have a data point of its own. There may be more than one included community per polygon
COMMENTS	Comments is an optional field used by the surveyor to provide additional information about the exotic pest plant population.
ACRES	Acres for the polygon as calculated by the XtoolsPro extension for ArcGIS.
COUNT	The number of data points in the natural community point file that occur within the polygon.

APPENDIX 5. DATA ATTRIBUTES, DEFINITIONS, AND VALUES FOR HISTORICAL NATURAL COMMUNITY POLYGONS

SITE	Name of the property.
POLYGON_ID	Unique number assigned to each polygon.
HISTORIC_NC	Historical natural community type, i.e. the type of natural community that occurred at this point prior to disturbance or alteration, using the FNAI classification system.
INCLUDEDNC	FNAI Natural community types that are included within the polygon. An inclusion may or may not have a data point of its own. There may be more than one included community per polygon.
COMMENTS	Comments is an optional field used by the surveyor to provide additional information about the designated historical natural community.
ACRES	Size in acres of the polygon as calculated by the XtoolsPro extension for ArcGIS.

Natural Community Descriptions

to accompany a Natural Community and Historic Map of

Golden Aster Scrub Nature Preserve
Hillsborough County

Florida Natural Areas Inventory
2020

The Golden Aster Scrub Nature Preserve is a 1,181-acre tract located in southern Hillsborough County within the Tampa Bay watershed. The preserve lies approximately six miles north of Sun City Center, FL. This managed area is bordered to the west by Interstate 75. Suburban development surrounds most of the property boundary.

Most of this tract lies within the Barrier Island Coastal Strip physiographic province of the Southwestern Flatwoods District just east of Tampa Bay (Brooks 1981). The Alafia River is located about 2.5 miles north of the property. Myakka fine sand (mesic flatwoods and pastures) and Archbold, Wabasso, and Pomello fine sands (scrub and scrubby flatwoods) make up the majority of the soils on the property.

Historic acreage was dominated by uplands, chiefly mesic flatwoods (602 acres), with lesser amounts of wet flatwoods (179 acres), scrubby flatwoods (145 acres), and of scrub (135 acres). Depression marshes were scattered throughout the flatwoods. Smaller wetlands such as baygall and wet prairie were present to a much lesser extent within the flatwoods communities. Hydric hammock was occasional along small creeks and bordering depression marshes on the western parcel. Most of the historic upland communities remain intact. Some of the uplands on the eastern parcel have been converted to artificial ponds or cleared in the past. Depression marshes within the vicinity of these artificial ponds and clearing have undergone significant hydrological alteration. Fire suppression has led to the conversion of some uplands to successional hardwood forest and has allowed for development of mesic hammock within small areas of historic mesic flatwoods. Lack of fire has also led to the expansion of hydric hammock on the western parcel.

This document contains a generalized description for each of the 9 current natural communities delineated within the managed area (Table 1). Plant species associated with each community are included in the written description of each community description. Taxonomic concepts mainly follow *Guide to the Vascular Plants of Florida.* 3rd ed. (Wunderlin and Hansen 2011). Natural community concepts follow the *Guide to the Natural Communities of Florida* (FNAI 2010). The data and map that accompany this document are Environmental Systems Research Institute, Inc. (ESRI) shapefiles.

During field surveys one listed plants was observed – cinnamon fern (*Osmunda cinnamomea*) which is listed at the State level as commercially-exploited. Cinnamon fern was observed within the northwestern portion of the eastern parcel in wet flatwoods. A rare plant point was not taken, however the species is listed within a natural community point taken at the same location.

One gopher tortoise (*Gopherus polyphemus*, State-Threatened G3S3) was observed in scrubby flatwoods during the survey. In the northeastern corner of the property, a gopher tortoise burrow was observed within a depression marsh that had undergone severe hydrological alterations.

Six Florida Exotic Pest Plant Council (FLEPPC Category 1) listed species were documented throughout Golden Aster Scrub Preserve: Peruvian primrosewillow (*Ludwigia peruviana*), sword fern (*Nephrolepis cordifolia*), skunk vine (*Paederia foetida*), schefflera (*Schefflera actinophylla*), Brazilian pepper (*Schinus terebinthifolia*), and Chinese tallow tree (*Triadica sebifera*). Most of these invasive plants were documented in hydric hammock on the western side of the property. Moderate to extensive feral hog digging (*Sus scrofa*) was common throughout this hammock especially in areas where exotics were found. The documented occurrences invasive species on Golden Aster Scrub Preserve is likely a small percentage of the actual coverage of these plants.

Table 1. Summary of natural communities found on the Golden Aster Scrub Nature Preserve

Natural Community	**Current Acreage**	**Historic Acreage**
Baygall	6	6
Depression marsh	75	80
Hydric hammock	70	26
Mesic flatwoods	518	602
Mesic hammock	25	--
Scrub	121	135
Scrubby flatwoods	115	145
Wet flatwoods	114	179
Wet prairie	6	8
Other Altered Landcover Types (artificial ponds, pastures, pine plantation, clearings, spoil areas, etc.)	131	--
Total	1,181	1,181

Baygall

Baygall is an evergreen, forested wetland typically at the base of sandy slopes where water seepage maintains a saturated peat substrate. It may form an ecotone between uplands and swamps, or it may develop as a larger bay swamp in isolated basins or broad areas of seepage. These forests are dominated by a tall canopy of abundant loblolly bay (*Gordonia lasianthus*), sweetbay (*Magnolia virginiana*), and slash pine (*Pinus elliottii*), with swamp bay (*Persea palustris*) and fetterbush (*Lyonia lucida*) often forming a dense thicket in the understory. Soils are generally composed of peat and are acidic.

Although there is no mention of baygall in the 1847 survey records, there is evidence of a small amount of baygall formation in the area of seepage flanking the large scrub on the eastern parcel. This appears as a darker area of more canopy development within the otherwise open, pine-dominated flatwoods.

Baygalls on the property typically have a canopy and subcanopy of loblolly bay. Dahoon (*Ilex cassine*) is also present in the subcanopy. Shrubs including Virginia willow (*Itea virginica*), fetterbush, and southern bayberry (*Morella cerifera*) may be fairly dense to sparse at the center. Herbs include primrosewillow (*Ludwigia* sp.), and Virginia chain fern (*Woodwardia virginica*).

Baygalls occur in saturated areas where acidic organic material has accumulated. They can be allowed to burn along with the adjacent uplands if conditions permit. Typically, fires burn only into the edges of the baygall community and extinguish naturally if the soil is damp. Caution should be used during periods of drought to minimize the chance of peat fires, which may burn for weeks outside of prescription. Management activities for baygalls should focus on maintaining the natural hydrology wherever practical. Any further hydrological disturbances are to be avoided. Plowed firebreaks and ditches should be restored and hydrology should be returned to its natural state where possible.

Depression Marsh

Depression marshes are shallow, usually rounded depressions embedded in a pyrogenic landscape. These marshes are frequently exposed to fire from the surrounding upland communities. This is a seasonally inundated community is characterized primarily by a cover of herbaceous plants. The concentric zones or bands of vegetation that are sometimes observed within depression marshes are related to hydroperiod length, depth of flooding, and fire-carrying characteristics of the marsh vegetation. Woody plant cover is typically low in this community. Shrubs, especially those exceeding three feet, and small trees, are often suggestive of fire exclusion.

Small depression marshes are common in pine flatwoods on Golden Aster Scrub Nature Preserve. These are referred to as “ponds” in the 1847 survey records and appear to be inundated in the 1957 aerial photography, showing up as a smooth black signature. The soil series within depression marshes at Golden Aster Scrub are predominantly Basinger, Holopaw, and Samsula soils, depressional (Siliceous, hyperthermic Spodic Psammaquents) and St. Johns fine sand (Sandy, siliceous, hyperthermic Typic Alaquods).

Depression marshes on Golden Aster Scrub range from undisturbed to heavily altered. Typical vegetation includes an array of grasses, rushes, and sedges such as blue maidencane (*Amphicarpum muehlenbergianum*), bluestems (*Andropogon* spp.), big carpetgrass (*Axonopus furcatus*), redtop panicum (*Coleataenia rigidula*), cypress witchgrass (*Dichanthelium dichotomum*), hemlock witchgrass (*Dichanthelium portoricense*), maidencane (*Panicum hemitomon*), bunched beaksedge (*Rhynchospora cephalantha*), fascicled beaksedge (*Rhynchospora fascicularis*), sugarcane plumegrass (*Saccharum giganteum*), and sand cordgrass (*Spartina bakeri*). Other herbs include white doll's daisy (*Boltonia asteroides*), Virginia buttonweed (*Diodia virginiana*), dogfennel (*Eupatorium capillifolium*), slender flattop goldenrod (*Euthamia caroliniana*), Carolina redroot (*Lachnanthes caroliana*), winged loosestrife (*Lythrum alatum*) camphorweed (*Pluchea* sp.), pickerelweed (*Pontederia cordata*), largeflower rosegentian (*Sabatia grandiflora*), American cupscale (*Sacciolepis striata*), Virginia chain fern (*Woodwardia virginica*), and yellow-eyed grass (*Xyris* sp.). Marshes that are fire suppressed typically have an outer edge of encroaching shrubs such as common buttonbush (*Cephalanthus occidentalis*), southern bayberry (*Morella cerifera*), and coastalplain willow (*Salix caroliniana*).

Both fire suppression and hydrology alteration leave these marshes vulnerable to invasive species such as Peruvian primrosewillow (*Ludwigia peruviana*) and Brazilian pepper (*Schinus terebinthifolia*).

There is little data on natural fire frequency in depression marshes. However, fires in surrounding pyrogenic communities should be allowed to burn into depression marshes and extinguish naturally or burn through them. The sparse outer zone of some marshes may act as a natural firebreak. Marshes with substantial shrub cover (either within the marsh or surrounding edges) should be targeted for repeated lightening season fires on a short return interval.

Hydric Hammock

Hydric hammock is an evergreen hardwood and/or palm forest with a variable understory typically dominated by palms and ferns occurring on moist soils, often with limestone very near the surface. While species composition varies, the community generally has a closed canopy of oaks and palms, an open understory, and a sparse to moderate groundcover of grasses and ferns. Hydric hammock occurs on low, flat, wet sites where limestone may be near the surface and soil moisture is kept high mainly by rainfall accumulation on poorly drained soils. Periodic flooding from rivers, seepage, and spring discharge may also contribute to hydric conditions (Vince et al. 1989). Fire is not considered an important component of hydric hammock dynamics; however, they do burn occasionally. Cabbage palms are fire tolerant and intense fires favor this species. Live oak can survive low intensity fires, but red cedar is highly susceptible to fire. Flooding duration and frequency are primary factors in species composition. While most hydric hammock trees are at least somewhat adapted to flooding, the ranges of tolerance vary according to timing and depth of inundation (Vince et al. 1989).

Historically, small hydric hammocks occurred along creeks and bordering depression marshes on the western parcel of Golden Aster Scrub. The signature on the 1957 aerial photography is dark gray with a rough texture, indicating a closed canopy. Soils are primarily Wabasso fine sand (Sandy over loamy, siliceous, active, hyperthermic Alfic Alaquods), and Malabar fine sand (Loamy, siliceous, active, hyperthermic Grossarenic Endoaqualfs), with smaller areas of Felda fine sand (Loamy, siliceous, superactive, hypertheric Arenic Endoaqualfs). Hydric hammock has nearly tripled in acreage from historic conditions, expanding into wet flatwoods due to fire exclusion.

The canopy and subcanopy are mainly dominated by swamp laurel oak (*Quercus laurifolia*), live oak (*Quercus virginiana*), and cabbage palm (*Sabal palmetto*). In areas that were historically wet flatwoods, slash pine (*Pinus elliottii*) is occasional in the canopy. Less frequent subcanopy species include sugarberry (*Celtis laevigata*), red mulberry (*Morus rubra*), and American elm (*Ulmus americana*). The shrub layer may be fairly open to moderately dense and includes American beautyberry (*Callicarpa americana*), pignut hickory (*Carya glabra*), sugarberry, red mulberry, wild coffee (*Psychotria nervosa*), saw palmetto (*Serenoa repens*), bully (*Sideroxylon* sp.), and Walter's viburnum (*Viburnum obovatum*). The herbaceous layer is typically sparse and includes flatsedge (*Cyperus* sp.), witchgrass (*Dichanthelium* sp.), basketgrass (*Oplismenus* sp.), bracken fern (*Pteridium aquilinum*), toothed midsorus fern (*Telmatoblechnum serrulatum*). Vines are abundant and include Virginia creeper (*Parthenocissus quinquefolia*), corkystem passion-flower (*Passiflora suberosa*), bristly greenbrier (*Smilax tamnoides*), eastern poison ivy

(*Toxicodendron radicans*), Florida grape (*Vitis cinerea* var. *floridana*), and muscadine (*Vitis rotundifolia*). Epiphytes are common and include golden polypody (*Phlebodium aureum*), resurrection fern (*Pleopeltis michauxiana*), southern needleleaf (*Tillandsia setacea*), Spanish moss (*Tillandsia usneoides*), and shoestring fern (*Vittaria lineata*). Invasive species are a serious threat in these hammocks. Encountered invasive plants include sword fern (*Nephrolepis cordifolia*), skunk vine (*Paederia foetida*), schefflera (*Schefflera actinophylla*), Brazilian pepper (*Schinus terebinthifolia*), and Caesar's weed (*Urena lobata*). Extensive feral hog digging was also encountered throughout these hammocks.

Because most of the hydric hammock on the property was likely historical wet flatwoods, prescribed fire may be beneficial to the understory. However, given the level of past and present disturbance from adjacent urban development, it may be impractical to attempt to fully restore the community to a pine-dominated habitat. Treatment of invasive exotic species and removal of feral hogs should be the main priority in the management of this habitat.

Mesic Hammock

Mesic hammock is a well-developed evergreen hardwood and/or palm forest on soils that are rarely inundated, occurring in naturally fire-protected areas. The canopy is typically closed and dominated by live oak (*Quercus virginiana*) with cabbage palm (*Sabal palmetto*) generally common in the canopy and subcanopy. Mesic hammock may occur as “islands” on high ground within basin swamps or hydric hammock or in ecotones between wetlands and upland communities. Other landscape positions that can provide protection from the spread of fire from one or more directions are likely places for mesic hammock development, including edges of lakes, sinkholes, other depressional or basin wetlands, and river floodplains. Soils of mesic hammock are sands mixed with organic matter and may have a thick layer of leaf litter, which maintains high moisture by heavy shading of the ground layer and accumulation of litter.

On Golden Aster Scrub, mesic hammocks appear to be a recent development, representing a conversion of former pine-dominated mesic flatwoods to shaded, oak-dominated hammocks. The isolation of uplands on the preserve by surrounding development and subsequent lack of fire has likely driven this succession.

Mesic hammocks on the property have a closed canopy of live oak and cabbage palm. The understory is primarily saw palmetto. This community is susceptible to invasive plants, especially in areas of disturbance, (e.g. hog rooting).

Mesic hammocks are of considerable importance to wildlife, providing cover, nesting sites, and hardwood mast. Migratory birds use hammocks for resting cover and foraging, and animals of neighboring wetland communities may take refuge in mesic hammock islands during floods. Because the hammocks on the preserve are derived from historical mesic flatwoods, they would likely benefit from prescribed fire. Fires in the adjacent flatwoods should be allowed to burn into hammocks, and efforts to monitor and treat invasive exotic plant species should remain a high priority.

Mesic Flatwoods

Mesic flatwoods is characterized by an open canopy of tall pines and a dense, ground layer of low shrubs, grasses, and forbs. Longleaf pine (*Pinus palustris*) is the principal canopy tree while characteristic shrubs include saw palmetto (*Serenoa repens*), gallberry (*Ilex glabra*), coastalplain staggerbush (*Lyonia fruticosa*), dwarf live oak (*Quercus minima*), shiny blueberry (*Vaccinium myrsinites*), and fetterbush (*Lyonia lucida*). The herbaceous layer is predominantly grasses, most notably, wiregrass (*Aristida stricta*) plus a large number of showy forbs.

Mesic flatwoods is the most widespread natural community in Florida, covering the flat sandy terraces left behind by former high stands of sea level during the Plio-Pleistocene. Soils are acidic, nutrient-poor fine sands with upper layers darkened by organic matter. Leon, Vero, and Smyrna fine sands are common examples (Gilbert et al. 1995). Drainage in this flat terrain can be impeded by a loosely cemented organic layer (spodic horizon) formed within several feet of the soil surface. The soils are alternately droughty during dry periods and saturated, or even inundated, after heavy rains. This is a fire-dependent community in which constituent plant species have evolved to recover rapidly from fire.

At Golden Aster Scrub, mesic flatwoods is the most extensive natural community type, occupying most of the area off of the scrub ridge. In the 1847 survey, this community was referred to as "3rd rate pine and saw palmetto land." The signature on the 1957 aerial photography is light gray, speckled with some texture from the saw palmetto and scattered trees. Soils are primarily Myakka fine sand (sandy, siliceous, hyperthermic aeric alaquods). Although these woods are more fragmented by roads and vehicle trails, they appear mostly unchanged from their historic condition, although some acreage has been lost due to artificial ponds. There is also some conversion of mesic flatwoods to mesic hammock and successional hardwood forest due to fire suppression, particularly in the southeastern corner.

Mesic flatwoods at Golden Aster Scrub typically has an open canopy of longleaf pine. On the western parcel, fire suppression has allowed both mesic and wet flatwoods to become overgrown, making these two communities difficult to distinguish. The canopy in this area includes longleaf pine or slash pine (*Pinus elliottii*), with a sparse to moderate subcanopy of water oak (*Quercus nigra*), live oak (*Quercus virginiana*), and cabbage palm (*Sabal palmetto*). Typical shrubs include netted pawpaw (*Asimina reticulata*), tarflower (*Bejaria racemosa*), dwarf huckleberry (*Gaylussacia dumosa*), roundpod St. John's wort (*Hypericum cistifolium*), Atlantic St. John's wort (*Hypericum tenuifolium*), fourpetal St. John's wort (*Hypericum tetrapetalum*), gallberry, coastalplain staggerbush, fetterbush, southern bayberry, wild pennyroyal (*Piloblephis rigida*), dwarf live oak, winged sumac (*Rhus copallinum*), saw palmetto, Darrow's blueberry (*Vaccinium darrowii*), shiny blueberry, and deerberry (*Vaccinium stamineum*). The herb layer is sparse to moderate, depending on shrub cover, and includes blue maidencane (*Amphicarpum muehlenbergianum*), purple bluestem (*Andropogon glomeratus* var. *glaucopsis*), wiregrass, Michaux's croton (*Croton michauxii*), cypress witchgrass (*Dichanthelium ensifolium* var. *ensifolium*), hemlock witchgrass (*Dichanthelium portoricense*), tall elephantsfoot (*Elephantopus elatus*), dogfennel (*Eupatorium capillifolium*), slender flattop goldenrod (*Euthamia caroliniana*), Elliott's milkpea (*Galactia elliottii*), pinweed (*Lechea* sp.), thin paspalum (*Paspalum setaceum*), yellow milkwort (*Polygala rugelii*), bracken fern (*Pteridium aquilinum*), sweet goldenrod

(*Solidago odora*), lopsided indiangrass (*Sorghastrum secundum*), and yellow-eyed grass (*Xyris* sp.).

A prescribed fire return interval of every 2-4 years is recommended for mesic flatwoods. Restoration of successional hardwood forests includes mechanical tree removal and reintroduction of fire. Where characteristic herbaceous species (e.g., wiregrass) have been lost, reintroduction via seed or plants may be necessary to restore natural species composition and community function. Planting more longleaf pines in the area may help to carry fire through the groundcover and promote the growth of native species.

Scrub

Scrub is a xeric community composed of evergreen shrubs, with or without a canopy of pines, and is found on dry, infertile, sandy ridges. The signature scrubby oak species: sand live oak (*Quercus geminata*), Chapman's oak (*Quercus chapmanii*), and myrtle oak (*Quercus myrtifolia*), as well as Florida rosemary (*Ceratiola ericoides*) and sand pine (*Pinus clausa*) are common to scrubs throughout the state. The dominance of these species, however, is variable from site to site.

At Golden Aster Scrub, a large scrub ridge extends from the northeast to southwest corner of the eastern parcel. On the 1957 aerial photography, scrub is dark gray speckled with white, indicating areas of open sand. Soils are primarily Pomello fine sand (Sandy, siliceous, hyperthermic Oxyaquic Alorthods) and Archbold fine sand (Hyperthermic, uncoated Typic Quartzipsamments). Scrub on this property remains largely intact. Approximately 14 acres of historic scrub has been converted to clearings, roads, or artificial ponds.

Scrub on this property may or may not have a scattered canopy of sand pine (*Pinus clausa*). The tall and short shrub layers are fairly dense with scrub oaks. Herbs are sparse and include capillary hairsedge (*Bulbostylis ciliatifolia*), coastalplain chaffhead (*Carphephorus corymbosus*), spurge (*Euphorbia* sp.), Piedmont pinweed (*Lechea torreyi*), and *blackroot* (*Pterocaulon pycnostachyum*). The scrub on the northeastern side of the property differs in structure from the largest section of scrub to the south. Fire suppression has led to a scattered canopy of sand live oak. Saw palmetto is much more common here than scrub oaks and wiregrass is occasional throughout. The overall structure is very similar to overgrown scrubby flatwoods, but longleaf pines are absent.

Scrub fire regimes are highly variable, depending on landscape settings and dominant vegetation. Current scientific research suggests oak-dominated scrub would have naturally burned every 6 to 19 years. More frequent fires (4 to 10 years) maintain optimal shrub heights for scrub jay habitat. Scrub fires are often high intensity and require careful application.

Scrubby Flatwoods

Scrubby flatwoods is a well-drained pine-dominated community intermediate between scrub and mesic flatwoods. These communities are characterized by an open canopy of widely scattered pine trees with a sparse shrubby understory and areas of open white sand. The vegetation consists of a combination of scrub and mesic flatwoods species. The canopy typically consists of widely spaced longleaf pine (*Pinus palustris*) and/or slash pine (*Pinus elliottii*) growing over a

shrub stratum dominated by scrub species such as sand live oak (*Quercus geminata)*, rusty staggerbush (*Lyonia ferruginea*), Chapman's oak (*Quercus chapmanii*), and myrtle oak (*Quercus myrtifolia*) mixed with typical mesic flatwoods species including saw palmetto (*Serenoa repens*), and a diversity of other low mesic shrubs. The herbaceous groundcover is patchy and usually has some wiregrass (*Aristida stricta* var. *beyrichiana*), and a mix of other herbs. The natural fire regime ranges from 5 – 15 years. Sparse groundcover and incombustible scrub oak leaf litter may reduce the occurrence of fires leading to a slightly longer average fire return interval than is the case for mesic flatwoods. Variability in season and frequency of prescribed fires should produce a mosaic of burned and unburned patches desirable for maintaining high biotic diversity in this community.

At Golden Aster Scrub, scrubby flatwoods borders the enter scrub ridge, grading into mesic flatwoods. The signature on the 1957 aerial photography is similar to mesic flatwoods, but much lighter gray, and speckled with some texture from the saw palmetto, scrub oaks, and scattered trees. Soils are primarily Pomello fine sand and Myakka fine sand. Most of the historic acreage remains intact. Approximately 18 acres of historic scrubby flatwoods has been converted to clearings, roads, or artificial ponds.

Scrubby flatwoods at Golden Aster Scrub has a canopy of longleaf pine and/or sand pine. Shrubs are moderate to dense with open patches of sand throughout. Typical shrubs include netted pawpaw (*Asimina reticulata*), pricklypear (*Opuntia humifusa*), sand live oak, myrtle oak, saw palmetto, and shiny blueberry (*Vaccinium myrsinites*). Scattered herbs include wiregrass, scrubland goldenaster (*Chrysopsis subulata*), tread softly (*Cnidoscolus stimulosus*), pinebarren frostweed (*Crocanthemum corymbosum*), fragrant eryngo (*Eryngium aromaticum*), Piedmont pinweed (*Lechea torreyi*), candyroot (*Polygala nana*), sandyfield beaksedge (*Rhynchospora megalocarpa*), and pineland scalypink (*Stipulicida setacea*).

Fire return intervals should be frequent enough to maintain shrub heights (<6 feet) within the range required by the Florida scrub-jay (recommended 5-15 year interval). Avoiding additional ground disturbance is important to prevent elimination of the natural groundcover and the establishment of weedy species.

Wet Flatwoods

Wet flatwoods are open pine forests with a sparse or absent midstory and a dense groundcover of low shrubs, hydrophytic grasses, and herbs. The pine canopy typically consists of one or a combination of longleaf pine (*Pinus palustris*), slash pine (*P. elliottii*), and pond pine (*P. serotina*). The relative density of shrubs and herbs varies greatly in wet flatwoods. Shrubs tend to dominate where fire has been absent for a long period or where cool season fires predominate; herbs are more abundant in locations that are frequently burned. Herbs generally include wiregrass (*Aristida stricta*), blue maidencane (*Amphicarpum muhlenbergianum*), and a suite of hydrophytic herb species.

On the eastern parcel of Golden Aster Scrub, wet flatwoods occurs mostly on the eastern half of the property, surrounding several depression marshes. On the western parcel, wet flatwoods is common throughout, often forming a mosaic with mesic flatwoods. The signature on the 1957 aerial photography is very similar to mesic flatwoods, but often smoother in texture. Soils on the

eastern parcel are St. Johns fine sand, Malabar fine sand, and Myakka fine sand. Soils on the western parcel are Wabasso fine sand, Malabar fine sand, and Myakka fine sand. The majority of wet flatwoods on this property us heavily fire suppressed. On the southeastern corner of the property, the majority of historic wet flatwoods have converted to successional hardwood forest. On the western parcel, roughly half of the historic wet flatwoods acreage has transitioned to hydric hammock.

The canopy and subcanopy is primarily slash pine. Other tree species including sweetbay (*Magnolia virginiana*), swamp laurel oak (*Quercus laurifolia*), and cabbage palm (*Sabal palmetto*) may be present in these layers. The shrub layer is fairly dense with St. John's wort (*Hypericum microsepalum*), dahoon (*Ilex cassine*), gallberry (*Ilex glabra*), fetterbush (*Lyonia lucida*), southern bayberry (*Morella cerifera*), swamp bay (*Persea palustris*), saw palmetto (*Serenoa repens*), American snowbell (*Styrax americanus*), and Darrow's blueberry (*Vaccinium darrowii*). Herbaceous cover is moderate to dense and includes blue maidencane, purple bluestem (Andropogon glomeratus var. glaucopsis), wiregrass, pink sundew (*Drosera capillaris*), slender flattop goldenrod (*Euthamia caroliniana*), narrowleaf sunflower (*Helianthus angustifolius*), clustered bushmint (*Hyptis alata*), Carolina redroot (*Lachnanthes caroliana*), shrubby primrosewillow (*Ludwigia suffruticosa*), cinnamon fern (*Osmunda cinnamomea*), procession flower (*Polygala incarnata*), yellow milkwort (*Polygala rugelii*), maid marian (*Rhexia nashii*), Nuttall's meadowbeauty (*Rhexia nuttallii*), Carolina wild petunia (*Ruellia caroliniensis*), largeflower rosegentian (*Sabatia grandiflora*), sugarcane plumegrass (*Saccharum giganteum*), and yellow hatpins (*Syngonanthus flavidulus*).

Wet flatwoods depend on frequent fires to reduce hardwood encroachment and to encourage herbaceous species survival and diversity. Fire likely occurred naturally in wet flatwoods every 3-10 years in the late spring/early summer lightning season. Restoration of successional hardwood forests includes mechanical tree removal and reintroduction of fire. Where characteristic herbaceous species (e.g., wiregrass) have been lost, reintroduction via seed or plants may be necessary to restore natural species composition and community function.

Wet Prairie

Wet prairie is an herbaceous community found on continuously wet, but not inundated, soils on somewhat flat or gentle slopes between lower lying depression marshes, shrub bogs, or dome swamps and slightly higher wet or mesic flatwoods. Trees and shrubs are absent or very sparse. It is typically dominated by dense wiregrass (*Aristida stricta*) in the drier portions, along with foxtail club-moss (*Lycopodiella alopecuroides*), cutover muhly (*Muhlenbergia expansa*), yellow butterwort (*Pinguicula lutea*), and savannah meadowbeauty (*Rhexia alifanus*). In the wetter portions, wiregrass may occur with, or be replaced by, species in the sedge family, such as plumed beaksedge (*Rhynchospora plumosa*), featherbristle beaksedge (*R. oligantha*), Baldwin’s nutrush (*Scleria baldwinii*), or slenderfruit nutrush (*S. georgiana*), plus longleaved threeawn (*Aristida palustris*). Also common in wetter areas are carnivorous species, such as pitcher plants (*Sarracenia* spp.), sundews (*Drosera* spp.), butterworts (*Pinguicula* spp.), and bladderworts (*Utricularia* spp.). Other characteristic species in this community include toothache grass (*Ctenium aromaticum*), pineland rayless goldenrod (*Bigelowia nudata*), flattened pipewort (*Eriocaulon compressum*), water cowbane (*Oxypolis filifolia*), and coastalplain yellow-eyed

grass (*Xyris ambigua*). The fire return interval in wet prairie is 2 to 3 years. These frequent fires prevent the invasion of weedy shrubs and trees that shade out the herbaceous species.

Wet prairie occurs on the eastern parcel of Golden Aster Scrub in the northwest and southeast corner of the property, between depression marshes. The signature on the 1957 aerial photography is a smooth light to medium gray signature with no pines. Soils are Malabar fine sand and St. John's fine sand. Wet prairie in the northwest corner remains intact, as it is surrounded by excellent quality mesic flatwoods. Wet prairie in the southeast corner is now surrounded by successional hardwood forest and is threatened by woody encroachment.

Wet prairie may or may not have an open canopy of cabbage palm. Shrubs are infrequent to occasional and include roundpod St. John's wort (*Hypericum cistifolium*), southern bayberry (*Morella cerifera*), and saw palmetto (*Serenoa repens*). Herbs are dense and include blue maidencane (*Amphicarpum muehlenbergianum*), wiregrass, big carpetgrass (*Axonopus furcatus*), slender flattop goldenrod (*Euthamia caroliniana*), yellow milkwort (*Polygala rugelii*), fascicled beaksedge (*Rhynchospora fascicularis*), goldenrod (*Solidago* sp.), and Carolina yellow-eyed grass (*Xyris caroliniana*).

Management goals in the northwest corner should focus on implementing frequent prescribed fires. Timing of fires ideally should be during the early lightning season or as close to this period a practicable. In the southeast corner, restoration of surrounding successional hardwood forests to wet flatwoods should be the focus for restoring and maintaining this community.

Other Altered Land Cover Types

Altered land cover refers to landscapes within the managed area where native vegetation has been disturbed to such an extent that they no longer resemble a natural community. Species composition is dependent upon the land use history, historic community, and soil types. Areas of remnant or recolonized vegetation can help to elucidate the historic natural community. Altered land cover types in the Golden Aster Scrub include artificial ponds, developed areas, clearings, roads, and successional hardwood forest. It may not be practical or desirable to restore some of the altered land cover areas (e.g., roads) to the historic natural community.

> Artificial pond (31) acres) – water retention ponds, cattle ponds, etc. At Golden Aster Scrub, 2 artificial ponds occur on the northeastern and southeastern portions of the eastern parcel.
>
> Clearing/regeneration (15 acres) – Dove fields, wildlife food plots, recent or historic clearings that have significantly altered the groundcover and/or overstory of the original natural community (old homesites, etc.). On the eastern parcel of Golden Aster Scrub, a clearing is mapped in the northeastern corner (historic scrub and scrubby flatwoods) where an asphalt manufacturing plant once stood in the 1980s. Cabbage palm (*Sabal palmetto*) is occasional in the canopy, subcanopy and shrub layers. Other shrubs include groundsel tree (*Baccharis halimifolia*), Brazilian pepper (*Schinus terebinthifolia*), and saw palmetto (*Serenoa repens*). Herbs are dense and weedy, including common ragweed (*Ambrosia artemisiifolia*), partridge pea (*Chamaecrista fasciculata*), Virginia buttonweed (*Diodia virginiana*), fingergrass (*Eustachys* sp.), rustweed (*Polypremum procumbens*),

licoriceweed (*Scoparia dulcis*), buttonweed (*Spermacoce* sp.), and dropseed (*Sporobolus* sp.).

Developed areas (0.4 acres) – Check stations, ORV use areas, parking lots, buildings, maintained lawns (as part of recreational, business, or residential areas), botanical or ornamental gardens, campgrounds, recreational, industrial, and residential areas.

Roads (45 acres) – Roads ≥5 meters wide are delineated on the current natural community map.

Successional Hardwood Forest (40 acres) **–** Closed-canopied forest dominated by fast growing hardwoods such as laurel oak (*Quercus hemisphaerica*), water oak (*Quercus nigra*), and/or sweetgum (*Liquidambar styraciflua*), often with remnant pines. These forests are either invaded natural habitat (i.e., mesic flatwoods, sandhill, upland pine, upland mixed woodland) due to lengthy fire-suppression or old fields that have succeeded to forest. The subcanopy and shrub layers of these forests are often dense and dominated by smaller individuals of the canopy species. Successional hardwood forests can contain remnant species of the former natural community such as turkey oak (*Quercus laevis*), saw palmetto (*Serenoa repens*), gallberry (*Ilex glabra*), and infrequently wiregrass (*Aristida stricta*). Additionally, species such as beautyberry (*Callicarpa americana*), muscadine (*Vitis rotundifolia*), and sparkleberry (*Vaccinium arboreum*) are common. Restoration of these forests includes mechanical tree removal and reintroduction of fire. Where characteristic herbaceous species (e.g., wiregrass) have been lost, reintroduction via seed or plants may be necessary to restore natural species composition and community function. At Golden Aster Scrub, successional hardwood forest occupies areas of former scrubby flatwoods, mesic flatwoods and wet flatwoods, where fire suppression over a long period of time has resulted in significant community composition and structure changes. The canopy consists of slash pine (*Pinus elliottii*), laurel oak swamp laurel oak (*Quercus laurifolia*), water oak, and live oak (*Quercus virginiana*). The subcanopy includes loblolly bay (*Gordonia lasianthus*), dahoon (*Ilex cassine*), swamp bay (*Persea palustris*), and cabbage palm (*Sabal palmetto*). The shrub layer is fairly scattered under the heavy shade of canopy trees and incudes remnant flatwoods vegetation such as huckleberry (*Gaylussacia frondosa* var. *tomentosa*), gallberry (*Ilex glabra*), fetterbush (*Lyonia lucida*), saw palmetto (*Serenoa repens*), and shiny blueberry (*Vaccinium myrsinites*). Herbaceous species include bluestem (*Andropogon glomeratus* var. *glaucopsis*), Carolina redroot (*Lachnanthes caroliana*), whitehead bogbutton (*Lachnocaulon anceps*), maidencane (*Panicum hemitomon*), bracken fern (*Pteridium aquilinum*), and Virginia chain fern (*Woodwardia virginica*).

Literature Cited

Brooks, H. K. 1981. Guide to the physiographic divisions of Florida. 8-5M-82. Florida Cooperative Extension Service, Institute of Food and Agriculture Sciences, University of Florida, Gainesville, FL.

Ewel, K.C., and W.J. Mitsch. 1978. The effect of fire on species composition in cypress dome ecosystems. Florida Scientist 41:25-30.

Florida Natural Areas Inventory. 2010. *Guide to the natural communities of Florida*. 2010 edition. Florida Natural Areas Inventory, Tallahassee, FL.

Gilbert, K.M., J.D. Tobe, R.W. Cantrell, M.E. Sweeley, and J.R. Cooper. 1995. The Florida Wetlands Delineation Manual. Florida Department of Environmental Protection, Florida Department of Environmental Regulation (in cooperation with the Florida Water Management Districts), Tallahassee, Florida.

Vince, S.W., S.R. Humphrey, and R.W. Simons. 1989. The ecology of hydric hammocks: a community profile. 85 (7.26). Biological Report. United States Fish and Wildlife Service, Washington, DC.

Wunderlin, R.P., and B.F. Hansen. 2011. *Guide to the Vascular Plants of Florida*, 3rd ed. University Press of Florida, Gainesville.

Appendix F

Cumulative Lists of Flora and Fauna

Golden Aster Scrub Plant Species List

Key: (I) = FISC Category I Invasive; (II) = FISC Category II Invasive; (CE) = Commercially Exploited; (ST) = State Threatened; (SE) = State Endangered; (FE) = Federally Endangered

Division	Family	Scientific Name	Common Name	Endemic	FISC Status	State Status	Federal Status
Pteridophyte	Blechnaceae	Telmatoblechnum serrulatum	Toothed Midsorus Fern				
Pteridophyte	Blechnaceae	Woodwardia areolata	Netted Chain Fern				
Pteridophyte	Blechnaceae	Woodwardia virginica	Virginia Chain Fern				
Pteridophyte	Dennstaedtiaceae	Pteridium aquilinum var. pseudocaudatum	Tailed Bracken				
Pteridophyte	Lycopodiaceae	Lycopodiella cernua	Nodding Club-Moss			CE	
Pteridophyte	Nephrolepidaceae	Nephrolepis brownii	Asian Sword Fern		I		
Pteridophyte	Nephrolepidaceae	Nephrolepis cordifolia	Tuberous Sword Fern		I		
Pteridophyte	Nephrolepidaceae	Nephrolepis exaltata	Sword Fern				
Pteridophyte	Osmundaceae	Osmunda regalis var. spectabilis	Royal Fern			CE	
Pteridophyte	Osmundaceae	Osmundastrum cinnamomeum	Cinnamon Fern			CE	
Pteridophyte	Polypodiaceae	Phlebodium aureum	Golden Polypody				
Pteridophyte	Polypodiaceae	Pleopeltis michauxiana	Resurrection Fern				
Pteridophyte	Pteridaceae	Acrostichum danaeifolium	Giant Leather Fern				
Pteridophyte	Pteridaceae	Vittaria lineata	Shoestring Fern				
Pteridophyte	Schizaeaceae	Lygodium japonicum	Japanese Climbing Fern		I		
Pteridophyte	Schizaeaceae	Lygodium microphyllum	Small-Leaf Climbing Fern		I		
Pteridophyte	Selaginellaceae	Selaginella arenicola	Sand Spike-Moss				
Pteridophyte	Thelypteridaceae	Thelypteris dentata	Downy Maiden Fern				
Pteridophyte	Thelypteridaceae	Thelypteris hispidula var. versicolor	Hairy Maiden Fern				
Pteridophyte	Thelypteridaceae	Thelypteris interrupta	Hottentot Fern				
Pteridophyte	Thelypteridaceae	Thelypteris kunthii	Widespread Maiden Fern				
Pteridophyte	Thelypteridaceae	Thelypteris palustris var. pubescens	Marsh Fern				
Gymnosperm	Cupressaceae	Juniperus virginiana	Red Cedar				
Gymnosperm	Pinaceae	Pinus clausa	Sand Pine				
Gymnosperm	Pinaceae	Pinus elliottii	Slash Pine				
Gymnosperm	Pinaceae	Pinus palustris	Longleaf Pine				
Monocotyledon	Agavaceae	Yucca filamentosa	Adam's Needle				
Monocotyledon	Alismataceae	Sagittaria graminea var. graminea	Grassy Arrowhead				
Monocotyledon	Alismataceae	Sagittaria isoetiformis	Quillwort Arrowhead				
Monocotyledon	Amaryllidaceae	Crinum americanum	Seven-Sisters				
Monocotyledon	Amaryllidaceae	Hymenocallis palmeri	Alligatorlily	Endemic			
Monocotyledon	Amaryllidaceae	Zephyranthes atamasca var. treatiae	Treat's Zephyrlily			ST	
Monocotyledon	Amaryllidaceae	Zephyranthes simpsonii	Redmargin Zephyrlily			ST	
Monocotyledon	Araceae	Arisaema triphyllum	Jack-In-The-Pulpit				
Monocotyledon	Arecaceae	Sabal palmetto	Cabbage Palm				
Monocotyledon	Arecaceae	Serenoa repens	Saw Palmetto			CE	
Monocotyledon	Bromeliaceae	Tillandsia bartramii	Bartram's Airplant				
Monocotyledon	Bromeliaceae	Tillandsia recurvata	Ballmoss				
Monocotyledon	Bromeliaceae	Tillandsia setacea	Southern Needleleaf				
Monocotyledon	Bromeliaceae	Tillandsia usneoides	Spanish Moss				
Monocotyledon	Bromeliaceae	Tillandsia utriculata	Giant Airplant			SE	
Monocotyledon	Commelinaceae	Callisia graminea	Grassleaf Roseling				
Monocotyledon	Commelinaceae	Callisia ornata	Florida Scrub Roseling	Endemic			
Monocotyledon	Commelinaceae	Commelina diffusa var. diffusa	Common Dayflower				
Monocotyledon	Commelinaceae	Commelina erecta	Whitemouth Dayflower				
Monocotyledon	Cyperaceae	Bulbostylis ciliatifolia	Capillary Hairsedge				
Monocotyledon	Cyperaceae	Bulbostylis stenophylla	Sandyfield Hairsedge				
Monocotyledon	Cyperaceae	Cladium jamaicense	Jamaica Swamp Sawgrass				
Monocotyledon	Cyperaceae	Cyperus compressus	Poorland Flatsedge				
Monocotyledon	Cyperaceae	Cyperus croceus	Baldwin's Flatsedge				
Monocotyledon	Cyperaceae	Cyperus haspan	Haspan Flatsedge				
Monocotyledon	Cyperaceae	Cyperus ovatus	Pinebarren Flatsedge				
Monocotyledon	Cyperaceae	Cyperus polystachyos	Manyspike Flatsedge				
Monocotyledon	Cyperaceae	Eleocharis baldwinii	Baldwin's Spikerush				
Monocotyledon	Cyperaceae	Fimbristylis caroliniana	Carolina Fimbry				
Monocotyledon	Cyperaceae	Fuirena pumila	Dwarf Umbrellasedge				
Monocotyledon	Cyperaceae	Fuirena scirpoidea	Southern Umbrellasedge				
Monocotyledon	Cyperaceae	Rhynchospora cephalantha	Bunched Beaksedge				
Monocotyledon	Cyperaceae	Rhynchospora colorata	Starrush Whitetop				
Monocotyledon	Cyperaceae	Rhynchospora fascicularis	Fascicled Beaksedge				
Monocotyledon	Cyperaceae	Rhynchospora fernaldii	Fernald's Beaksedge				
Monocotyledon	Cyperaceae	Rhynchospora intermedia	Pinebarren Beaksedge				
Monocotyledon	Cyperaceae	Rhynchospora megalocarpa	Sandyfield Beaksedge				
Monocotyledon	Cyperaceae	Rhynchospora plumosa	Plumed Beaksedge				
Monocotyledon	Cyperaceae	Scleria ciliata	Fringed Nutrush				

Monocotyledon	Cyperaceae	Scleria oligantha	Littlehead Nutrush			
Monocotyledon	Cyperaceae	Scleria triglomerata	Tall Nutgrass			
Monocotyledon	Eriocaulaceae	Eriocaulon compressum	Flattened Pipewort			
Monocotyledon	Eriocaulaceae	Eriocaulon decangulare	Tenangle Pipewort			
Monocotyledon	Eriocaulaceae	Lachnocaulon anceps	Whitehead Bogbutton			
Monocotyledon	Eriocaulaceae	Lachnocaulon beyrichianum	Southern Bogbutton			
Monocotyledon	Eriocaulaceae	Syngonanthus flavidulus	Yellow Hatpins			
Monocotyledon	Haemodoraceae	Lachnanthes caroliana	Carolina Redroot			
Monocotyledon	Hypoxidaceae	Hypoxis curtissii	Common Yellow Stargrass			
Monocotyledon	Hypoxidaceae	Hypoxis juncea	Fringed Yellow Stargrass			
Monocotyledon	Iridaceae	Sisyrinchium angustifolium	Narrowleaf Blue-Eyed Grass			
Monocotyledon	Iridaceae	Sisyrinchium rosulatum	Annual Blue-Eyed Grass			
Monocotyledon	Juncaceae	Juncus coriaceus	Leathery Rush			
Monocotyledon	Juncaceae	Juncus effusus subsp. solutus	Soft Rush			
Monocotyledon	Juncaceae	Juncus marginatus	Shore Rush			
Monocotyledon	Juncaceae	Juncus repens	Lesser Creeping Rush			
Monocotyledon	Juncaceae	Juncus scirpoides	Needlepod Rush			
Monocotyledon	Melanthiaceae	Veratrum virginicum	Virginia Bunchflower			
Monocotyledon	Nartheciaceae	Aletris lutea	Yellow Colicroot			
Monocotyledon	Orchidaceae	Encyclia tampensis	Florida Butterfly Orchid			CE
Monocotyledon	Orchidaceae	Habenaria floribunda	Toothpetal False Reinorchid			
Monocotyledon	Orchidaceae	Orthochilus ecristatus	Giant Orchid			
Monocotyledon	Poaceae	Amphicarpum muehlenbergianum	Blue Maidencane			
Monocotyledon	Poaceae	Andropogon cumulicola	No Common Name	Endemic		
Monocotyledon	Poaceae	Andropogon glomeratus var. glaucopsis	Purple Bluestem			
Monocotyledon	Poaceae	Andropogon glomeratus var. glomeratus	Bushy Bluestem			
Monocotyledon	Poaceae	Andropogon ternarius	Splitbeard Bluestem			
Monocotyledon	Poaceae	Andropogon virginicus var. glaucus	Chalky Bluestem			
Monocotyledon	Poaceae	Andropogon virginicus var. virginicus	Broomsedge Bluestem			
Monocotyledon	Poaceae	Aristida patula	Tall Threeawn	Endemic		
Monocotyledon	Poaceae	Aristida purpurascens var. purpurascens	Arrowfeather Threeawn			
Monocotyledon	Poaceae	Aristida spiciformis	Bottlebrush Threeawn			
Monocotyledon	Poaceae	Aristida stricta	Wiregrass			
Monocotyledon	Poaceae	Axonopus fissifolius	Common Carpetgrass			
Monocotyledon	Poaceae	Axonopus furcatus	Big Carpetgrass			
Monocotyledon	Poaceae	Cenchrus echinatus	Southern Sandbur			
Monocotyledon	Poaceae	Chasmanthium laxum	Slender Woodoats			
Monocotyledon	Poaceae	Coleataenia anceps	Beaked Panicum			
Monocotyledon	Poaceae	Coleataenia rigidula	Redtop Panicum			
Monocotyledon	Poaceae	Coleataenia tenera	Bluejoint Panicum			
Monocotyledon	Poaceae	Cynodon dactylon	Bermudagrass			
Monocotyledon	Poaceae	Dichanthelium aciculare	Needleleaf Witchgrass			
Monocotyledon	Poaceae	Dichanthelium acuminatum var. acuminatum	Tapered Witchgrass			
Monocotyledon	Poaceae	Dichanthelium ensifolium var. breve	Dwarf Cypress Witchgrass	Endemic		
Monocotyledon	Poaceae	Dichanthelium ensifolium var. ensifolium	Cypress Witchgrass			
Monocotyledon	Poaceae	Dichanthelium laxiflorum	Openflower Witchgrass			
Monocotyledon	Poaceae	Dichanthelium portoricense	Hemlock Witchgrass			
Monocotyledon	Poaceae	Digitaria filiformis var. filiformis	Slender Crabgrass			
Monocotyledon	Poaceae	Eragrostis elliottii	Elliott's Lovegrass			
Monocotyledon	Poaceae	Eragrostis refracta	Coastal Lovegrass			
Monocotyledon	Poaceae	Eragrostis spectabilis	Purple Lovegrass			
Monocotyledon	Poaceae	Gymnopogon ambiguus	Bearded Skeletongrass			
Monocotyledon	Poaceae	Imperata cylindrica	Cogongrass		I	
Monocotyledon	Poaceae	Kellochloa verrucosa	Warty Panicgrass			
Monocotyledon	Poaceae	Melinis repens	Rose Natalgrass		I	
Monocotyledon	Poaceae	Oplismenus hirtellus	Woodsgrass			
Monocotyledon	Poaceae	Panicum hemitomon	Maidencane			
Monocotyledon	Poaceae	Panicum repens	Torpedograss		I	
Monocotyledon	Poaceae	Paspalum conjugatum	Sour Paspalum			
Monocotyledon	Poaceae	Paspalum laeve	Field Paspalum			
Monocotyledon	Poaceae	Paspalum nicorae	Brunswickgrass			
Monocotyledon	Poaceae	Paspalum notatum var. saurae	Bahiagrass			
Monocotyledon	Poaceae	Paspalum setaceum	Thin Paspalum			
Monocotyledon	Poaceae	Paspalum urvillei	Vaseygrass			
Monocotyledon	Poaceae	Saccharum giganteum	Sugarcane Plumegrass			
Monocotyledon	Poaceae	Sacciolepis indica	Indian Cupscale			
Monocotyledon	Poaceae	Schizachyrium sanguineum	Crimson Bluestem			
Monocotyledon	Poaceae	Schizachyrium stoloniferum	Creeping Little Bluestem			
Monocotyledon	Poaceae	Setaria corrugata	Coastal Bristlegrass			
Monocotyledon	Poaceae	Setaria magna	Giant Bristlegrass			

Monocotyledon	Poaceae	Setaria parviflora	Yellow Bristlegrass				
Monocotyledon	Poaceae	Sorghastrum secundum	Lopsided Indiangrass				
Monocotyledon	Poaceae	Spartina bakeri	Sand Cordgrass				
Monocotyledon	Poaceae	Sporobolus indicus	Smutgrass				
Monocotyledon	Poaceae	Sporobolus junceus	Pineywoods Dropseed				
Monocotyledon	Poaceae	Steinchisma hians	Gaping Panicum				
Monocotyledon	Poaceae	Stenotaphrum secundatum	St. Augustinegrass				
Monocotyledon	Poaceae	Tripsacum dactyloides	Eastern Gamagrass				
Monocotyledon	Poaceae	Urochloa maxima	Guineagrass				
Monocotyledon	Poaceae	Urochloa mutica	Paragrass		I		
Monocotyledon	Pontederiaceae	Pontederia cordata	Pickerelweed				
Monocotyledon	Smilacaceae	Smilax auriculata	Earleaf Greenbrier				
Monocotyledon	Smilacaceae	Smilax bona-nox	Saw Greenbrier				
Monocotyledon	Smilacaceae	Smilax glauca	Cat Greenbrier				
Monocotyledon	Smilacaceae	Smilax laurifolia	Laurel Greenbrier				
Monocotyledon	Smilacaceae	Smilax pumila	Sarsaparilla Vine				
Monocotyledon	Smilacaceae	Smilax tamnoides	Bristly Greenbrier				
Monocotyledon	Smilacaceae	Smilax walteri	Coral Greenbrier				
Monocotyledon	Typhaceae	Typha domingensis	Southern Cattail				
Monocotyledon	Xyridaceae	Xyris brevifolia	Shortleaf Yelloweyed Grass				
Monocotyledon	Xyridaceae	Xyris caroliniana	Carolina Yelloweyed Grass				
Monocotyledon	Xyridaceae	Xyris elliottii	Elliott's Yelloweyed Grass				
Dicotyledon	Acanthaceae	Dyschoriste oblongifolia	Oblongleaf Twinflower				
Dicotyledon	Acanthaceae	Ruellia caroliniensis	Carolina Wild Petunia				
Dicotyledon	Adoxaceae	Sambucus nigra subsp. canadensis	American Elder				
Dicotyledon	Adoxaceae	Viburnum obovatum	Walter'S Viburnum				
Dicotyledon	Altingiaceae	Liquidambar styraciflua	Sweetgum				
Dicotyledon	Amaranthaceae	Dysphania ambrosioides	Mexican Tea				
Dicotyledon	Anacardiaceae	Rhus copallinum	Winged Sumac				
Dicotyledon	Anacardiaceae	Schinus terebinthifolia	Brazilian Pepper				
Dicotyledon	Anacardiaceae	Toxicodendron radicans	Eastern Poison Ivy				
Dicotyledon	Annonaceae	Asimina incana	Woolly Pawpaw				
Dicotyledon	Annonaceae	Asimina reticulata	Netted Pawpaw				
Dicotyledon	Apiaceae	Centella asiatica	Spadeleaf				
Dicotyledon	Apiaceae	Eryngium aromaticum	Fragrant Eryngo				
Dicotyledon	Apiaceae	Eryngium baldwinii	Baldwin's Eryngo				
Dicotyledon	Apiaceae	Eryngium yuccifolium	Button Rattlesnakemaster				
Dicotyledon	Apiaceae	Ptilimnium capillaceum	Mock Bishopsweed				
Dicotyledon	Apocynaceae	Asclepias curtissii	Curtiss' Milkweed	Endemic		SE	
Dicotyledon	Apocynaceae	Asclepias feayi	Florida Milkweed	Endemic			
Dicotyledon	Apocynaceae	Asclepias pedicellata	Savannah Milkweed				
Dicotyledon	Apocynaceae	Asclepias tuberosa	Butterflyweed				
Dicotyledon	Apocynaceae	Gonolobus suberosus	Angularfruit Milkvine				
Dicotyledon	Aquifoliaceae	Ilex ambigua	Carolina Holly				
Dicotyledon	Aquifoliaceae	Ilex cassine var. cassine	Dahoon				
Dicotyledon	Aquifoliaceae	Ilex glabra	Inkberry				
Dicotyledon	Araliaceae	Hydrocotyle umbellata	Manyflower Marshpennywort				
Dicotyledon	Asteraceae	Ageratina jucunda	Hammock Snakeroot				
Dicotyledon	Asteraceae	Ambrosia artemisiifolia	Common Ragweed				
Dicotyledon	Asteraceae	Baccharis glomeruliflora	Silverling				
Dicotyledon	Asteraceae	Baccharis halimifolia	Groundsel Tree				
Dicotyledon	Asteraceae	Balduina angustifolia	Coastalplain Honeycombhead				
Dicotyledon	Asteraceae	Bidens alba	Beggarticks				
Dicotyledon	Asteraceae	Bidens bipinnata	Spanish Needles				
Dicotyledon	Asteraceae	Bigelowia nudata subsp. australis	Pineland Rayless Goldenrod	Endemic			
Dicotyledon	Asteraceae	Boltonia diffusa	Smallhead Doll's Daisy				
Dicotyledon	Asteraceae	Carphephorus corymbosus	Coastalplain Chaffhead				
Dicotyledon	Asteraceae	Carphephorus paniculatus	Hairy Chaffhead				
Dicotyledon	Asteraceae	Chrysopsis floridana	Florida Goldenaster	Endemic		SE	FE
Dicotyledon	Asteraceae	Chrysopsis subulata	Scrubland Goldenaster	Endemic			
Dicotyledon	Asteraceae	Cirsium horridulum	Purple Thistle				
Dicotyledon	Asteraceae	Conyza canadensis	Canadian Horseweed				
Dicotyledon	Asteraceae	Coreopsis leavenworthii	Leavenworth's Tickseed				
Dicotyledon	Asteraceae	Eclipta prostrata	False Daisy				
Dicotyledon	Asteraceae	Elephantopus carolinianus	Carolina Elephantsfoot				
Dicotyledon	Asteraceae	Elephantopus elatus	Tall Elephantsfoot				
Dicotyledon	Asteraceae	Emilia fosbergii	Florida Tasselflower				
Dicotyledon	Asteraceae	Emilia sonchifolia	Lilac Tasselflower				
Dicotyledon	Asteraceae	Erechtites hieraciifolius	American Burnweed				
Dicotyledon	Asteraceae	Erigeron vernus	Early Whitetop Fleabane				

Dicotyledon	Asteraceae	Eupatorium capillifolium	Dogfennel			
Dicotyledon	Asteraceae	Eupatorium compositifolium	Yankeeweed			
Dicotyledon	Asteraceae	Eupatorium leptophyllum	Falsefennel			
Dicotyledon	Asteraceae	Eupatorium mohrii	Mohr's Thoroughwort			
Dicotyledon	Asteraceae	Eupatorium rotundifolium	Roundleaf Thoroughwort			
Dicotyledon	Asteraceae	Eupatorium serotinum	Lateflowering Thoroughwort			
Dicotyledon	Asteraceae	Euthamia caroliniana	Slender Flattop Goldenrod			
Dicotyledon	Asteraceae	Gamochaeta purpurea	Spoonleaf Purple Everlasting			
Dicotyledon	Asteraceae	Helianthus angustifolius	Narrowleaf Sunflower			
Dicotyledon	Asteraceae	Helianthus floridanus	Florida Sunflower			
Dicotyledon	Asteraceae	Heterotheca subaxillaris	Camphorweed			
Dicotyledon	Asteraceae	Liatris pauciflora var. pauciflora	Fewflower Gayfeather			
Dicotyledon	Asteraceae	Lygodesmia aphylla	Rose-Rush			
Dicotyledon	Asteraceae	Mikania scandens	Climbing Hempvine			
Dicotyledon	Asteraceae	Oclemena reticulata	Whitetop Aster			
Dicotyledon	Asteraceae	Palafoxia feayi	Feay's Palafox	Endemic		
Dicotyledon	Asteraceae	Parthenium hysterophorus	Santa Maria Feverfew			
Dicotyledon	Asteraceae	Phoebanthus grandiflorus	Florida False Sunflower	Endemic		
Dicotyledon	Asteraceae	Pityopsis graminifolia	Narrowleaf Silkgrass			
Dicotyledon	Asteraceae	Pluchea foetida	Stinking Camphorweed			
Dicotyledon	Asteraceae	Praxelis clematidea	No Common Name		II	
Dicotyledon	Asteraceae	Pterocaulon pycnostachyum	Blackroot			
Dicotyledon	Asteraceae	Rudbeckia hirta	Blackeyed Susan			
Dicotyledon	Asteraceae	Sericocarpus tortifolius	Whitetop Aster			
Dicotyledon	Asteraceae	Silphium asteriscus	Starry Rosinweed			
Dicotyledon	Asteraceae	Solidago fistulosa	Pinebarren Goldenrod			
Dicotyledon	Asteraceae	Solidago leavenworthii	Leavenworth's Goldenrod			
Dicotyledon	Asteraceae	Solidago odora var. chapmanii	Chapman's Goldenrod			
Dicotyledon	Asteraceae	Solidago sempervirens	Seaside Goldenrod			
Dicotyledon	Asteraceae	Solidago stricta	Wand Goldenrod			
Dicotyledon	Asteraceae	Symphyotrichum carolinianum	Climbing Aster			
Dicotyledon	Asteraceae	Tridax procumbens	Coatbuttons			
Dicotyledon	Asteraceae	Verbesina virginica	White Crownbeard			
Dicotyledon	Asteraceae	Vernonia gigantea	Giant Ironweed			
Dicotyledon	Asteraceae	Youngia japonica	Oriental False Hawksbeard			
Dicotyledon	Betulaceae	Carpinus caroliniana	American Hornbeam			
Dicotyledon	Bignoniaceae	Campsis radicans	Trumpet Creeper			
Dicotyledon	Cactaceae	Opuntia humifusa	Pricklypear			
Dicotyledon	Cannabaceae	Celtis laevigata	Sugarberry			
Dicotyledon	Caryophyllaceae	Drymaria cordata	Drymary			
Dicotyledon	Caryophyllaceae	Stipulicida setacea var. lacerata	Pineland Scalypink			
Dicotyledon	Caryophyllaceae	Stipulicida setacea var. setacea	Pineland Scalypink			
Dicotyledon	Casuarinaceae	Casuarina equisetifolia	Australian-Pine		I	
Dicotyledon	Chrysobalanaceae	Geobalanus oblongifolius	Gopher Apple			
Dicotyledon	Cistaceae	Crocanthemum corymbosum	Pinebarren Frostweed			
Dicotyledon	Cistaceae	Crocanthemum nashii	Florida Scrub Frostweed			
Dicotyledon	Cistaceae	Lechea cernua	Nodding Pinweed	Endemic		ST
Dicotyledon	Cistaceae	Lechea minor	Thymeleaf Pinweed			
Dicotyledon	Cistaceae	Lechea mucronata	Hairy Pinweed			
Dicotyledon	Cistaceae	Lechea torreyi	Piedmont Pinweed			
Dicotyledon	Clusiaceae	Hypericum cistifolium	Roundpod St.John's-Wort			
Dicotyledon	Clusiaceae	Hypericum gentianoides	Pineweeds			
Dicotyledon	Clusiaceae	Hypericum mutilum	Dwarf St.John's-Wort			
Dicotyledon	Clusiaceae	Hypericum myrtifolium	Myrtleleaf St.John's-Wort			
Dicotyledon	Clusiaceae	Hypericum tenuifolium	Atlantic St.John's-Wort			
Dicotyledon	Clusiaceae	Hypericum tetrapetalum	Fourpetal St.John's-Wort			
Dicotyledon	Clusiaceae	Hypericum virginicum	Virginia Marsh St.John's-Wort			
Dicotyledon	Convolvulaceae	Ipomoea pandurata	Man-Of-The-Earth			
Dicotyledon	Convolvulaceae	Ipomoea sagittata	Saltmarsh Morning-Glory			
Dicotyledon	Cornaceae	Cornus foemina	Swamp Dogwood			
Dicotyledon	Cucurbitaceae	Melothria pendula	Creeping Cucumber			
Dicotyledon	Droseraceae	Drosera capillaris	Pink Sundew			
Dicotyledon	Ebenaceae	Diospyros virginiana	Common Persimmon			
Dicotyledon	Ericaceae	Bejaria racemosa	Tarflower			
Dicotyledon	Ericaceae	Ceratiola ericoides	Florida Rosemary			
Dicotyledon	Ericaceae	Gaylussacia dumosa	Dwarf Huckleberry			
Dicotyledon	Ericaceae	Lyonia ferruginea	Rusty Staggerbush			
Dicotyledon	Ericaceae	Lyonia fruticosa	Coastalplain Staggerbush			
Dicotyledon	Ericaceae	Lyonia lucida	Fetterbush			
Dicotyledon	Ericaceae	Rhododendron viscosum	Swamp Azalea			

Dicotyledon	Ericaceae	Vaccinium arboreum	Sparkleberry			
Dicotyledon	Ericaceae	Vaccinium corymbosum	Highbush Blueberry			
Dicotyledon	Ericaceae	Vaccinium darrowii	Darrow's Blueberry			
Dicotyledon	Ericaceae	Vaccinium myrsinites	Shiny Blueberry			
Dicotyledon	Ericaceae	Vaccinium stamineum	Deerberry			
Dicotyledon	Euphorbiaceae	Acalypha gracilens	Slender Threeseed Mercury			
Dicotyledon	Euphorbiaceae	Cnidoscolus stimulosus	Tread-Softly			
Dicotyledon	Euphorbiaceae	Croton argyranthemus	Silver Croton			
Dicotyledon	Euphorbiaceae	Croton michauxii	Rushfoil			
Dicotyledon	Euphorbiaceae	Euphorbia hirta	Pillpod Sandmat			
Dicotyledon	Euphorbiaceae	Euphorbia hypericifolia	Graceful Sandmat			
Dicotyledon	Euphorbiaceae	Euphorbia inundata var. garrettii	No Common Name	Endemic		
Dicotyledon	Euphorbiaceae	Euphorbia polyphylla	Lesser Florida Spurge	Endemic		
Dicotyledon	Euphorbiaceae	Euphorbia thymifolia	Gulf Sandmat			
Dicotyledon	Euphorbiaceae	Stillingia sylvatica	Queensdelight			
Dicotyledon	Euphorbiaceae	Triadica sebifera	Chinese Tallowtree		I	
Dicotyledon	Fabaceae	Abrus precatorius	Rosary Pea		I	
Dicotyledon	Fabaceae	Aeschynomene americana	Shyleaf			
Dicotyledon	Fabaceae	Alysicarpus vaginalis	White Moneywort			
Dicotyledon	Fabaceae	Amorpha herbacea var. herbacea	Clusterspike False Indigo			
Dicotyledon	Fabaceae	Apios americana	Groundnut			
Dicotyledon	Fabaceae	Chamaecrista fasciculata	Partridge Pea			
Dicotyledon	Fabaceae	Chamaecrista nictitans var. aspera	Sensitive Pea			
Dicotyledon	Fabaceae	Chapmannia floridana	Florida Alicia	Endemic		
Dicotyledon	Fabaceae	Crotalaria pallida var. obovata	Smooth Rattlebox			
Dicotyledon	Fabaceae	Crotalaria rotundifolia	Rabbitbells			
Dicotyledon	Fabaceae	Crotalaria spectabilis	Showy Rattlebox			
Dicotyledon	Fabaceae	Dalea carnea var. carnea	Whitetassels			
Dicotyledon	Fabaceae	Desmodium incanum	Zarzabacoa Comun			
Dicotyledon	Fabaceae	Galactia elliottii	Elliott'S Milkpea			
Dicotyledon	Fabaceae	Indigofera hirsuta	Hairy Indigo			
Dicotyledon	Fabaceae	Leucaena leucocephala	White Leadtree		II	
Dicotyledon	Fabaceae	Lupinus diffusus	Skyblue Lupine			
Dicotyledon	Fabaceae	Macroptilium lathyroides	Wild Bushbean		II	
Dicotyledon	Fabaceae	Mimosa quadrivalvis var. floridana	Florida Sensitive Brier			
Dicotyledon	Fabaceae	Senna ligustrina	Privet Wild Sensitive Plant			
Dicotyledon	Fabaceae	Senna occidentalis	Septicweed			
Dicotyledon	Fagaceae	Quercus chapmanii	Chapman's Oak			
Dicotyledon	Fagaceae	Quercus geminata	Sand Live Oak			
Dicotyledon	Fagaceae	Quercus incana	Bluejack Oak			
Dicotyledon	Fagaceae	Quercus inopina	Scrub Oak	Endemic		
Dicotyledon	Fagaceae	Quercus laurifolia	Laurel Oak			
Dicotyledon	Fagaceae	Quercus minima	Dwarf Live Oak			
Dicotyledon	Fagaceae	Quercus myrtifolia	Myrtle Oak			
Dicotyledon	Fagaceae	Quercus nigra	Water Oak			
Dicotyledon	Fagaceae	Quercus pumila	Running Oak			
Dicotyledon	Fagaceae	Quercus virginiana	Live Oak			
Dicotyledon	Gelsemiaceae	Gelsemium sempervirens	Yellow Jessamine			
Dicotyledon	Gentianaceae	Sabatia brevifolia	Shortleaf Rosegentian			
Dicotyledon	Gentianaceae	Sabatia grandiflora	Largeflower Rosegentian			
Dicotyledon	Haloragaceae	Proserpinaca pectinata	Combleaf Mermaidweed			
Dicotyledon	Iteaceae	Itea virginica	Virginia Willow			
Dicotyledon	Juglandaceae	Carya glabra	Pignut Hickory			
Dicotyledon	Lamiaceae	Callicarpa americana	American Beautyberry			
Dicotyledon	Lamiaceae	Condea verticillata	John Charles			
Dicotyledon	Lamiaceae	Hyptis alata	Clustered Bushmint			
Dicotyledon	Lamiaceae	Piloblephis rigida	Wild Pennyroyal			
Dicotyledon	Lamiaceae	Salvia lyrata	Lyreleaf Sage			
Dicotyledon	Lamiaceae	Scutellaria arenicola	Florida Scrub Skullcap			
Dicotyledon	Lamiaceae	Scutellaria integrifolia	Helmet Skullcap			
Dicotyledon	Lamiaceae	Trichostema dichotomum	Forked Bluecurls			
Dicotyledon	Lauraceae	Cinnamomum camphora	Camphortree		I	
Dicotyledon	Lauraceae	Persea borbonia var. borbonia	Red Bay			
Dicotyledon	Lentibulariaceae	Pinguicula lutea	Yellow Butterwort			ST
Dicotyledon	Lentibulariaceae	Utricularia subulata	Zigzag Bladderwort			
Dicotyledon	Magnoliaceae	Magnolia virginiana	Sweetbay			
Dicotyledon	Malvaceae	Sida rhombifolia	Cuban Jute			
Dicotyledon	Malvaceae	Urena lobata	Caesarweed		I	
Dicotyledon	Melastomataceae	Rhexia cubensis	West Indian Meadowbeauty			
Dicotyledon	Melastomataceae	Rhexia mariana	Pale Meadowbeauty			

Dicotyledon	Melastomataceae	Rhexia nuttallii	Nuttall's Meadowbeauty		
Dicotyledon	Melastomataceae	Rhexia petiolata	Fringed Meadowbeauty		
Dicotyledon	Moraceae	Morus rubra	Red Mulberry		
Dicotyledon	Myricaceae	Morella cerifera	Wax Myrtle		
Dicotyledon	Onagraceae	Ludwigia linearis	Narrowleaf Primrosewillow		
Dicotyledon	Onagraceae	Ludwigia maritima	Seaside Primrosewillow		
Dicotyledon	Onagraceae	Ludwigia peruviana	Peruvian Primrosewillow		I
Dicotyledon	Onagraceae	Ludwigia repens	Creeping Primrosewillow		
Dicotyledon	Onagraceae	Ludwigia suffruticosa	Shrubby Primrosewillow		
Dicotyledon	Onagraceae	Oenothera simulans	Southern Beeblossom		
Dicotyledon	Orobanchaceae	Agalinis tenuifolia	Slenderleaf False Foxglove		
Dicotyledon	Orobanchaceae	Buchnera americana	American Bluehearts		
Dicotyledon	Oxalidaceae	Oxalis corniculata	Common Yellow Woodsorrel		
Dicotyledon	Passifloraceae	Passiflora incarnata	Purple Passionflower		
Dicotyledon	Phytolaccaceae	Phytolacca americana	American Pokeweed		
Dicotyledon	Plantaginaceae	Penstemon multiflorus	Manyflower Beardtongue		
Dicotyledon	Plantaginaceae	Scoparia dulcis	Sweetbroom		
Dicotyledon	Plantaginaceae	Sophronanthe hispida	Rough Hedgehyssop		
Dicotyledon	Polygalaceae	Polygala incarnata	Procession Flower		
Dicotyledon	Polygalaceae	Polygala nana	Candyroot		
Dicotyledon	Polygalaceae	Polygala rugelii	Yellow Milkwort	Endemic	
Dicotyledon	Polygalaceae	Polygala setacea	Coastalplain Milkwort		
Dicotyledon	Polygonaceae	Persicaria hydropiperoides	Mild Waterpepper		
Dicotyledon	Polygonaceae	Persicaria punctata	Dotted Smartweed		
Dicotyledon	Polygonaceae	Polygonum pinicola	Tall Jointweed		
Dicotyledon	Polygonaceae	Polygonum polygamum var. polygamum	October Flower		
Dicotyledon	Ranunculaceae	Clematis crispa	Swamp Leather-Flower		
Dicotyledon	Rhamnaceae	Berchemia scandens	Alabama Supplejack		
Dicotyledon	Rosaceae	Aronia arbutifolia	Red Chokeberry		
Dicotyledon	Rosaceae	Prunus caroliniana	Carolina Laurelcherry		
Dicotyledon	Rosaceae	Prunus serotina	Black Cherry		
Dicotyledon	Rosaceae	Rubus cuneifolius	Sand Blackberry		
Dicotyledon	Rosaceae	Rubus trivialis	Southern Dewberry		
Dicotyledon	Rubiaceae	Cephalanthus occidentalis	Common Buttonbush		
Dicotyledon	Rubiaceae	Diodia virginiana	Virginia Buttonweed		
Dicotyledon	Rubiaceae	Edrastima uniflora	Clustered Mille Graines		
Dicotyledon	Rubiaceae	Hexasepalum teres	Poor Joe		
Dicotyledon	Rubiaceae	Houstonia procumbens	Innocence		
Dicotyledon	Rubiaceae	Mitchella repens	Partridgeberry		
Dicotyledon	Rubiaceae	Paederia foetida	Skunkvine		I
Dicotyledon	Rubiaceae	Psychotria nervosa	Wild Coffee		
Dicotyledon	Rubiaceae	Psychotria tenuifolia	Shortleaf Wild Coffee		
Dicotyledon	Rubiaceae	Spermacoce remota	Woodland False Buttonweed		
Dicotyledon	Rubiaceae	Spermacoce verticillata	Shrubby False Buttonweed		II
Dicotyledon	Salicaceae	Salix caroliniana	Carolina Willow		
Dicotyledon	Sapindaceae	Acer rubrum	Red Maple		
Dicotyledon	Sapotaceae	Sideroxylon celastrinum	Saffron Plum		
Dicotyledon	Sapotaceae	Sideroxylon reclinatum subsp. reclinatum	Florida Bully		
Dicotyledon	Saururaceae	Saururus cernuus	Lizard's Tail		
Dicotyledon	Solanaceae	Physalis angustifolia	Coastal Groundcherry		
Dicotyledon	Solanaceae	Solanum americanum	American Black Nightshade		
Dicotyledon	Solanaceae	Solanum viarum	Tropical Soda Apple		I
Dicotyledon	Styracaceae	Styrax americanus	American Snowbell		
Dicotyledon	Tetrachondraceae	Polypremum procumbens	Rustweed		
Dicotyledon	Theaceae	Gordonia lasianthus	Loblolly Bay		
Dicotyledon	Turneraceae	Piriqueta cistoides subsp. caroliniana	Pitted Stripeseed		
Dicotyledon	Ulmaceae	Ulmus americana	American Elm		
Dicotyledon	Urticaceae	Boehmeria cylindrica	False Nettle		
Dicotyledon	Verbenaceae	Phyla nodiflora	Turkey Tangle Fogfruit		
Dicotyledon	Violaceae	Viola lanceolata	Bog White Violet		
Dicotyledon	Violaceae	Viola sororia	Common Blue Violet		
Dicotyledon	Viscaceae	Phoradendron leucarpum	Oak Mistletoe		
Dicotyledon	Vitaceae	Nekemias arborea	Peppervine		
Dicotyledon	Vitaceae	Parthenocissus quinquefolia	Virginia Creeper		
Dicotyledon	Vitaceae	Vitis rotundifolia	Muscadine		
Dicotyledon	Vitaceae	Vitis shuttleworthii	Calloose Grape		
Dicotyledon	Ximeniaceae	Ximenia americana	Tallow Wood		

Golden Aster Scrub Animal Species List

Key: (ST) = State Threatened; (FT) – Federally Threatened; (FT(S/A)) = Federally Threatened (Similarity of Appearance)

Class	Order	Family	Scientific Name	Standard English Name	Native/Non-Native	State Status	Federal Status
Amphibia	Anura	Bufonidae	Anaxyrus quercicus	Oak Toad			
Amphibia	Anura	Bufonidae	Anaxyrus terrestris	Southern Toad			
Amphibia	Anura	Eleutherodactylidae	Eleutherodactylus planirostris	Greenhouse Frog	Non-native		
Amphibia	Anura	Hylidae	Acris gryllus	Southern Cricket Frog			
Amphibia	Anura	Hylidae	Hyla cinerea	Green Treefrog			
Amphibia	Anura	Hylidae	Hyla femoralis	Pine Woods Treefrog			
Amphibia	Anura	Hylidae	Hyla squirella	Squirrel Treefrog			
Amphibia	Anura	Hylidae	Osteopilus septentrionalis	Cuban Treefrog	Non-native		
Amphibia	Anura	Hylidae	Pseudacris ocularis	Little Grass Frog			
Amphibia	Anura	Microhylidae	Gastrophryne carolinensis	Eastern Narrow-Mouthed Toad			
Amphibia	Anura	Ranidae	Lithobates sphenocephalus	Southern Leopard Frog			
Aves	Accipitriformes	Accipitridae	Accipiter cooperii	Cooper's Hawk			
Aves	Accipitriformes	Accipitridae	Accipiter striatus	Sharp-Shinned Hawk			
Aves	Accipitriformes	Accipitridae	Buteo brachyurus	Short-Tailed Hawk			
Aves	Accipitriformes	Accipitridae	Buteo jamaicensis	Red-Tailed Hawk			
Aves	Accipitriformes	Accipitridae	Buteo lineatus	Red-Shouldered Hawk			
Aves	Accipitriformes	Accipitridae	Circus hudsonius	Northern Harrier			
Aves	Accipitriformes	Accipitridae	Elanoides forficatus	Swallow-Tailed Kite			
Aves	Accipitriformes	Accipitridae	Haliaeetus leucocephalus	Bald Eagle			
Aves	Accipitriformes	Pandionidae	Pandion haliaetus	Osprey			
Aves	Anseriformes	Anatidae	Aix sponsa	Wood Duck			
Aves	Anseriformes	Anatidae	Anas fulvigula	Mottled Duck			
Aves	Anseriformes	Anatidae	Anas platyrhynchos	Mallard			
Aves	Anseriformes	Anatidae	Aythya affinis	Lesser Scaup			
Aves	Anseriformes	Anatidae	Aythya collaris	Ring-Necked Duck			
Aves	Anseriformes	Anatidae	Cairina moschata	Muscovy Duck	Non-native		
Aves	Anseriformes	Anatidae	Dendrocygna autumnalis	Black-Bellied Whistling Duck			
Aves	Anseriformes	Anatidae	Lophodytes cucullatus	Hooded Merganser			
Aves	Anseriformes	Anatidae	Mergus serrator	Red-Breasted Merganser			
Aves	Anseriformes	Anatidae	Spatula clypeata	Northern Shoveler			
Aves	Anseriformes	Anatidae	Spatula discors	Blue-Winged Teal			
Aves	Apodiformes	Apodidae	Chaetura pelagica	Chimney Swift			
Aves	Caprimulgiformes	Caprimulgidae	Antrostomus carolinensis	Chuck-Will's-Widow			
Aves	Caprimulgiformes	Caprimulgidae	Chordeiles minor	Common Nighthawk			
Aves	Cathartiformes	Cathartidae	Cathartes aura	Turkey Vulture			
Aves	Cathartiformes	Cathartidae	Coragyps atratus	Black Vulture			
Aves	Charadriiformes	Charadriidae	Charadrius vociferus	Killdeer			
Aves	Charadriiformes	Laridae	Hydroprogne caspia	Caspian Tern			
Aves	Charadriiformes	Laridae	Larus argentatus	Herring Gull			
Aves	Charadriiformes	Laridae	Larus delawarensis	Ring-Billed Gull			
Aves	Charadriiformes	Laridae	Leucophaeus atricilla	Laughing Gull			
Aves	Charadriiformes	Laridae	Rynchops niger	Black Skimmer		ST	
Aves	Charadriiformes	Laridae	Sterna forsteri	Forster's Tern			
Aves	Charadriiformes	Laridae	Sternula antillarum	Least Tern		ST	
Aves	Charadriiformes	Laridae	Thalasseus maximus	Royal Tern			
Aves	Charadriiformes	Laridae	Thalasseus sandvicensis	Sandwich Tern			
Aves	Charadriiformes	Scolopacidae	Gallinago delicata	Wilson's Snipe			
Aves	Charadriiformes	Scolopacidae	Limnodromus scolopaceus	Long-Billed Dowitcher			
Aves	Ciconiiformes	Ciconiidae	Mycteria americana	Wood Stork			FT
Aves	Columbiformes	Columbidae	Columba livia	Rock Pigeon	Non-native		
Aves	Columbiformes	Columbidae	Columbina passerina	Common Ground Dove			
Aves	Columbiformes	Columbidae	Streptopelia decaocto	Eurasian Collared Dove	Non-native		
Aves	Columbiformes	Columbidae	Zenaida asiatica	White-Winged Dove	Non-native		
Aves	Columbiformes	Columbidae	Zenaida macroura	Mourning Dove			
Aves	Coraciiformes	Alcedinidae	Megaceryle alcyon	Belted Kingfisher			
Aves	Cuculiformes	Cuculidae	Coccyzus americanus	Yellow-Billed Cuckoo			
Aves	Falconiformes	Falconidae	Falco columbarius	Merlin			
Aves	Falconiformes	Falconidae	Falco peregrinus	Peregrine Falcon			
Aves	Falconiformes	Falconidae	Falco sparverius paulus	Southeastern American Kestrel		ST	
Aves	Falconiformes	Falconidae	Falco sparverius ssp.	American Kestrel			
Aves	Galliformes	Odontophoridae	Colinus virginianus	Northern Bobwhite			
Aves	Galliformes	Phasianidae	Pavo cristatus	Indian Peafowl	Non-native		
Aves	Gruiformes	Aramidae	Aramus guarauna	Limpkin			
Aves	Gruiformes	Gruidae	Antigone canadensis pratensis	Florida Sandhill Crane		ST	
Aves	Gruiformes	Rallidae	Fulica americana	American Coot			
Aves	Gruiformes	Rallidae	Gallinula galeata	Common Gallinule			
Aves	Passeriformes	Bombycillidae	Bombycilla cedrorum	Cedar Waxwing			
Aves	Passeriformes	Cardinalidae	Cardinalis cardinalis	Northern Cardinal			

Aves	Passeriformes	Cardinalidae	Passerina cyanea	Indigo Bunting			
Aves	Passeriformes	Corvidae	Aphelocoma coerulescens	Florida Scrub Jay			FT
Aves	Passeriformes	Corvidae	Corvus brachyrhynchos	American Crow			
Aves	Passeriformes	Corvidae	Corvus ossifragus	Fish Crow			
Aves	Passeriformes	Corvidae	Cyanocitta cristata	Blue Jay			
Aves	Passeriformes	Fringillidae	Haemorhous mexicanus	House Finch	Non-native		
Aves	Passeriformes	Fringillidae	Spinus tristis	American Goldfinch			
Aves	Passeriformes	Hirundinidae	Hirundo rustica	Barn Swallow			
Aves	Passeriformes	Hirundinidae	Petrochelidon fulva	Cave Swallow			
Aves	Passeriformes	Hirundinidae	Petrochelidon pyrrhonota	Cliff Swallow			
Aves	Passeriformes	Hirundinidae	Progne subis	Purple Martin			
Aves	Passeriformes	Hirundinidae	Riparia riparia	Bank Swallow			
Aves	Passeriformes	Hirundinidae	Stelgidopteryx serripennis	Northern Rough-Winged Swallow			
Aves	Passeriformes	Hirundinidae	Tachycineta bicolor	Tree Swallow			
Aves	Passeriformes	Icteridae	Agelaius phoeniceus	Red-Winged Blackbird			
Aves	Passeriformes	Icteridae	Molothrus ater	Brown-Headed Cowbird			
Aves	Passeriformes	Icteridae	Quiscalus major	Boat-Tailed Grackle			
Aves	Passeriformes	Icteridae	Quiscalus quiscula	Common Grackle			
Aves	Passeriformes	Icteridae	Sturnella magna	Eastern Meadowlark			
Aves	Passeriformes	Laniidae	Lanius ludovicianus	Loggerhead Shrike			
Aves	Passeriformes	Mimidae	Dumetella carolinensis	Gray Catbird			
Aves	Passeriformes	Mimidae	Mimus polyglottos	Northern Mockingbird			
Aves	Passeriformes	Mimidae	Toxostoma rufum	Brown Thrasher			
Aves	Passeriformes	Paridae	Baeolophus bicolor	Tufted Titmouse			
Aves	Passeriformes	Paridae	Poecile carolinensis	Carolina Chickadee			
Aves	Passeriformes	Parulidae	Geothlypis trichas	Common Yellowthroat			
Aves	Passeriformes	Parulidae	Mniotilta varia	Black-And-White Warbler			
Aves	Passeriformes	Parulidae	Oreothlypis celata	Orange-Crowned Warbler			
Aves	Passeriformes	Parulidae	Protonotaria citrea	Prothonotary Warbler			
Aves	Passeriformes	Parulidae	Seiurus aurocapilla	Ovenbird			
Aves	Passeriformes	Parulidae	Setophaga americana	Northern Parula			
Aves	Passeriformes	Parulidae	Setophaga coronata	Yellow-Rumped Warbler			
Aves	Passeriformes	Parulidae	Setophaga discolor	Prairie Warbler			
Aves	Passeriformes	Parulidae	Setophaga dominica	Yellow-Throated Warbler			
Aves	Passeriformes	Parulidae	Setophaga palmarum	Palm Warbler			
Aves	Passeriformes	Parulidae	Setophaga pinus	Pine Warbler			
Aves	Passeriformes	Parulidae	Setophaga ruticilla	American Redstart			
Aves	Passeriformes	Parulidae	Setophaga striata	Blackpoll Warbler			
Aves	Passeriformes	Passerellidae	Ammodramus savannarum	Grasshopper Sparrow			
Aves	Passeriformes	Passerellidae	Melospiza georgiana	Swamp Sparrow			
Aves	Passeriformes	Passerellidae	Melospiza melodia	Song Sparrow			
Aves	Passeriformes	Passerellidae	Passerculus sandwichensis	Savannah Sparrow			
Aves	Passeriformes	Passerellidae	Peucaea aestivalis	Bachman's Sparrow			
Aves	Passeriformes	Passerellidae	Pipilo erythrophthalmus	Eastern Towhee			
Aves	Passeriformes	Passerellidae	Pooecetes gramineus	Vesper Sparrow			
Aves	Passeriformes	Passerellidae	Spizella passerina	Chipping Sparrow			
Aves	Passeriformes	Polioptilidae	Polioptila caerulea	Blue-Gray Gnatcatcher			
Aves	Passeriformes	Regulidae	Regulus calendula	Ruby-Crowned Kinglet			
Aves	Passeriformes	Sturnidae	Sturnus vulgaris	European Starling	Non-native		
Aves	Passeriformes	Troglodytidae	Cistothorus palustris	Marsh Wren			
Aves	Passeriformes	Troglodytidae	Cistothorus platensis	Sedge Wren			
Aves	Passeriformes	Troglodytidae	Thryothorus ludovicianus	Carolina Wren			
Aves	Passeriformes	Troglodytidae	Troglodytes aedon	House Wren			
Aves	Passeriformes	Turdidae	Catharus guttatus	Hermit Thrush			
Aves	Passeriformes	Turdidae	Sialia sialis	Eastern Bluebird			
Aves	Passeriformes	Turdidae	Turdus migratorius	American Robin			
Aves	Passeriformes	Tyrannidae	Contopus virens	Eastern Wood-Pewee			
Aves	Passeriformes	Tyrannidae	Empidonax virescens	Acadian Flycatcher			
Aves	Passeriformes	Tyrannidae	Myiarchus crinitus	Great Crested Flycatcher			
Aves	Passeriformes	Tyrannidae	Sayornis phoebe	Eastern Phoebe			
Aves	Passeriformes	Tyrannidae	Tyrannus dominicensis	Gray Kingbird			
Aves	Passeriformes	Vireonidae	Vireo flavifrons	Yellow-Throated Vireo			
Aves	Passeriformes	Vireonidae	Vireo griseus	White-Eyed Vireo			
Aves	Passeriformes	Vireonidae	Vireo olivaceus	Red-Eyed Vireo			
Aves	Passeriformes	Vireonidae	Vireo solitarius	Blue-Headed Vireo			
Aves	Pelecaniformes	Ardeidae	Ardea alba	Great Egret			
Aves	Pelecaniformes	Ardeidae	Ardea herodias	Great Blue Heron			
Aves	Pelecaniformes	Ardeidae	Bubulcus ibis	Cattle Egret			
Aves	Pelecaniformes	Ardeidae	Butorides virescens	Green Heron			
Aves	Pelecaniformes	Ardeidae	Egretta caerulea	Little Blue Heron		ST	
Aves	Pelecaniformes	Ardeidae	Egretta thula	Snowy Egret			
Aves	Pelecaniformes	Ardeidae	Egretta tricolor	Tricolored Heron		ST	
Aves	Pelecaniformes	Ardeidae	Nycticorax nycticorax	Black-Crowned Night Heron			

Aves	Pelecaniformes	Pelecanidae	Pelecanus erythrorhynchos	American White Pelican			
Aves	Pelecaniformes	Pelecanidae	Pelecanus occidentalis	Brown Pelican			
Aves	Pelecaniformes	Threskiornithidae	Eudocimus albus	White Ibis			
Aves	Pelecaniformes	Threskiornithidae	Platalea ajaja	Roseate Spoonbill		ST	
Aves	Pelecaniformes	Threskiornithidae	Plegadis falcinellus	Glossy Ibis			
Aves	Piciformes	Picidae	Colaptes auratus	Northern Flicker			
Aves	Piciformes	Picidae	Dryobates pubescens	Downy Woodpecker			
Aves	Piciformes	Picidae	Dryocopus pileatus	Pileated Woodpecker			
Aves	Piciformes	Picidae	Melanerpes carolinus	Red-Bellied Woodpecker			
Aves	Piciformes	Picidae	Melanerpes erythrocephalus	Red-Headed Woodpecker			
Aves	Podicipediformes	Podicipedidae	Podiceps auritus	Horned Grebe			
Aves	Podicipediformes	Podicipedidae	Podilymbus podiceps	Pied-Billed Grebe			
Aves	Psittaciformes	Psittacidae	Aratinga nenday	Nanday Parakeet			
Aves	Strigiformes	Strigidae	Bubo virginianus	Great Horned Owl			
Aves	Strigiformes	Strigidae	Megascops asio	Eastern Screech Owl			
Aves	Strigiformes	Strigidae	Strix varia	Barred Owl			
Aves	Suliformes	Anhingidae	Anhinga anhinga	Anhinga			
Aves	Suliformes	Phalacrocoracidae	Phalacrocorax auritus	Double-Crested Cormorant			
Insecta	Hymenoptera	Apidae	Bombus sp.	Bumblebee			
Insecta	Lepidoptera	Lycaenidae	Strymon melinus	Gray Hairstreak			
Insecta	Lepidoptera	Nymphalidae	Agraulis vanillae	Gulf Fritillary			
Insecta	Lepidoptera	Nymphalidae	Anartia jatrophae	White Peacock			
Insecta	Lepidoptera	Nymphalidae	Danaus gilippus	Queen			
Insecta	Lepidoptera	Nymphalidae	Heliconius charithonia tuckerorum	Zebra Heliconian			
Insecta	Lepidoptera	Papilionidae	Eurytides marcellus	Zebra Swallowtail			
Insecta	Lepidoptera	Papilionidae	Papilio glaucus	Eastern Tiger Swallowtail			
Insecta	Lepidoptera	Papilionidae	Papilio palamedes	Palamedes Swallowtail			
Insecta	Lepidoptera	Papilionidae	Papilio polyxenes	Black Swallowtail			
Insecta	Lepidoptera	Papilionidae	Papilio troilus	Spicebush Swallowtail			
Insecta	Lepidoptera	Pieridae	Phoebis sennae	Cloudless Sulphur			
Mammalia	Artiodactyla	Cervidae	Odocoileus virginianus	White-Tailed Deer			
Mammalia	Artiodactyla	Suidae	Sus scrofa	Feral Hog	Non-native		
Mammalia	Carnivora	Canidae	Canis latrans	Coyote			
Mammalia	Carnivora	Canidae	Vulpes vulpes	Red Fox			
Mammalia	Carnivora	Felidae	Felis catus	Domestic Cat			
Mammalia	Carnivora	Felidae	Lynx rufus	Bobcat			
Mammalia	Carnivora	Mephitidae	Spilogale putorius	Eastern Spotted Skunk			
Mammalia	Carnivora	Procyonidae	Procyon lotor	Raccoon			
Mammalia	Chiroptera	Molossidae	Tadarida brasiliensis	Brazilian Free-Tailed Bat			
Mammalia	Chiroptera	Vespertilionidae	Eptesicus fuscus/Lasiurus cinereus/Lasiurus intermedius	Low Frequency Bat Group (Brown Bat, Hoary Bat, Northern Yellow Bat)			
Mammalia	Chiroptera	Vespertilionidae	Lasiurus borealis/Lasiurus seminolus	Red Bat Group (Eastern Red Bat And Seminole Bat)			
Mammalia	Chiroptera	Vespertilionidae	Nycticeius humeralis	Evening Bat			
Mammalia	Chiroptera	Vespertilionidae	Perimyotis subflavus	Tricolored Bat			
Mammalia	Cingulata	Dasypodidae	Dasypus novemcinctus	Nine-Banded Armadillo			
Mammalia	Didelphimorphia	Didelphidae	Didelphis virginiana	Virginia Opossum			
Mammalia	Eulipotyphla	Talpidae	Scalopus aquaticus	Eastern Mole			
Mammalia	Lagomorpha	Leporidae	Sylvilagus floridanus	Eastern Cottontail			
Mammalia	Rodentia	Cricetidae	Podomys floridanus	Florida Mouse			
Mammalia	Rodentia	Cricetidae	Sigmodon hispidus	Hispid Cotton Rat			
Mammalia	Rodentia	Sciuridae	Sciurus carolinensis	Eastern Gray Squirrel			
Reptilia	Crocodilia	Alligatoridae	Alligator mississippiensis	American Alligator			FT(S/A)
Reptilia	Serpentes	Colubridae	Coluber constrictor	North American Racer			
Reptilia	Serpentes	Colubridae	Drymarchon corais couperi	Eastern indigo snake			FT
Reptilia	Serpentes	Colubridae	Masticophis flagellum	Coachwhip			
Reptilia	Serpentes	Crotalidae	Crotalus adamanteus	Eastern Diamond-Backed Rattlesnake			
Reptilia	Serpentes	Crotalidae	Sistrurus miliarius barbouri	Dusky Pygmy Rattlesnake			
Reptilia	Squamata	Anguidae	Ophisaurus attenuatus longicaudus	Eastern Slender Glass Lizard			
Reptilia	Squamata	Dactyloidae	Anolis carolinensis	Green Anole			
Reptilia	Squamata	Phrynosomatidae	Sceloporus undulatus	Eastern Fence Lizard			
Reptilia	Squamata	Scincidae	Plestiodon inexpectatus	Southeastern Five-Lined Skink			
Reptilia	Squamata	Scincidae	Scincella lateralis	Little Brown Skink			
Reptilia	Squamata	Teiidae	Aspidoscelis sexlineata	Six-Lined Racerunner			
Reptilia	Squamata	Teiidae	Salvator merianae	Argentine Giant Tegu	Non-native		
Reptilia	Testudines	Chelydridae	Chelydra serpentina	Snapping Turtle			
Reptilia	Testudines	Emydidae	Terrapene bauri	Florida Box Turtle			
Reptilia	Testudines	Testudinidae	Gopherus polyphemus	Gopher Tortoise		ST	
Reptilia	Testudines	Trionychidae	Apalone ferox	Florida Softshell			

Appendix G
Biological Control of the Mexican Bromeliad Weevil

Mexican Bromeliad Weevil (suggested common name), *Metamasius callizona* (Chevrolat) (Insecta: Coleoptera: Curculionidae)[1]

Barba Larson and J. Howard Frank[2]



Figure 1. *Tillandsia utriculata* (L.), a bromeliad species endangered in Florida due to attack by *Metamasius callizona* (Chevrolat), in the Fakahatchee Strand State Preserve, Collier County, 1993.
Credits: H. Nadel, University of Florida

Introduction and History

Metamasius callizona (Chevrolat) has no accepted common name, but it has been referred to as the "Evil Weevil" by bromeliad enthusiasts throughout Florida, as a result of the destruction it has caused to native populations of bromeliads in the southern portion of the state. A member of the weevil family Curculionidae, it is one of three species of the genus *Metamasius* present in Florida. *Metamasius mosieri* Barber, the smallest of the three and native to Florida, Cuba, and the Dominican Republic, has been collected in Florida infrequently. Unlike *Metamasius callizona*, its presence does not threaten populations of native bromeliads in Florida's natural areas. The third species, *Metamasius hempipterus sericeus* (Olivier), was first reported in Florida in Miami-Dade County in 1984 and has since become an important pest of sugarcane, bananas, and ornamental palms.



Figure 2. *Guzmania monostachia* (L.), one of Florida's rare and endangered species of bromeliads, in the Fakahatchee Strand State Preserve, Collier County, 1999.
Credits: J.H. Frank, University of Florida

1. This document is EENY161, one of a series of the Entomology and Nematology Department, UF/IFAS Extension. Original publication date October 2000. Revised October 2000, April 2009, February 2016, April 2016, and February 2019. Visit the EDIS website at https://edis.ifas.ufl.edu. This document is also available on the Featured Creatures website at http://entnemdept.ifas.ufl.edu/creatures/.

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Reviewed: 05/2022

Metamasius callizona, which was first encountered in Florida in 1989 at a Ft. Lauderdale (Broward County) bromeliad nursery, is thought to have entered the state in a shipment of bromeliads imported from Veracruz, Mexico. The nursery was treated, but within two months, the weevil was found to be established in northern Broward County and southern Palm Beach County. By 1991, the weevil was present in four counties in southern Florida, and by 1999, it was found in 12 additional counties. As a direct result of attack by *Metamasius callizona*, the Florida Endangered Plant Advisory Council has added two species of bromeliads [*Tillandsia utriculata* (L.) and *Tillandsia fasciculata* Swartz] to the list of endangered species under the 1998 Florida Administrative Code. Additionally, the weevil has entered the Everglades region, home of Florida's rarest populations of bromeliads.

Description

Adults, which are 11 to 16 mm (0.4 to 0.6 in.) long, are black with a single yellow or orange band crossing the wing covers above the midpoint (Figure 3). The first and second ventral abdominal segments of males are indented and may display brownish coloration, while female abdominal segments are flat and always black.



Figure 3. Adult of *Metamasius callizona* (Chevrolat), the Mexican bromeliad weevil.
Credits: J. L. Castner, University of Florida

Metamasius callizona adults are easily distinguished from both *Metamasius mosieri* (Figure 4), which is 6 to 9 mm (0.24 to 0.35 in.) long and red and black with two black spots on the upper, red portion of the wing covers, and from *Metamasius hemipterus sericeus* (Figure 5), which is 9 to 14 mm (0.35 to 0.55 in.) long and may be either red or orange, and black, with variation in color pattern.

Metamasius callizona eggs are elongate, averaging approximately 2 mm (0.08 in.) in length and 1 mm (0.04 in.) in width. They are white when first oviposited, later turning yellow and finally light brown.



Figure 4. Adult *Metamasius mosieri* Barber, the Florida bromeliad weevil.
Credits: P.M. Choate, University of Florida



Figure 5. Color pattern of adult silky cane weevil, *Metamasius hemipterus sericeus* (Olivier).
Credits: Robin M. Giblin-Davis, University of Florida



Figure 6. Egg of *Metamasius callizona* (Chevrolat), the Mexican bromeliad weevil.
Credits: J. Salas, FONAIAP

Larvae (Figure 7) are cream-colored with a dark head. Mean head capsule widths for laboratory reared first- through fifth-instar larvae were determined to be 0.92 mm (0.04 in.), 1.21 mm (0.05 in.), 1.69 mm (0.07 in.), 2.10 mm (0.08 in.), and 2.73 mm (0.11 in.), respectively. While the first three instars have discrete size classes, field-collected fourth- and fifth-instar larvae cannot be distinguished. Pupae are generally found within a fibrous cocoon (Figure 8) made of plant material.



Figure 7. Larva of *Metamasius callizona* (Chevrolat), the Mexican bromeliad weevil.
Credits: J.L. Castner, University of Florida



Figure 8. Cocoon of *Metamasius callizona* (Chevrolat), the Mexican bromeliad weevil, constructed of shredded plant material.
Credits: B. Larson, University of Florida



Figure 9. Pupa of *Metamasius callizona* (Chevrolat), the Mexican bromeliad weevil.
Credits: B. Larson, University of Florida

Distribution and Host Plants

Metamasius callizona was described from Mexico and originally thought to range from Mexico to western Panama, although the report from Panama has been considered questionable. In Mexico, the weevil has been reported on *Aechmea mexicana* Baker, *Catopsis* sp., and *Tillandsia limbata* Schltdl. from Veracruz, on *Vriesia* sp. from Puebla, on *Tillandsia utriculata* and *Tillandsia streptophylla* Scheidweiler near Coatepec, on *Tillandsia roland-gosselinii* Mez near Pochutla, and in a grower's shade houses near Cordoba on *Tillandsia heterophylla* Morren, *Tillandsia ehlersiana* Rauh, *Tillandsia streptophylla*, and *Tillandsia deppeana* Steudel. Habitats in Mexico where the weevil has been found are often shaded and rainy, over 700 m in altitude.

Between 1973 and 1987, USDA-APHIS plant inspectors intercepted 14 weevils determined to be *Metamasius callizona*, being imported primarily on *Tillandsia* spp. All specimens of *Metamasius callizona* found in imported shipments have originated in Mexico. An additional 122 weevils identified only as *Metamasius* were intercepted during the same time period on bromeliads known to be attacked by *Metamasius callizona*.

The weevil is also reported from Guatemala (Alta Verapaz: San Juan). A survey of the Alta Verapaz region in June–August 2000 failed to yield *Metamasius callizona*, although weevils of related species, principally *Metamasius quadrilineatus* Champion, were found in bromeliads. Despite the early record of *Metamasius callizona* from Panama (Chiriquí: Potrerillos), the species was not detected during a survey in 1994. Furthermore, while specimens of many other species of *Metamasius* are present in the Smithsonian Tropical Research Institute in Panama, there are no *Metamasius callizona* specimens in the collection, leading to the suggestion that the weevil's natural range does not extend throughout Central America. However, *Metamasius callizona* was found in Belize in the fall of 2010 and again in 2014, infesting *Tillandsia utriculata.*

The first specimen of *Metamasius callizona* in Florida was found on a nursery-grown *Tillandsia ionantha* Planchon, a plant native to Mexico and Central America on which adults will feed but not lay eggs. In natural areas, the weevil primarily attacks *Tillandsia utriculata*, *Tillandsia fasciculata*, and *Tillandsia paucifolia* Baker. The weevil is most damaging to *Tillandsia utriculata* plants, killing them directly. While *Tillandsia fasciculata* appears to be more resistant, damage to flowering plants can be highly destructive to their populations. The weevil has also been observed

attacking *Tillandsia balbisiana* Schultes (a species that had been listed already in Florida as threatened) and *Tillandsia flexuosa* Swartz (already listed as threatened), *Tillandsia variabilis* Schlechtendal (threatened), *Tillandsia simulata* Small (a species precinctive [=endemic] to Florida), as well as *Catopsis* and *Guzmania* spp. The state's native bromeliads that are likely to be attacked by *Metamasius callizona* if it reaches their more isolated habitats include *Tillandsia pruinosa* Swartz (endangered), *Guzmania monostachia* (L.) (endangered), *Catopsis berteroniana* (Schultes) (endangered), *Catopsis floribunda* (Brongniart) (endangered), and *Catopsis nutans* (Swartz) (endangered). The weevil, which appears to be restricted to plants large enough to supply an adequate amount of stem tissue for larval development, has been found most often in large species of *Tillandsia*. It will most likely not attack Florida's other native bromeliads [*Tillandsia bartramii* Elliott, *Tillandsia setacea* Swartz, *Tillandsia recurvata* (L.), and *Tillandsia usneoides* (L.)], which probably do not provide enough plant material for completion of larval development due to their small size. See http://entnemdept.ufl.edu/frank/bromeliadbiota/flbrom.htm.

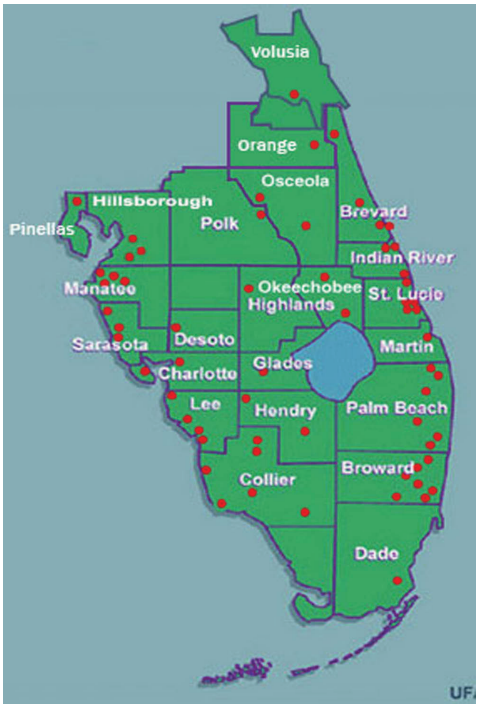


Figure 10. Distribution as of February 2009.
Credits: J. Salas, FONAIAP

Since its first appearance in Broward County, the weevil has spread through much of southern Florida by both natural dispersal and by movement of infested plants. As of December 2009, *Metamasius callizona* had been reported in the following 23 counties in Florida (Figure 10), given with date of first report: Broward (November 1989), Palm Beach (November 1989), Lee (October 1990), Miami-Dade (May 1991), Charlotte (August 1994), St. Lucie (November 1995), Glades (March 1996), Collier (March 1996), Sarasota (August 1996), Manatee (September 1996), Martin (May 1997), Hendry (August 1997), Brevard (November 1998), Indian River (December 1998), Desoto (March 1999), Highlands (March 1999), Polk (December 2000), Okeechobee (April 2002), Hillsborough (June 2003), Osceola (October 2003), Pinellas (July 2006), Orange (November 2006), and Volusia (January 2009).

In addition to attacking bromeliads in parks and other public lands, the weevil has infested private bromeliad collections and nurseries. Under greenhouse conditions, bromeliads mined and killed by *Metamasius callizona* have included *Aechmea* cvs., *Ananas comosus* (L.) (pineapple), *Canistrum lindenii* (Regel) Mez, *Cryptanthus* cvs., *Dyckia* sp., *Fernseea bocainensis* Pereira & Moutinho, *Guzmania* cvs., *Hechtia* sp., *Hohenbergia* sp., *Neoregelia* cvs., *Neoregelia compacta* (Mez), *Nidularium* cv., *Orthophytum gurkenii* Hutch., *Pitcairnia angustifolia* Solander, *Quesnelia* "testudo," *Tillandsia fasciculata, Tillandsia paucifolia, Tillandsia utriculata*, and *Vriesia* cvs.

Biology and Damage

When reared on a diet of pineapple stem, the weevil's development time from oviposition to adult emergence averaged approximately eight weeks under laboratory conditions (temperature of 26°C, relative humidity of 82%, photoperiod of 14:10 L:D). Mean duration of the egg stage was 8.3 days, while the larval stage averaged 36.4 days (5.0 days, 4.5 days, 4.4 days, 5.7 days, and 17.8 days for the first to fifth larval instars, respectively). The pupal stage lasted a mean of 11.8 days. Pre-ovipositional period of females averaged 28.9 days, and females lived an average 156.4 days in the laboratory. Minimal generational time in the field is estimated to be 10 weeks, with mean generational time projected to be 13 to 17 weeks. Larvae, pupae, and adults have been found throughout the year in southern Florida, suggesting continuous mating. Therefore, there are probably three to four continuous generations per year in Florida.

All life stages of the weevil may be present in the same plant. Adult females, which primarily feed on leaves but have been seen to feed on flowers, cut slits in host plant leaves close to their feeding sites, into which they lay eggs individually. Newly emerged larvae begin to consume leaf tissue as they move down to the base of the stem. They tunnel into the growing stem tissue, producing large holes in the base that may cause the plant to dislodge from its support structure on the tree. Larval damage is generally

confined to the base of the plant (Figure 11) but can also reach up the flower stalk. Several weevils may successfully develop on the same host plant, provided there is sufficient plant tissue. However, larger larvae will attack smaller ones upon encountering them. The weevil usually pupates in the center of the plant's stem (Figure 12), within a cocoon it constructs from shredded plant material. When reared in planted pineapple tops, the weevil sometimes pupates in the soil near the base of the plant.



Figure 11. Three larvae of *Metamasius callizona* (Chevrolat), the Mexican bromeliad weevil, destroying base of *Tillandsia utriculata* (L.) stem.
Credits: B. Larson, University of Florida



Figure 12. Stem of *Tillandsia utriculata* (L.), damaged by *Metamasius callizona* (Chevrolat), the Mexican bromeliad weevil, with weevil cocoon.
Credits: J.L. Castner, University of Florida

Damage is often accompanied by the production of a light brown, gelatinous material, which may be the plant's defensive reaction. This gel can be seen covering entrance holes to the weevil mines. Other symptoms of weevil damage include adult feeding marks on leaves, browning of leaves (Figures 13 and 14), and decomposition of the base of the central leaves, which can easily be pulled out when larval mining is substantial.



Figure 13. Damage on leaves of *Tillandsia utriculata* (L.) by *Metamasius callizona* (Chevrolat), the Mexican bromeliad weevil.
Credits: J.H. Frank, University of Florida



Figure 14. Damage on leaves of pineapple, *Ananas comosus* (L.), by *Metamasius callizona* (Chevrolat), the Mexican bromeliad weevil.
Credits: P.M. Choate, University of Florida

In ornamental bromeliad nurseries, the mining of *Metamasius callizona* larvae directly kills some species. Extent of damage to natural bromeliad populations in Florida varies. For example, heavy infestations of large, flowering plants have caused severe damage to populations of *Tillandsia utriculata*, which reproduce primarily by seed. *Tillandsia fasciculata* plants are able to produce offsets, which aids their populations to some extent in escaping decimation by the weevil. However, the absence of any natural enemies of the weevil in Florida has resulted in much greater destruction to bromeliad populations than that occurring in any part of the weevil's natural range.

Management

Where infestations of *Metamasius callizona* occur on ornamental bromeliads grown in nurseries, a reduced concentration of an insecticide labeled for beetle adults and grubs is recommended, applied as a spray or dip every two to three months to prevent infestations. This recommendation is based on general principles and not on specific efficacy data, because no chemical trials of any pesticide have been carried out against the weevil. See https://edis.ifas.ufl.edu/features/handbooks/MGHSouth.html.

In natural areas, where the pest is threatening native populations of bromeliads, chemical control is not feasible, in part because the epiphytic growth habit of the host plants makes them inaccessible from the ground. More importantly, many of the populations affected by the pest are found in state and county parks where use of chemical pesticides is not acceptable because of possible effects on non-target organisms.



Figure 15. Bromeliads anchored to tree branches, Miami-Dade County, 1996.
Credits: J.H. Frank, University of Florida

Biological control offers the most likely success in management of the weevil. One potential biological control agent was discovered and studied at the Escuela Agrícola Panamericana in Zamorano, Honduras. This parasitoid tachinid fly, *Lixadmontia franki* (Figures 16 and 17), was found attacking the closely related weevil species *Metamasius quadrilineatus* in Honduran cloud forests, primarily in species of *Tillandsia*. The female fly larviposits at the base of leaves, near the entrance to the tunnel made by weevil larvae, and the fly larvae enter the tunnel to seek out the host. Fly larvae attack the larval stage of the weevil, and while parasitized weevil larvae may construct a pupation chamber, they die before pupating. Percent parasitism of weevils in field-collected bromeliads in Honduras has ranged from 5 to 67% and seems to increase during the summer rainy season to reach a maximum in October–November.



Figure 16. Dorsal view of adult of *Lixadmontia franki*, a fly that parasitizes, *Metamasius callizona* (Chevrolat), the Mexican bromeliad weevil.
Credits: R. Cave, University of Florida



Figure 17. Lateral view of adult of *Lixadmontia franki*, a parasitic fly of *Metamasius callizona* (Chevrolat), the Mexican bromeliad weevil.
Credits: P.M. Choate, University of Florida

Lixadmontia franki flies brought into Florida and maintained in a quarantine facility were found to parasitize *Metamasius callizona* in bromeliad plants. The fly's natural host in Central America is *Metamasius quadrilineatus*, and it also will parasitize *Metamasius mosieri*, both of these being bromeliad-killing weevils. It would not attack *Metamasius hemipterus sericeus*. A strong fly colony was established in the quarantine facility, and Federal and State release permits were issued in 2007. Releases began at the

end of June 2007 and are planned to be continued through 2008 in some Federal Preserves and State and county parks with concurrent evaluation.

The Florida Council of Bromeliad Societies (FCBS) has initiated a project to collect seeds of native bromeliads threatened by *Metamasius callizona*. Plants grown from those seeds will eventually be replaced in their natural setting if weevil populations are successfully reduced. For more information on the seed collection project and biological control efforts, see http://entomology.ifas.ufl.edu/frank/savebromeliads/.

At least 20 other species of weevils are known to attack bromeliads in Central and South America. Several related species of weevils have been found in shipments of bromeliads from Neotropical countries, including *Metamasius flavopictus* (Champion) (Figure 18), *Metamasius sellatus* Champion (Figure 19), and *Metamasius quadrilineatus* (Figure 20). Therefore, in addition to managing populations of *Metamasius callizona* already present in the state, it is necessary to prevent the accidental importation of additional weevil pests. There are two important preventive tactics. Dipping imported plants in insecticides labeled for beetles both before leaving the country of export and after arriving in Florida reduces the risk, although the effect of chemicals on eggs is unknown. However, the most effective preventive tactic is to import only seeds of Neotropical bromeliads.



Figure 18. Adult *Metamasius flavopictus* (Champion), a weevil pest of bromeliads.
Credits: J. Lotz, Division of Plant Industry

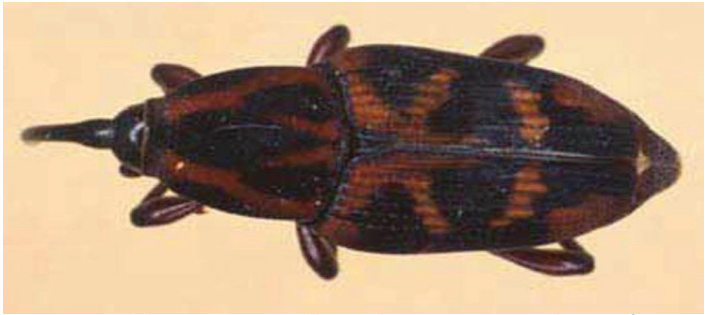


Figure 19. Adult *Metamasius sellatus* Champion, a weevil pest of bromeliads.
Credits: J. Lotz, Division of Plant Industry



Figure 20. Adult *Metamasius quadrilineatus* Champion, a weevil pest of bromeliads.
Credits: J.H. Frank, University of Florida

Selected References

Creel OR. 2000. The evil weevil: what will Florida lose? The Palmetto 19: 10-11, 14-16. (26 June 2013)

Frank JH. 1997. Protection of Florida's native bromeliads by control of *Metamasius callizona*. Journal of the Bromeliad Society 47: 60-64.

Frank JH. 1999. Bromeliad-eating weevils. Selbyana 20: 40-48.

Frank JH. 1999. Further spread of the weevil *Metamasius callizona* in Florida. Journal of the Bromeliad Society 49: 206-209.

Frank JH. 2000. Florida's native bromeliads imperiled by exotic evil weevil. The Palmetto 19: 6-9, 12.

Frank JH, Thomas MC. 1994. *Metamasius callizona* (Chevrolat) (Coleoptera: Curculionidae), an immigrant pest, destroys bromeliads in Florida. Canadian Entomologist 126: 673-682.

Frank JH, Cooper TM, Larson BC. 2006. *Metamasius callizona* (Coleoptera: Dryophthoridae): longevity and fecundity in the laboratory. Florida Entomologist 89: 208-211.

Frank JH, Fish D. 2008. Potential biodiversity loss in Florida bromeliad phytotelmata due to *Metamasius callizona* (Coleoptera: Dryophthoridae), an invasive species. Florida Entomologist 91: 1-8.

O'Brien CW, Thomas MC. 1990. The species of *Metamasius* in Florida (Coleoptera: Curculionidae). Florida Department of Agriculture and Consumer Services, Division of Plant Industry, Entomology Circular 330: 1-4.

O'Brien CW, Thomas MC, Frank JH. 1990. A new weevil pest of *Tillandsia* in south Florida. Journal of the Bromeliad Society 40: 203-205, 222.

Salas J, Frank JH. 2001. Development of *Metamasius callizona* (Coleoptera: Curculionidae) on pineapple stems. Florida Entomologist 84: 123-126.

Suazo A, Cave RD, Frank JH. 2008. Reproductive biology and development of *Lixadmontia franki* (Diptera: Tachinidae), a parasite of bromeliad-eating weevils. Florida Entomologist 91: 453-459.

Vaurie P. 1966. A revision of the neotropical genus *Metamasius* (Coleoptera, Curculionidae, Rhynchophorinae). Species groups I and II. American Museum of Natural History Bulletin 131: 213-337.

Wood DM, Cave RD. 2006. Description of a new genus and species of weevil parasitoid from Honduras (Diptera: Tachinidae). Florida Entomologist 89: 239-244.

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REPRODUCTIVE BIOLOGY AND DEVELOPMENT OF *LIXADMONTIA FRANKI* (DIPTERA: TACHINIDAE), A PARASITOID OF BROMELIAD-EATING WEEVILS

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ABSTRACT

The biology and development of *Lixadmontia franki* Wood and Cave (Diptera: Tachinidae), an endoparasitoid of bromeliad-eating weevils in the genus *Metamasius*, are described. Embryonic development is completed within 8 d post-mating while the egg is held inside the female reproductive system. Neonate larvae actively search for a host and initiate parasitism by penetrating the host's cuticle. Larval developmental time and pupation at 20°C averaged 17 and 25 d, respectively, with no significant differences observed between genders. Adult males live on average 9 d compared to 17 d for females. Females are capable of parasitizing third to sixth instars of *Metamasius quadrilineatus* Chevrolat, but the highest levels of parasitism were observed when third and fourth instars were exposed to flies.

Key Words: parasitism, biological control, weevil

RESUMEN

Se describen la biología y el desarrollo de *Lixadmontia franki* Wood y Cave (Diptera: Tachinidae), un endoparasitoide del picudo de las bromelias del género *Metamasius*. El desarrollo embriónico se completa en un período de 8 d después del apareo, mientras el huevo se mantiene en el sistema reproductivo de la hembra. Larvas neonatas buscan activamente a su hospedero y comienza el parasitismo con la penetración de la cutícula del hospedero. El tiempo de desarrollo de la larva y la pupa a 20° C promedia en 17 y 25 d, respectivamente, sin encontrarse diferencias significativas entre los sexos. Los machos adultos viven en promedio 9 d, comparado con 17 d en las hembras. Las hembras son capaces de parasitar larvas de tercero al sexto estadío de *Metamasius quadrilineatus* Chevrolat, sin embargo, los niveles más altos de parasitismo se observaron cuando se expusieron hospederos de tercero y cuarto estadío a las moscas.

Translation provided by the authors.

Lixadmontia franki Wood and Cave (Diptera: Tachinidae) is native to the tropical montane cloud forests of Honduras and Guatemala, where it attacks the larvae of the bromeliad-eating weevil *Metamasius quadrilineatus* Champion (Coleoptera: Dryophthoridae) (Wood & Cave 2006). The host weevil feeds on epiphytic bromeliads, including species in the genera *Tillandsia*, *Catopsis* and *Vriesea* found between 1600 and 2000 m above sea level (Alvarez del Hierro & Cave 1999). Parasitism by *L. franki* occurs mostly from Jun to Jan and can be as much as 60% in the field during this period.

Laboratory tests have demonstrated that *L. franki* also readily parasitizes the larva of *Metamasius callizona* (Chevrolat) (Frank & Cave 2005). *Metamasius callizona*, a native of southern Mexico and Guatemala, was first detected in Florida in 1989 (Frank & Thomas 1991, 1994). Since then, it has spread throughout southern Florida, destroying much of the native bromeliad flora and threatening populations of rare native bromeliad species (e.g., *Catopsis nutans* Swartz, *Catopsis berteroniana* Schultes, *Guzmania monostachia* L., and *Tillandsia pruinosa* Swartz) (Frank & Cave 2005; http://bromeliadbiota.ifas.ufl.edu). *Tillandsia utriculata* L., once considered common in southern Florida, is now considered endangered due to the extensive damage caused by *M. callizona* (Frank 2000).

Because the only known hosts of *L. franki* are the larvae of bromeliad-eating weevils in the genus *Metamasius*, it offers the possibility of an effective biological control agent of *M. callizona* in Florida (Cave 1997). No other parasitoids of bromeliad-attacking *Metamasius* weevils are known to exist. Information on the developmental and reproductive biology of *L. franki* is of vital importance to understand and maximize parasitism

under laboratory and field conditions. Alvarez del Hierro & Cave (1999) noted an adult lifespan of 20 d and pupal incubation time of 18-20 d. Virtually nothing else was known about the biology of the fly. Here we provide new information on the biology and behavior of *L. franki* attacking *M. quadrilineatus* under laboratory conditions.

Materials and Methods

Biological Material

Collections of host plants, weevils, and flies were taken in 5 cloud forests in south-central Honduras. These included the biological reserves of Cerro Monserrat (N13°56' W86°54') in El Paraíso department, and Cerro Uyuca (N14°00' W87°09'), El Chile (N14°30' W86°51'), La Montañita (N14°03' W87°10'), and Cerro de Apalagua (N14°02' W87°04') (all 1400-1800 m elevation) in Francisco Morazán department. Plant material consisted of live bromeliad plants knocked down from trees by natural causes and which could be found in groups on the forest floor. The leaves from these plants were removed and the stems used as feeding material for the weevil colony. Stems collected in such manner were placed in plastic bags and stored at 4°C until needed. These plants were primarily *Tillandsia standleyi* L.B. Smith (approximately 90%), one of the most common species in these ecosystems, with *Tillandsia ponderosae* L. B. Smith and *Catopsis hahnii* Baker making up the rest.

Metamasius quadrilineatus eggs, larvae, and pupae were collected from field infested plants, brought to the laboratory, placed individually in 30-mL (1-oz) plastic cups with screened lids, and used to start a weevil colony. A slice of bromeliad stem was provided for each weevil larva as needed to ensure a constant supply of fresh food. Early instar weevils were determined not to be parasitized in the field, therefore field-collected first and second instar weevils were used to supplement the laboratory colony. Some of these larvae also were raised to the third and fourth instars and exposed to adult flies.

Lixadmontia franki reared from field-parasitized weevil larvae were used to initiate a fly colony. This colony was continually supplemented with field material, but by the end of this project it had turned into a self-sustaining laboratory population. Forty fly pupae were placed between layers of moistened paper towels in a 10-cm diameter Petri dish within 2 d after formation and incubated at 21°C with 70% RH. Petri dishes with fly pupae were placed in a screen cage ($1.5 \times 1.5 \times 1.2$ m) where adults were allowed to emerge. Adult flies were provided with water and artificial hummingbird nectar (Perky-Pet Instant Nectar, Perky-Pet Products Co., Denver, CO) in 30-mL plastic cups fitted with cotton wicks through the lid to prevent flies from drowning. For parasitism, thirty 30-mL plastic cups, each containing a third or fourth instar weevil and 5-cm piece of bromeliad stem, were placed on a tray and simultaneously placed inside the fly cage (Suazo et al. 2006). A new tray with 30 larvae was introduced into the fly cage every other day. All larvae on the same tray were exposed to adult flies for 12 consecutive days. For experimental purposes, newly emerged flies were placed in smaller cages ($35 \times 35 \times 35$ cm) and provided with food and water as described above. Flies were sexed based on dimorphism in the abdominal region: females are usually larger and have a rounder, darker abdomen, contrasted with that of males, which is more triangular and reddish colored.

Development Time, Mating Behavior, Female Fecundity, and Longevity

Development time of fly larvae at 21°C was estimated by artificially parasitizing 3rd instar weevils. Ready-to-hatch pharate 1st instars, recognizable by the presence of a well developed cephalopharyngeal skeleton, were collected by dissecting the abdomen of six 8-10-d-old mated females, exposing their reproductive system, and gently opening the oviduct where the pharate larvae were located (Fig. 2B). Dissections were made in sterilized water with the aid of a stereomicroscope. Artificial parasitism was accomplished by using a fine bristle brush to place a 1st instar on the weevil host. After placing the maggot on the weevil larva, the penetration time for the maggot to enter the host was recorded. The elapsed time between host penetration and exit of the fully developed fly larva from the host was deemed the development time. Data for penetration time were obtained from 14 fly larvae and, for development time, from 20 fly larvae.

The period from pupal formation until adult emergence was studied under 4 constant temperature regimes: 15, 20, 25, and 30°C, all with 70% RH. Minimum and maximum temperatures were chosen based on average day and night temperatures at Cerro Uyuca. Newly formed pupae within their puparium were weighed and placed between layers of moistened paper towel in a 92-mL (25-dram) plastic vial. Pupae were added to each of the incubators daily for 4 d until a total of 20 pupae was attained at each temperature. Fiberglass screen was used to cover both ends of the vial to allow for proper ventilation. Fly emergence was checked daily and the date of emergence was used to determine pupal development time. The gender of each emergent fly was determined and the number of emergent flies per cohort at each temperature was used to determine percent emergence. Pupae from which emergence did not occur after an additional 2 weeks from the expected emergence time (21 d, based on preliminary obser-

vations) were examined under the microscope. Pupae which appeared to be alive and healthy were left and checked daily for an additional 2 weeks until fly emergence or death. Causes of death were dehydration, characterized by a scaly and dry appearance, partial emergence (only head out of the puparium), fungal or bacterial infection, or physical damage.

To study mating behavior, 4-6 pairs of newly emerged flies were placed within a screen cage (35 × 35 × 35 cm). Five cages were set up over a 1-week period. In preliminary observations, it was determined that flies mated only during the day, so observations were made daily from 7:00 am to 7:00 pm at 2-h intervals for 4 consecutive d. Mating time and date were recorded and courtship and mating behavior was noted. Data were obtained from 22 mating pairs.

To estimate fecundity, newly emerged females were allowed to mate and then moved to a separate cage supplied with hummingbird food but no hosts. Flies were dissected (as described above) 2, 4, 6, and 8 d after mating; unmated flies housed in a similar cage with hummingbird food but no hosts also were dissected. At least 3 flies were dissected for each treatment. The number of eggs with developing embryos and number of pharate 1st instars were counted and recorded. Measurements of the length and width (mm) of fifteen 1st instars were taken.

The post-mating preoviposition period of female flies was determined by exposing weevil larvae to flies 2, 4, 6 and 8 d after mating. Mating pairs were separated from a large colony and placed in a small cage (35 × 35 × 35 cm). Four cages, each with 3 mating pairs and 6 weevil larvae in bromeliad stems, were prepared. Weevil larvae fed on *T. standleyi* stems for 3 d before being exposed to the flies and were exposed to the flies for only 1 d. Exposed weevil larvae were subsequently reared on bromeliad stems until pupation or emergence of fly larvae. The experiment was repeated twice. Twelve weevil larvae were exposed in each of the treatments. The number of parasitized larvae was recorded and these data were used to calculate percent parasitism for each of the fly maturity periods.

Adult longevity was determined by placing flies of both sexes that emerged within a 24-h period in screen cages (35 × 35 × 35 cm) and recording the number of dead flies and their gender daily. Cages contained variable numbers (8-12) of mixed gender flies. Five cages were set up over a period of 1 week, based on fly availability. Data were collected until all flies died.

Susceptibility of Host Instars to Parasitism

To determine the preferred host instar for parasitism, each of the 6 weevil instars was exposed to three 10-d-old fly pairs for 5 consecutive d. Weevil instars were determined by head capsule width (Alvarez del Hierro 1997). Weevils were exposed to flies in cages (35 × 35 × 35 cm) containing hummingbird nectar and water. Data were collected in 3 trials consisting of 6 larvae/instar, which yielded 18 observations per instar.

Statistical Analyses

Analysis of variance (ANOVA) (Proc GLM, SAS Institute, 1996) was used to evaluate the effect of temperature on pupation period, pupal weight and survivorship, reproductive maturation time on the number of eggs and pharate 1st instars produced, and preferred host instar parasitized. Significant ANOVAs were followed by a Duncan's mean separation test. Comparison of adult longevity between genders was tested for significance by a *t*-test ($\alpha = 0.05$) (Proc GLM, SAS Institute, 1996). Means are given with their standard error.

Results

Developmental Time, Mating Behavior, Female Fecundity, and Longevity

When placed on a host, 1st instars of *L. franki* were observed penetrating the weevil larva by cutting the cuticle with their mandibles (Fig. 1), usually through an intersegmental membrane. Average elapsed time from placement on the host to penetration was 7.8 ± 7.5 min with a range of 3-30 min. The time to pass through the host's integument was about 1 s.

Larval development time inside the host lasted on average 17.0 ± 0.7 d with a range of 13-21 d (Table 1). After completion of development within the host, the mature fly larva exited the host car-

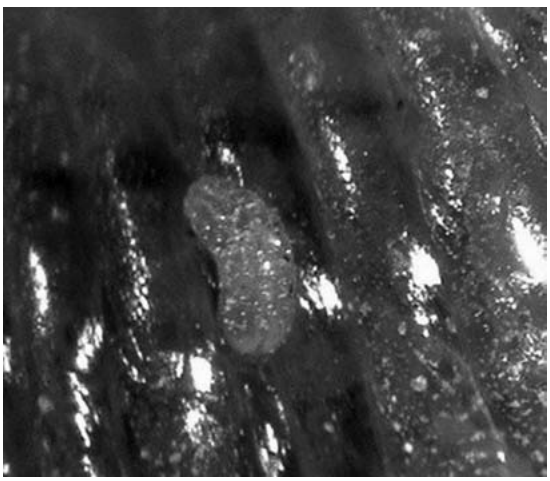


Fig. 1. First instar *Lixadmontia franki* on the integument of a 3rd instar *Metamasius quadrilineatus*.

TABLE 1. DEVELOPMENTAL PARAMETERS FOR *LIXADMONTIA FRANKI* PARASITIZING *METAMASIUS QUADRILINEATUS*.

Variable	*n*	Mean ± SE	Min	Max	*P*-value (*t*-test)
Larval developmental time (d)	20	17.0 ± 0.7	13	21	
Pupation period (d)					
15°C					
Male	7	43.4 ± 0.4	42	44	>0.05
Female	8	43.6 ± 0.2	43	44	
20°C					
Male	9	24.7 ± 0.2	20	29	>0.05
Female	5	25.0 ± 0.5	24	27	
Adult longevity (d)					
Male	14	9.0 ± 1.8	3	24	0.025
Female	16	16.9 ± 3.1	3	54	

cass, usually from the caudal end of the host. Pupation occurred 1-2 d after exiting the weevil carcass. Pupation normally occurred under decomposing bromeliad tissue or inside the feeding tunnels or pupal chambers made by the weevils in the plastic rearing cups.

Weights of pupae were significantly different between males and females ($F_{2,26} = 4.83$; $P = 0.016$) with females weighing 37.3 ± 2.4 mg compared to 28.4 ± 1.7 mg for males. Pupation period did not differ significantly between males and females at 15 and 20°C (Table 1). However, duration of the pupal stage was significantly longer at 15°C (43.5 ± 0.2 d) than at 20°C (24.8 ± 0.6 d) ($F_{2,26} = 475.33$; $P < 0.0001$). Similarly, survival at 15°C was 75%, contrasting with 65% at 20°C. No fly emergence was observed when pupae were incubated at 25 and 30°C. Dehydration of pupae was characterized by a scaly, brittle appearance of the contents with no distinguishable adult anatomical structures, the lack of a foul smell and no visible mycelia after opening the pupal case. Dehydration accounted for only 10% of pupal mortality at 20°C, whereas 85% and 100% died from dehydration at 25 and 30°C, respectively. Some flies died while exiting (partially emerged flies) and had only their heads out of the puparium; this type of mortality accounted for approximately 10 and 20% of mortality at 20 and 25°C, respectively. Death by bacterial or fungal infection was determined after breaking the puparium open and noticing a mushy consistency and foul smell (bacteria) or dry consistency and visible mycelia (fungi). This factor accounted for 15% of mortality and was observed only at 15°C.

Mating by *L. franki* occurred within 48 h after adult emergence. On average, female flies mated 1.7 ± 0.2 d after emergence. During courtship, males moved in circles around the female, constantly moving their wings in a forward/backward motion. After this courtship period, which lasted less than a min, mating took place. Copulation lasted an average of 58.9 ± 7.1 min with a range of 20-105 min.

Unmated females did not have any eggs within the oviduct (Fig. 2A). Eggs with developing embryos within the reproductive system of mated females were evident at 2 d post-mating and the number increased significantly ($F_{3,13} = 8.13$; $P = 0.026$) with time after mating, reaching a maximum at 6 d (Table 2). Eggs with pharate 1st instars were not seen within the oviduct of gravid flies until 8 d post-mating (Table 2), at which time they were packed side by side within the median oviduct (Fig. 2B). Active, fully formed 1st instars were apparently still contained within the egg chorion inside the oviduct, but neonate larvae were observed moving without restriction, as they would within a chorion, when they exited the ovipositor of freshly killed females (Fig. 3). First instars averaged 0.88 ± 0.22 mm long and 0.19 ± 0.01 mm wide.

No weevil larvae exposed to adult flies 2-6 d after mating were parasitized, whereas more than half of the weevil larvae exposed to adult flies 8 d post-mating were parasitized (Table 2). Adult female flies lived significantly longer than males ($t = 1.71$; $df = 24$; $P = 0.025$), averaging 16.4 ± 3.1 d compared to 9.0 ± 1.8 d for males (Table 1).

Susceptibility of Host Instars to Parasitism

Parasitism was observed only in 3rd to 6th instar weevils, never in 1st and 2nd instars. Levels of parasitism were significantly different ($F_{5,126} = 5.8$, $P < 0.0001$) between the different host instars and ranged from 40.9% in 3rd instars to 4.3% in 6th instars (Fig. 4). Female flies hovered around the pieces of bromeliad stem containing weevil larvae until landing on the plant material. It is yet uncertain whether the females deposited one or more neonate larvae or eggs with a fully developed embryo on the host plant material. Observations during the dissection of gravid, recently killed females indicate that the first instars may hatch from the egg while still in the mother's ab-

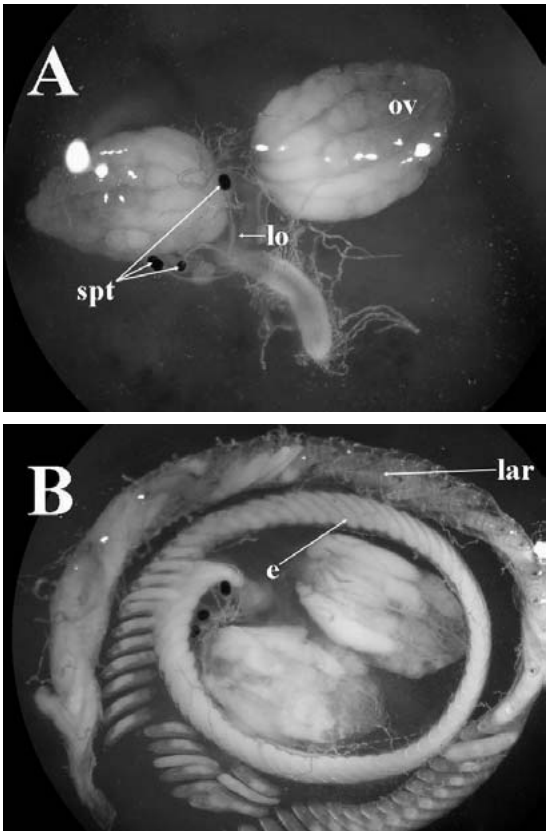


Fig. 2. Reproductive system of an unmated female *Lixadmontia franki* immediately after emergence (A) and of a mated female fly 8 d after mating (B). Ovaries and ovarioles (ov); spermatheca (spt); lateral oviduct (lo); pharate 1st instar (lar); eggs (e).

domen. Whichever the case, these were placed close to the entrance point where the weevil larva burrowed into the plant stem.

Discussion

In its natural habitat, *M. quadrilineatus*, the native host of *L. franki*, feeds on fallen bromeliads found on the forest floor of tropical montane cloud forests (Alvarez del Hierro & Cave 1999). These plants are normally found in large groups on their side, a condition that prevents water accumulation among the bases of the leaves, which apparently favors feeding and development of weevil larvae. Weevil larvae burrow and feed inside the stems of these plants, providing a seemingly difficult environment for *L. franki* to find and parasitize its host. However, *L. franki* has adapted to these conditions by either laying eggs containing pharate larvae that hatch from the egg immediately after deposition or by possibly larvipositing neonate 1st instars; in either case, the young larvae immediately burrow through the macerated plant tissue and weevil frass to locate and contact a host. This is an adaptation in tachinid flies to parasitize hosts within well-protected and concealed areas and to minimize search and handling time (Stireman et al. 2006). The ability of first instars to survive before finding a host is impressive. Neonate larvae left in distilled water overnight at room temperature (~22°C) successfully penetrated the host when placed on the larvae of *M. callizona* (AS, personal observation). This suggests that, given the right conditions, a first instar *L. franki* can survive for a long period before finding a host.

Duration of the pupal stage at 15°C was almost twice that at 20°C, but the mortality was lower. This may be a reflection of the environmental conditions within the fly's native cloud forest habitat and is an important factor to consider when developing mass-rearing methods of *L. franki*.

Female *L. franki* emerge from the puparium without eggs in their oviduct. Egg maturation and embryonic development require about 8 d to complete. The presence of pharate larvae within the egg chorion inside the oviduct and the apparent exit of free-moving larvae from the female's abdomen indicate that *L. franki* larvae may hatch from the egg just before exiting the female's reproductive system. This is similar to the ovoviviparous reproduction observed in *Lydella jalisco* Woodley, which parasitizes stem borers (Lauzière et al. 2001). *Lixadmontia franki* has a low fecundity level compared to that reported for ovolarviparous tachinid species (Stireman et al. 2006). Species with indirect oviposition strategies generally

Table 2. Fecundity of and parasitism by *L. franki* at 4 adult ages.

Days post-mating	*n*	Eggs w/ developing embryos (Mean ± SE)	Pharate 1st instars (Mean ± SE)	Total	Parasitism (%)
2	4	20.0 ± 3.5 a	0	22.5	0 a
4	3	81.6 ± 8.5 b	0	81.7	0 a
6	4	103.5 ± 17.9 b	0	103.5	0 a
8	6	84.3 ± 11.6 b	53.8 ± 9.9	138.1	57 b

Values in the same column with the same letter are not significantly different (Duncan's mean separation test; $P > 0.05$).

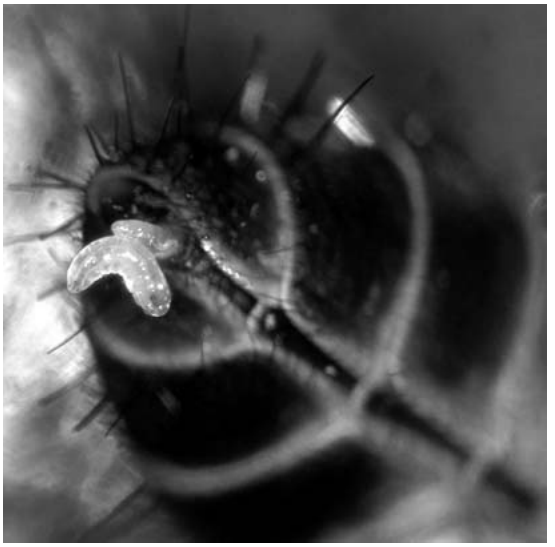


Fig. 3. First instar *Lixadmontia franki* exiting the adult female ovipositor.

have a low probability of successful parasitism and low survival of their offspring, and, therefore, high fecundity as opposed to those that oviposit directly on the host (Stireman et al. 2006). Larviparity in *L. franki* needs to be substantiated by closer examination of the median oviduct to find free roaming 1st instars and empty chorions.

The difference observed between male and female longevity in *L. franki* concurs with evidence in other tachinid species of short male longevity compared to female counterparts (Cardoza et al. 1997).

Control of *M. callizona* has been largely limited to commercial ornamental bromeliad operations by chemicals (Short 1992). However, chemical control in southern Florida's protected areas where weevils have large populations is not an option because of the difficulties of applying chemicals to plants found high in the trees, environmental contamination, and the negative effects on non-target organisms. *Lixadmontia franki* parasitizes only bromeliad-eating weevils in the genus *Metamasius.* The potential of *L. franki* in a biological control program of *M. callizona* largely depends on the fly's adaptability to the climatological conditions of southern Florida ecosystems and the establishment of self-sustaining populations in these habitats. Although *L. franki* originates from cool, shady, moist montane tropical forests and its reproduction in the laboratory is best at around 20°C, we have observed flies survive temperatures of upwards to 28°C when adequate moisture is available. We expect the adult flies will be able to escape from Florida's high summer temperatures by seeking the cooler refuges within water-laden tank bromeliads under shady tree canopies.

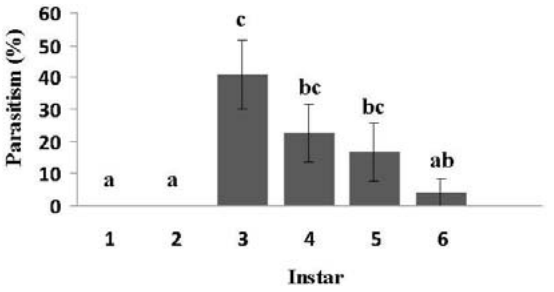


Fig. 4. Parasitism by *Lixadmontia franki* in 6 instars of *Metamasius quadrilineatus*. Vertical lines indicated 1 SE above the mean. Values of bars with the same letter are not significantly different (Duncan's means separation test, $P > 0.05$).

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References Cited

Alvarez del Hierro, D. R. 1997. Biología Reproductiva y Método de Crianza en el Laboratorio de *Admontia* sp. (Diptera: Tachinidae), Parasitoide de *Metamasius quadrilineatus* Champion (Coleoptera: Curculionidae). Ing. Agr. thesis, Esc. Agr. Panamericana, Zamorano, Honduras.

Alvarez del Hierro, D. R., and R. D. Cave. 1999. Ecología de *Metamasius quadrilineatus* (Coleoptera: Curculionidae) y *Admontia* (Diptera: Tachinidae) en tres bosques montanos de Honduras. Ceiba 40: 43-49.

Cardoza, Y. J., N. Epsky, and R. R. Heath. 1997. Biology and development of *Lespesia aletiae* (Diptera: Tachinidae) in two lepidopteran species in the laboratory. Florida Entomol. 80: 289-300.

Cave, R. D. 1997. *Admontia* sp., a potential biological control agent of *Metamasius callizona* in Florida. J. Bromeliad Soc. 47: 244-249.

Frank, J. H. 2000. Florida's native bromeliads imperiled by exotic evil weevil. The Palmetto 19: 6-9, 12.

Frank, J. H., and M. C. Thomas. 1991. *Metamasius callizona* kills bromeliads in southeastern Florida. J. Bromeliad Soc. 41: 107-108.

Frank, J. H., and M. C. Thomas. 1994. *Metamasius callizona* (Chevrolat) (Coleoptera: Curculionidae), an immigrant pest, destroys bromeliads in Florida. Canadian Entomol. 126: 673-682.

Frank, J. H., and R. D. Cave. 2005. *Metamasius callizona* is destroying Florida's native bromeliads, pp.

91-101 *In* M. Hoddle [ed.], Second International Symposium on Biological Control of Arthropods, Davos, Switzerland. Sep 12-16, 2005.

LAUZIÈRE, I., J. C. LEGASPI, B. C. LEGASPI, J. W. SMITH, AND W. A. JONES. 2001. Life-history studies of *Lydella jalisco* (Diptera: Tachinidae), a parasitoid of *Eoreuma loftini* (Lepidoptera: Pyralidae). BioControl 46: 71-90.

SAS INSTITUTE. 1996. SAS/STAT guide for personal computers, version 6 edition. SAS Institute, Cary, NC.

SHORT, D. E. 1992. Chemical control of *Metamasius callizona* in bromeliads. J. Bromeliad Soc. 42: 128.

STIREMAN, III, J. O., J. E. O'HARA, AND D. M. WOOD. 2006. Tachinidae: Evolution, behavior and ecology. Annu. Rev. Entomol. 51: 525-555.

SUAZO, A., N. ARISMENDI, J. H. FRANK, AND R. D. CAVE. 2006. Method for continuously rearing *Lixadmontia franki* (Diptera: Tachinidae), a potential biological control agent of *Metamasius callizona* (Coleoptera: Dryophthoridae). Florida Entomol. 89: 348-353.

WOOD, D. M., AND R. D. CAVE. 2006. Description of a new genus and species of weevil parasitoid from Honduras (Diptera: Tachinidae). Florida Entomol. 89: 239-244.

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Review

Classical biological control for the protection of natural ecosystems ☆

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ABSTRACT

Of the 70 cases of classical biological control for the protection of nature found in our review, there were fewer projects against insect targets (21) than against invasive plants (49), in part, because many insect biological control projects were carried out against agricultural pests, while nearly all projects against plants targeted invasive plants in natural ecosystems. Of 21 insect projects, 81% (17) provided benefits to protection of biodiversity, while 48% (10) protected products harvested from natural systems, and 5% (1) preserved ecosystem services, with many projects contributing to more than one goal. In contrast, of the 49 projects against invasive plants, 98% (48) provided benefits to protection of biodiversity, while 47% (23) protected products, and 25% (12) preserved ecosystem services, again with many projects contributing to several goals. We classified projects into complete control (pest generally no longer important), partial control (control in some areas but not others), and "in progress," for projects in development for which outcomes do not yet exist. For insects, of the 21 projects discussed, 62% (13) achieved complete control of the target pest, 19% (4) provided partial control, and 43% (9) are still in progress. By comparison, of the 49 invasive plant projects considered, 27% (13) achieved complete control, while 33% (16) provided partial control, and 49% (24) are still in progress. For both categories of pests, some projects' success ratings were scored twice when results varied by region. We found approximately twice as many projects directed against invasive plants than insects and that protection of biodiversity was the most frequent benefit of both insect and plant projects. Ecosystem service protection was provided in the fewest cases by either insect or plant biological control agents, but was more likely to be provided by projects directed against invasive plants, likely because of the strong effects plants exert on landscapes. Rates of complete success appeared to be higher for insect than plant targets (62% vs 27%), perhaps because most often herbivores gradually weaken, rather than outright kill, their hosts, which is not the case for natural enemies directed against pest insects. For both insect and plant biological control, nearly half of all projects reviewed were listed as currently in progress, suggesting that the use of biological control for the protection of wildlands is currently very active.

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1. Introduction

Natural ecosystems and their component species are experiencing catastrophic and rapid loss as habitat is destroyed for human use and invaded by species from other biogeographical areas (Simberloff et al., 1997; Cox, 1999; Lockwood et al., 2006). Political solutions may be devised to stop habitat loss, and restraints and economic incentives used to reduce human exploitation of natural habitats. However, damage from invasive species cannot easily be reversed. While better legislation and detection tools will be paramount in preventing new invasions, invaders – once established – often persist indefinitely and spread to their ecological limits. Reducing damage in small areas with chemical or physical/mechanical control is possible for some species if funds and staff are available. But at the landscape level, these tools work only if the infested area is small or sufficiently isolated to prevent quick re-infestation. However, on continents, most invasive plants and insects cannot easily be eradicated. For landscape-level suppression or prevention of emerging damage from an expanding invasion, classical biological control should be considered because if successful it brings about desired ecological change over large areas without repeated cost or treatment of the entire infested area (Van Driesche et al., 2008). Other management practices that can be effective at landscape scales against invasive plants (but rarely, insects) include changes in land use, grazing, or fire management, and manipulation of nutrients or hydrology. For successful control of invasive plants, it may be necessary to integrate one or more of these approaches with biological control.

Biological control efforts against plants and insects have different histories, with insect biological control being used for much of its first century largely against crop pests. Only in the1990s did insect biological control against environmental pests develop as an independent goal (Van Driesche, 1994). In contrast, biological control efforts were rarely focused on invasive plants infesting crops. Rather, invasive plants in forests, grasslands, and aquatic areas were targeted to preserve timber, forage, water, and navigation (Huffaker, 1957). Over time, protection of native biodiversity and ecosystem function also became major goals of biological control of invasive plants (Van Driesche and Bellows, 1996).

Biological control projects have successfully contributed to the protection of the flora and fauna of many natural ecosystems, and are presently a component in many recovery plans (e.g., Causton, 2001 for Galápagos plants) and restoration efforts worldwide. Benefits of biological control in natural areas also include the preservation of wildlands as sources of renewable resources and recreational use. Finally, biological control programs have proven effective in the protection of some ecosystem services such as flood control, fire regulation, and maintenance of healthy soils.

Damage to natural ecosystems from biological control agents is also a potential outcome. For example, in North America the tachinid *Compsilura concinnata*, introduced for the control of the gypsy moth (*Lymantria dispar*) may be responsible for regional declines of several saturniids and other moths in the northeastern USA (Boettner et al., 2000; Schweitzer et al., 2010). The non-target effects of biocontrol agents on native insects on islands, and especially Hawaii, have received considerable attention (Howarth, 1991; Henneman and Memmott, 2001). Risks posed by biological control introductions have been the focus of several reviews, and we refer readers to these: Howarth (1991), Simberloff and Stiling (1996), Lynch and Thomas (2000), Pemberton (2000), Louda et al. (2003), and van Lenteren et al. (2006), among others. We do not review non-target impacts and important cases of such effects exist, particularly for projects directed against agricultural or pasture pests, which are outside the scope of this article. Limited mention is made here of such important impacts if they pertain to the species covered in this article.

Here we focus on the benefits of classical biological control as a tool for ecosystem preservation and restoration, especially given the fact that more biological control projects will needed in the future to correct damage from the increasing number of invasive plants and insects that are establishing in new communities worldwide. Over the course of coming decades, we foresee an expanding

need for carefully planned and professionally monitored biological control programs in wildlands that will require the joint efforts of biological control practitioners, invasion biologists, ecologists, taxonomists, policy makers, and conservation specialists.

2. Protecting biodiversity in natural ecosystems

Loss of native biodiversity is the most enduring consequence of alien species invasions; here we discuss the contribution of classical biological control to reversing such losses, in a variety of natural habitats (wetlands, forests, grasslands, deserts/shrublands, coastal/sand dune, and island communities). Effects of invasive species commonly cascade from the attacked species, upward or downward, affecting other members of the food web such as specialized herbivores, or their parasitoids and predators. The benefits of successful biological control also ramify through ecosystems, and where known these are also discussed.

2.1. Aquatic and wetland habitats

Invasive aquatic plants can cause radical changes in even pristine aquatic systems, either by physically altering the habitat or by strong plant–plant competition between the invader and native plants for resources. No examples were found of biological control of invasive insects in aquatic systems. Consequently, here we discuss only invasive plants, of which many species have been subject to biological control. These invasive plants are grouped as (1) floating/emergent species that can cover the surface of water bodies, (2) submerged plants that take resources from native macrophytes, and (3) other species that grow in wetlands but are not themselves aquatic species.

2.1.1. Floating or emergent species

Floating plants strongly affect the physical character of the habitats they invade (Toft et al., 2003), and therefore their effects on biodiversity have much in common across several invasive species. Layers of invasive plants cover the water surface, sequester nutrients, and block sunlight from reaching submersed native macrophytes. Light-deprived submerged plants photosynthesize at lower rates and thus produce less oxygen, which when combined with lower rates of physical aeration by wind and waves (due to damping by floating plant mats) leads to less dissolved oxygen (Ultsch, 1973), more CO_2 and H_2S, and lower pH (Mitchell, 1978; Thomas and Room, 1986a). These changes make the habitat less suitable for native invertebrates (Hansen et al., 1971) and fish. Death of native plants eliminates the foundation for the native food web, with cascading effects on herbivores and predators. Five floating invasive plants of major importance have been targets of successful biological control: *Azolla filiculoides* (Hill and McConnachie, 2009), *Eichhornia crassipes* (Coetzee et al., 2009), *Salvinia molesta* (Julien et al., 2009), *Pistia stratiotes* (Neuenschwander et al., 2009), and *Alternanthera philoxeriodes* (Buckingham, 2002).

Azolla filiculoides (red fern) infested much of South Africa by the 1990s (Hill, 1999), forming mats that affected biodiversity (Gratwicke and Marshall, 2001). It caused the near extinction of the rare fish *Sandelia bainsii* by altering its last remaining habitat (Cambray, Albany Museum, personal communication). The North American weevil *Stenopelmus rufinasus* was released in 1997. It established and dispersed widely, and very rapidly provided complete control of the weed wherever it occurred (McConnachie et al., 2004), allowing recovery of affected water bodies (Hill and McConnachie, 2009).

Eichhornia crassipes (waterhyacinth) infestations have altered the ecology of water bodies in the southern USA, Mexico, East and West Africa, India, and other warm regions. Weed mats reduce light reaching submerged plants and deplete oxygen, depressing phytoplankton (McVea and Boyd, 1975) and microinvertebrates (Hansen et al., 1971). Benthic invertebrates beneath *E. crassipes* mats were less diverse than under open water in the New Year's Dam reservoir in South Africa (Midgley et al., 2006). Similarly, *E. crassipes* mats lowered diversity of littoral macroinvertebrates on Lake Victoria (Masifwa et al., 2001). Varying levels of biological control of waterhyacinth have been achieved with two species of *Neochetina* weevils on the Nile River in the Sudan (Beshir and Bennett, 1985), the southern USA (Center et al., 2002), South Africa, West Africa, Malawi, Lake Victoria, and Papua New Guinea (Coetzee et al., 2009). In Lake Victoria, biological control reduced waterhyacinth to about 5–10% of its peak levels (Wilson et al., 2007; Anonymous, 2000; Julien, personal communication). In Benin, following successful biological control of *E. crassipes*, fish populations (*Citarhinus* spp.) rebounded (Ajuonu et al., 2003; Neuenschwander, personal communication).

Salvinia molesta (giant salvinia), a South American floating fern, formed thick mats on lakes and river oxbows in Australia, Papua New Guinea, parts of the USA, and parts of Africa, especially the Congo basin. Its biological control has been successful in Australia (Room et al., 1981), Papua New Guinea (Thomas and Room, 1986a), the Congo (Mbati and Neuenschwander, 2005; Diop and Hill, 2009), and 14 other countries, through releases of the weevil *Cyrtobagous salviniae* (Julien et al., 2009).

Invasions of water lettuce (*P. stratiotes*) led to similar floating plant mats on lakes in Australia, the southern USA, and Congo. Water lettuce has been controlled in Papua New Guinea and Australia (Harley et al., 1990), several regions in Africa (Mbati and Neuenschwander, 2005; Ajuonu and Neuenschwander, 2003; Neuenschwander et al., 2009), and warm parts of North America (Dray and Center, 1992), most often with the weevil *Neohydronomus affinis*. Infested lakes, once matted over by water lettuce, are now open (e.g., Mbati and Neuenschwander, 2005). Elimination of water lettuce and giant salvinia mats reversed the physical and chemical habitat changes discussed above that are commonly produced by floating invasive plants.

Alternanthera philoxeriodes (alligator weed) is an emergent species that roots on shore or in shallow water and then produces recumbent stems that develop into floating mats. These mats restrict light and oxygen and lead to anaerobic conditions, which in turn affect native flora and fauna. Infestations also increase siltation and reduce flow (Coulson, 1977; Julien, 1995). In the southern USA, Australia, New Zealand, and China, the introduced flea beetle *Agasicles hygrophila*, either alone or with the crambid moth *Arcola malloi*, effectively destroyed floating alligator weed mats and prevented their regrowth (Coulson, 1977; Julien, 1981; Julien and Griffiths, 1998; Sainty et al., 1998). The weed is now restricted to banks and shallow margins, so impacts on aquatic biodiversity have largely been eliminated.

2.1.2. Submersed species

The principal submersed invasive species against which biological control has been attempted is *Hydrilla verticillata* (hydrilla). It is a disturbance specialist that rapidly colonizes areas and forms surface canopies that block out the light. It has a broad tolerance range and thrives in many habitats. It matures quickly and propagates and disperses by fragmentation. Hydrilla beds displace native plants and degrade infested habitats (Holm et al., 1997). Four natural enemies of hydrilla have been released in the USA (Balciunas et al., 2002). In Lake Seminole, Florida, damage to hydrilla by an introduced dipteran leafminer, *Hydrellia pakistanae*, was associated with an increase in the number of native plant species (Grodowitz et al., 2003) and a general decline in hydrilla competitiveness with other plants (Grodowitz, personal communication). However, hydrilla continues to be a serious problem in many areas and the introduction of additional agents will be needed, perhaps together with

reintroduction of propagules of native plants, to restore invaded communities.

2.1.3. Other invaders damaging to wetlands

Wetland communities have also been invaded by such non-aquatic plants as the tree *Melaleuca quinquenervia*, the climbing fern *Lygodium microphyllum*, the shrub *Mimosa pigra*, and the herbaceous perennials *Lythrum salicaria* and *Fallopia japonica*. Through a mixture of habitat change and competition, these plants strongly affect native biodiversity. Biological control of all five species is underway, or already achieved.

Melaleuca quinquenervia aggressively invades wetlands in Florida and the Caribbean, forming monospecific stands that displace native vegetation and degrade wildlife habitat (Rayamajhi et al., 2002). Melaleuca reduced biodiversity of freshwater marshes in south Florida by 60–80% (Austin, 1978). Introduced biological control agents (especially the weevil *Oxyops vitiosa* and the psyllid *Boreioglycaspis melaleucae*) have curtailed the tree's reproduction, greatly reducing its spread (Pratt et al., 2005; Tipping et al., 2008; Rayamajhi et al., 2008). Biological control agents have reduced seed production and seedling survival (Center et al., 2007; Rayamajhi et al., 2007; Tipping et al., 2009), killing 85% of seedlings, saplings, and suppressed understory trees. This has led to a corresponding decrease in melaleuca cover and a fourfold increase in plant biodiversity (Rayamajhi et al., 2009). Combined with cutting and chemical control, biological control is helping to suppress melaleuca in Florida (see Plate 1).

Old World climbing fern, *L. microphyllum*, also threatens the Everglades and other south Florida habitats, where it dominates Everglade hammocks, cypress swamps, and pine flatwoods (Pemberton and Ferriter, 1998). Two-thirds of southern Florida is susceptible to invasion by this weed (Volin et al., 2004). The pyralid moth *Neomusotima conspurcatalis* and the gall mite *Floracarus perrepae* have been introduced and become established (Boughton and Pemberton, 2009; Boughton and Pemberton, unpublished data). The moth has spread rapidly, defoliating the fern around release sites (Boughton and Pemberton, 2009), and some defoliated areas have already been repopulated by native plants (Boughton and Pemberton, 2009).

Mimosa pigra is an aggressive invader of tropical wetlands in Australia, Asia, and Africa. In Australia, it occurs particularly in wetland margins, lakes, and channels with a long period of inundation and disturbance by feral animals. It also spreads into open plains and swamps (Cook et al., 1996). It currently occupies 800 km^2 of northern Australian wetlands and threatens 40,000 km^2. Invasion converts several vegetation structural types into homogeneous mimosa shrublands with greatly reduced biodiversity (Braithwaite et al., 1989). Infestations threaten many vulnerable plant and animal species (Walden et al., 2004), as further discussed under "Ecosystem Services/Provision of habitat for vertebrate wildlife." Both of two fungal species and nine of 13 insect agents released in Australia have established. Although it has been difficult to separate their impacts, both the sesiid borer *Carmenta mimosa* and the leafmining gracillariid *Neurostrota gunniella* have reduced seed rain and seedling regeneration, lowered seed banks, and caused the retreat of mimosa at stand edges (Heard and Paynter, 2009). Seed banks are 90% below pre-biological control levels. The impacts of the more recently released agents have not been measured, but appear substantial.

Lythrum salicaria (purple loosestrife) is a Eurasian perennial that has extensively invaded wetlands across the northern USA and adjacent areas in Canada. Loosestrife monocultures damage populations of specialist wetland plants, birds, amphibians, and insects (Blossey et al., 2001b; Brown et al., 2006; Maerz et al., 2005a; Schooler et al., 2009). In Oregon, purple loosestrife infestations have lowered plant and insect diversity in tufted hairgrass (*Deschampsia cespitosa*) communities (Schooler et al., 2006) and affected insect diversity in estuarine habitats important for juvenile salmon migration (Schooler et al., 2009). Four biological control agents – the leaf-feeding beetles *Galerucella calmariensis* and *Galerucella pusilla*, the root-mining weevil *Hylobius transversovittatus*, and the flower-feeding weevil *Nanophyes marmoratus* – were widely released (Blossey et al., 2001b). Stand defoliation occurred within 4 years at some release sites and later occurred more widely (Blossey et al., 2001b). Although impacts varied among sites (Denoth and Myers, 2005; Grevstad, 2006; Landis et al., 2003), these herbivores suppressed *L. salicaria* in many habitats. Assessments in Michigan found that *G. calmariensis* established, spread, and reduced plant height by 61–95% (Landis et al., 2003). Purple loosestrife abundance is best suppressed where both leaf beetles and the root weevil are present (Blossey, unpublished data). In many areas where loosestrife has been suppressed, native species have returned (Landis et al., 2003). However in others, invasive hybrid cattails (*Typha* × *glauca*), *Phragmites australis* (Type M), or reed canary grass (*Phalaris arundinaceae*) (Schooler, 1998) have expanded.

Fallopia japonica (Japanese knotweed) invades riparian areas in Europe and the northern USA, damaging native flora and associated fauna, especially amphibians (Maerz et al., 2005b; Gerber et al., 2008). The Japanese psyllid *Aphalara itadori* is host-specific (Shaw et al., 2009) and its release for biological control of Japanese knotweed is anticipated in the UK in 2010, which will be the first classical weed biological control introduction in Europe.

2.2. Boreal and temperate forests

Natural forest ecosystems have been strongly affected by both invasive insects that kill native trees and invasive plants that compete with native plants.

2.2.1. Invasive insects

Biological control projects against invasive forest insects were initiated in North America to protect threatened lumber sources. Classical biological control of forest pests was rare in Europe due to a lack of important invaders and rare in the Southern Hemisphere because forestry, and hence associated biological control, was largely based in plantations of exotic trees. North American projects to protect lumber supplies also protected forest biodiversity, which had been eroded by invasions of tree-killing insects and pathogens (Campbell and Schlarbaum, 1994, 2002). However, few efforts were made during this period to document impacts of invasive species on forest biodiversity or improvements following biological control of the invasive pests, except for effects on the attacked tree species.

2.2.1.1. Tree-killing borers. Beginning in the 1980s, increased shipment of containerized goods from Asia to the USA facilitated the establishment of several wood boring beetles that were transported as larvae or pupae in wooden crates and pallets. The most damaging species was the ash-feeding buprestid *Agrilus planipennis* (emerald ash borer), discovered in Michigan in 2002. Ecological damage from this invasion includes >80% mortality of several species of ash at many locations, including rare species such as pumpkin ash (*Fraxinus profunda*) (Bauher, personal communication). Ash is a dominant or co-dominant in many forest communities, particularly in mesic woodlands and riparian areas (MacFarlane and Meyer, 2005), and many of these habitats have been severely affected. Six ash species were attacked in the central USA by 2009, while several others in western North America are threatened. Twenty-one species of moths are monophagous on *Fraxinus* (Wagner, 2007), of which five sphingids – *Ceratomia undulosa*, *Manduca jasminearum*, *Sphinx canadensis*,*Sphinx chersis*, *Sphinx franckii* – are particularly vulnerable to extinction due to tree death from emerald ash borer. Three parasitoids (*Oobius agrili*, *Tetrastichus plani-*

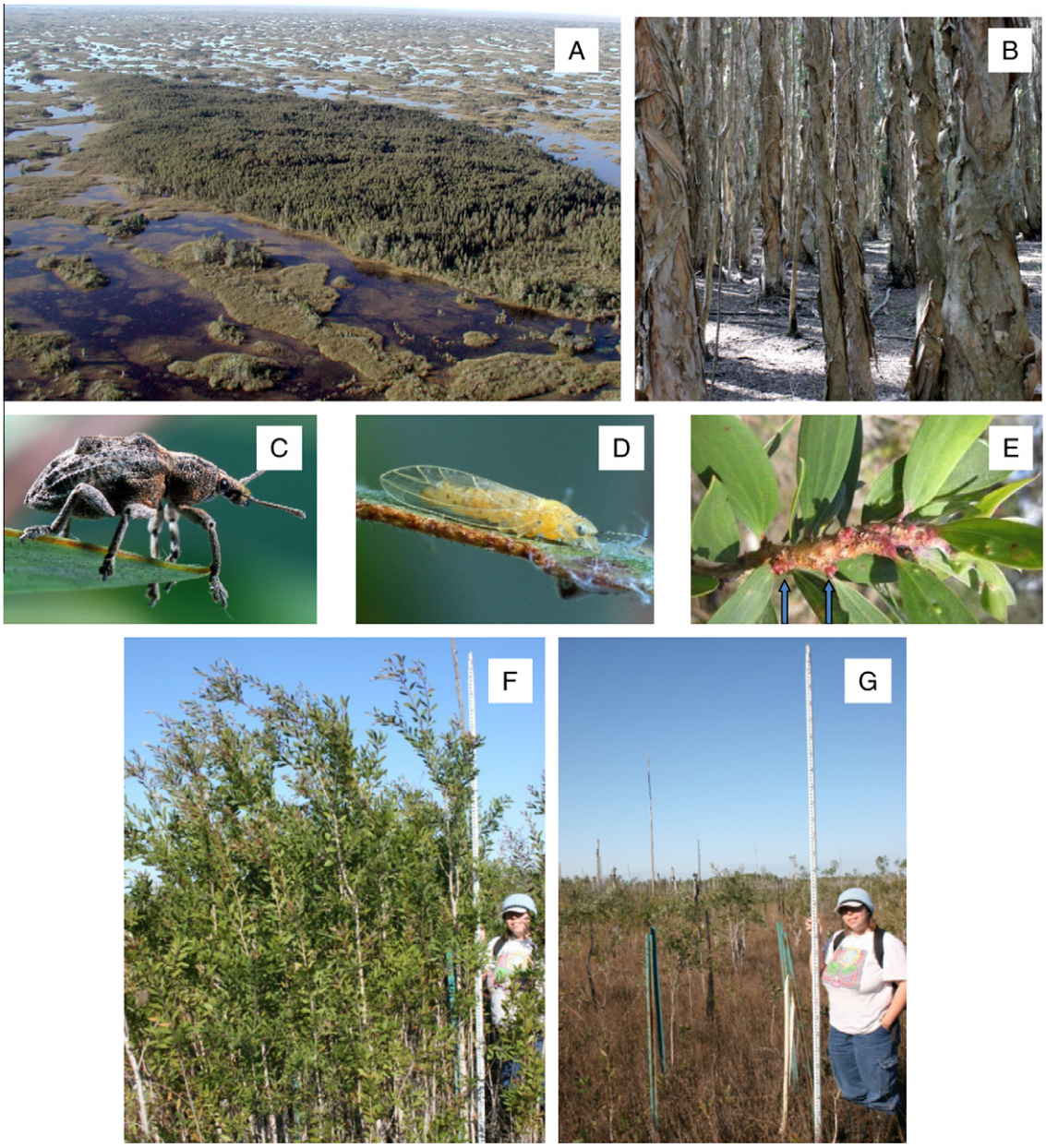


Plate 1. The Australian tree *Melaleuca quinquenervia* invades wetlands of the Florida Everglades (A), where trees displace native species. Melaleuca monocultures lack native understory plants (B). Three species have been introduced to help suppress melaleuca: the weevil *Oxyops vitiosa* (C), the psyllid *Boreioglycaspis melaleucae* (D), and the stem galling midge *Lophodiplosis trifida* (E). Herbivory from these insects has greatly reduced flowering, seedling recruitment, and growth, as demonstrated by an insecticide exclusion trial in Florida after the establishment of these insects. Trees treated with insecticides to exclude these agents (F) grew rapidly from 2003 to 2008, but untreated trees exposed to the effects of herbivory were markedly stunted (G). Photo credits: Fraçoise Laroche, South Florida Water Management District (A); Paul Pratt, USDA/ARS (B and E); and Steve Asmus, USDA/ARS (C and D); Phil Tipping, USDA/ARS (F and G).

pennisi, and *Spathius agrili*) from China that attack this borer were collected, screened for host-specificity, released, and recovered (Bauer et al., 2007; Duan et al., unpublished data) and their impact is presently being evaluated.

A second invasive tree-killing invasive beetle, the great spruce bark beetle (*Dendroctonus micans*), is a Siberian species that has spread west to the UK and south to Turkey since the 19th century. As the beetle expanded its range, it apparently outpaced the spread of its specialized natural enemies, leading to serious outbreaks in Western Europe and the Caucasus region, causing widespread mortality of spruce (*Picea* spp.) (Grégoire, 1988). In Western Europe damage occurred most often in plantations, but in Georgia and northeastern Turkey the beetle seriously affected natural stands of oriental spruce (*Picea orientalis*), a tree of high regional ecological significance that stabilizes steep slopes (Kobachidze, 1967; Grégoire, 1988). A host-specific predatory beetle, *Rhizophagus grandis*, associated with low, stable populations of *D. micans* in Siberia was released in Georgia, Turkey, and Western Europe, and significantly lowered spruce beetle populations and tree mortality in most locations (Fielding and Evans, 1997).

2.2.1.2. Sucking insects. High densities of invasive Hemiptera can devitalize and even kill their hosts. In temperate forests, an invasive adelgid and a cypress aphid have had such effects. Hemlock woolly adelgid (*Adelges tsugae*) spread in the USA from its point of invasion in 1951 in Virginia south to Georgia and north to Maine. South of Massachusetts, it caused high levels of mortality of eastern hemlock (*Tsuga canadensis*) and Carolina hemlock (*Tsuga caro-*

liniana) and affected hemlock-dependent organisms in the Appalachian Mts. (Evans, 2002), where eastern hemlock is the only species whose canopy produces dense shade. In the Delaware River Basin, hemlock deaths affected stream insects (Snyder et al., 2002), brook trout (Ross et al., 2003), and various understory plants (Eschtruth et al., 2006), with species requiring cooler temperatures being replaced by ones adapted to warmer habitats. Because native predators were unable to prevent adelgid outbreaks (Montgomery and Lyon, 1996), predators were sought in the adelgid's native range, including coccinellids from China and Japan, and *Laricobius* (Derodontidae) beetles from western North America, China, and Japan. The coccinellids *Sasajiscymnus tsugae*, *Scymnus ningshanensis*, and *Scymnus sinuanodulus* and the derodontid *Laricobius nigrinus* have been introduced to the eastern USA (Cheah and McClure, 1998; McClure et al., 2000; Lu and Montgomery, 2001; Montgomery et al., 2002; Zilahi-Balogh et al., 2002, 2003). *Laricobius nigrinus* established well at 13 of 22 release sites (Mausel, unpublished data) and spread in the Appalachian Mts. Biological control investigations continue on this invasive insect.

In Africa, the invasive cypress aphid (*Cinara cupressivora*) spread rapidly from Malawi in 1986 into neighboring countries and attacked native Cupressaceae trees, causing dieback (Watson et al., 1999; Day, R., et al., 2003). Heavy infestations killed mature trees and, in Malawi, threatened the endemic, endangered Mulanje cedar, *Widdringtonia whytei*, on the Mt. Mulanje massif (Baylis et al., 2007). In Kenya, it attacked *Juniperus procera*, an important native tree in many watersheds. By 2003, the aphid invaded Colombia, Brazil, Bolivia, and Chile, attacking various Cupressaceae, including the Cordilleran cypress *Austrocedrus chilensis* (Baldini et al., 2007). Release of the braconid *Pauesia juniperorum* in Africa began in 1994 and its establishment was confirmed in Malawi and Kenya by 1996 (Day, R., et al., 2003). Aphid densities declined in the mid 1990s in Africa, and this decline was associated at least in part with this parasitoid (Kairo, personal communication).

2.2.1.3. Defoliating sawflies and moths. From the last decades of the 19th century to the early 20th century, a series of European sawflies and moths invaded North American forests. The invasive sawflies especially affected pine and spruce. White pine (*Pinus strobus*), abundant in many northeastern forests, was commonly defoliated after 1910 by *Diprion similis*. Spruce (*Picea* spp.) forests in eastern Canada and Maine were extensively defoliated in the 1930s by *Gilpinia hercyniae* (Van Driesche et al., 1996). Biological control programs suppressed both species, *D. similis* being controlled by introduced parasitoids (especially *Monodontomerus dentipes*) (McGugan and Coppel, 1962) and *G. hercyniae* by a highly specific nucleopolyhedrovirus probably introduced accidentally along with European parasitoids (Magasi and Syme, 1984).

During this same period, several invasive European moths invaded North American forests, affecting especially larch and oak. Larch forests were defoliated by the coleophorid *Coleophora laricella*, which first infested eastern larch (*Larix laricina*) (1886–1950s) and later western larch (*Larix occidentalis*) (1957–1980s). Better records of impact exist for the western infestation. There, defoliation was principally of new growth (Ryan, 1990). Repeated, intense infestations reduced terminal and radial growth, and caused some tree mortality. Biodiversity impacts on species other than larch were not studied. Two introduced parasitoids, the braconid *Agathis pumila* and the eulophid *Chrysocharis laricinellae*, controlled the pest in both eastern (Webb and Quednau, 1971) and western North America (Ryan, 1990), and subsequent outbreaks have been small, brief, and infrequent. In Oregon, larval densities declined >98% following biological control introductions (Ryan, 1990).

Also in this era, oaks (*Quercus* spp.) were affected by the geometrid *Operophtera brumata* (winter moth) and the lymantriid *L. dispar* (gypsy moth). Winter moth was first reported in 1949 in Nova Scotia, but later invaded British Columbia and then Massachusetts. Winter moth outbreaks defoliated oaks repeatedly, causing up to 50% mortality. Winter moth's populations were suppressed in both Nova Scotia (Embree, 1971) and British Columbia (Embree and Otvos, 1984) by introduced parasitoids, mainly the tachinid fly *Cyzenis albicans*. In Nova Scotia, outbreaks collapsed within 3 years once *C. albicans* parasitism reached 10% (Embree, 1971). Moth densities dropped from >1000/tree in 1954 to <1/tree in 1963.

In Massachusetts by the late 1800s, the gypsy moth began defoliating oaks and other hardwoods over an ever increasing area (McManus and McIntyre, 1981) – stripping 10.7 million ha of forest in the USA in the outbreak of 1980–1982 and 5.8 million ha in the outbreak of 1989–1991 (USDA Forest Service website). In many areas, oak mortality caused stand composition to shift toward sweet birch, black gum, red maple, and tulip poplar (Muzika and Gottschalk, 1995). Control programs directed against gypsy moth with aerial forest pesticide applications (1950–1980) endangered more than a dozen species of rare eastern butterflies and moths (Schweitzer et al., 2010). Many natural enemies were introduced against gypsy moth starting in 1905 (Doane and McManus, 1981) and continuing to 2000 (Ertle, personal communication). These efforts achieved widespread establishment of one predator and six parasitoids (Van Driesche et al., 1996), and the accidental establishment of one fungus, *Entomophaga maimaiga*. Apart from the periphery of the infested area, no large-scale pesticide applications have been necessary to control gypsy moth since 1989, likely due to fungal epizootics (Webb et al., 1999) and the introduced parasitoids. One introduced generalist parasitoid, the tachinid *C. concinnata*, attacks many native moths and is held to be a threat to native silkmoths (Boettner et al., 2000) and a variety of other native lepidopterans (Schweitzer et al., 2010).

2.2.1.4. Gall makers. Gall insects are generally not considered important as determinants of plant density but an appreciation of the strength of their impacts is developing based on their successful use as biological control agents (Muniappan and McFadyen, 2005) and the damage that some invasive gall makers have caused to native plants (e.g., Gramling, 2005). In temperate forests, the invasive chestnut gall wasp (*Dryocosmus kuriphilus*) damaged native trees in Asia, North America, and Europe. This Chinese species invaded Japan (1940s), Korea (1950s), the USA (1970s), and Italy (Quacchia et al., 2008). In all invaded regions, it caused significant damage to native *Castanea* species, galling shoots, reducing tree vigor, preventing flowering, and killing trees (Kato and Hijii, 1997; Cooper and Rieske, 2007). In Japan and southern Europe, *Castanea* species are an important component of native forests, providing food for wildlife, bee forage, soil improvement, and slope stabilization in mountains (Howes, 1979; Thomas et al., 1992; Quacchia et al., 2008). In the USA, *D. kuriphilus* threatened to retard the recovery program for American chestnut (*Castanea dentata*) in Appalachian and New England forests (where chestnut was previously devastated by the introduced fungus *Cryphonectria parasitica* [Cooper and Rieske, 2007]). The Chinese parasitoid *Torymus sinensis* reduced galling to non-pest levels in Japan (Moriya et al., 2003) and the USA (Cooper and Rieske, 2007). Its release in Italy (Quacchia et al., 2008) is too recent to evaluate.

2.2.2. Invasive plants

Many weeds have invaded temperate forests and their number, area of infestation, and importance are increasing. However, only a few have been targets for biological control. Here we discuss four projects (a vine, an herb, and two trees) that are under way in North America but have not yet controlled their targets. Assessing the value to native biodiversity of such projects is limited by the general lack of pre-release studies on damage to native flora and

fauna from invasive plants (Morin et al., 2009), in part, because such effects develop slowly over long periods of time.

2.2.2.1. Mile-a-minute weed. Persicaria perfoliata, a spiny annual vine of Asian origin, developed extensive monocultures in disturbed open areas in the mid-Atlantic region of the USA after its invasion into Pennsylvania in the1930s (Hough-Goldstein et al., 2008). It inhibited both commercial reforestation and natural forest regeneration and interfered with the recreational use of natural areas. It reduced the quality of wildlife habitat and out-competed native plants, presumably due to its early germination, rapid growth, and ability to climb over other plants (Wu et al., 2002). A host-specific Asian weevil, *Rhinoncomimus latipes*, was released and established at sites throughout the range of mile-a-minute weed (Hough-Goldstein et al., 2009). At release sites, spring densities of the plant declined by 75% within 2–3 years, compared to no change at control sites. Benefits to native biodiversity, as mile-a-minute weed densities continue to decline, are being monitored.

2.2.2.2. Tree of heaven. The Chinese tree *Ailanthus alitissima* has invaded 41 of the contiguous 48 US states, where it often out-competes native pioneer plants due to its ability to survive harsh conditions, sprout from cut stumps, and produce large number of seeds. It also affects vegetation through the release of allelochemicals (Voigt and Mergen, 1962). Significant funding was allocated annually to control the weed in national and state parks, but these efforts had limited effect. A classical biological control program against tree of heaven was initiated in 2004 with the weevil *Eucryptorrhynchus brandti*, which causes mortality of *A. altissima* in China (Ding et al., 2006). Of 28 plant species examined in no-choice feeding tests in quarantine, adult feeding occurred only on corkwood (*Leitneria floridiana*) and choice tests demonstrated a strong preference for *A. altissima* (Kok et al., 2008). Tests assessing development of immature stages and egg maturation by adults are underway.

2.2.2.3. Garlic mustard. Alliaria petiolata is a cool-season, shade-tolerant, obligate biennial herb that invades forests. First detected in New York in 1868 (Nuzzo, 1993), it has since spread across the northern USA (Blossey et al., 2001a). Dense garlic mustard stands can displace native herbaceous plants and may harm insects, ground-nesting birds, reptiles, amphibians, and rodents (Blossey et al., 2001a). It is an oviposition sink for one native butterfly, *Pieris virginiensis* (Porter, 1994), whose larvae are unable to complete development on garlic mustard (Courant et al., 1994) and is a partial egg sink for a second species, *Pieris oleracea*, which shows variation in its ability to develop successfully on the plant (Keeler and Chew, 2008). Garlic mustard also damages the mycorrhizal associations essential to many native plants (Callaway et al., 2008). Surveys of its associated insects in Europe identified four weevils as potential biological control agents (Blossey et al., 2001a). Demographic modeling (Davis et al., 2006) suggested that the root-feeding weevil *Ceutorhynchus scrobicollis* is the most promising species, but that stem-mining or seed-feeding weevils may also be needed. Advanced host-specificity testing is underway for *C. scrobicollis* and preliminary work is in progress for the three other species.

2.2.2.4. Chinese tallow tree. Triadica sebifera is a tree native to China that is invading warm temperate forests and meadows of the southeastern USA (Richard et al., 2004; Pattison and Mack, 2007). Its seeds are readily dispersed by birds and it has the potential to spread throughout most of eastern North America. A biological control program against Chinese tallow tree has been initiated to evaluate the impacts of seed-feeding herbivore insects, with the goal of restricting dispersal. A leaf-rolling weevil, *Heterapoderopsis bicallosicollis*, was found to be host-specific to the plant (Wang et al., 2009) and has been imported from China into quarantine for evaluation.

2.3. Subtropical and tropical forests

2.3.1. Invasive insects

Tropical or subtropical forests have greater biodiversity than temperate area forests and thus more species potentially at risk from invasive insects. However, effects of invasions may go unrecognized because inventories of tropical biotas are more preliminary than those of temperature communities. We discuss nine examples.

2.3.1.1. Bromeliad weevil. Metamasius callizona is native to Mexico and Guatemala. Its larvae mine meristematic tissue of bromeliads and kill plants. Importation of infested bromeliads from Veracruz, Mexico brought this weevil to Florida around 1989 (Frank and Thomas, 1994), where it now severely damages eight of Florida's native epiphytic bromeliads in their natural habitats and is a risk factor for four other rare bromeliads. Most of these are state-listed endangered or threatened taxa, two of which (*Tillandsia fasciculata* and *T. utriculata*) are listed expressly because of the threats posed by this weevil. One bromeliad (*Tillandsia simulata*) is endemic to Florida. Also at risk are at least 14 invertebrates that live in pools of water impounded in leaf axils of these bromeliads and might disappear if their hosts were lost (Frank and Fish, 2008). Biological control of this weevil has been started with the discovery and release of a specialized tachinid (*Lixadmontia franki*) (Frank and Cave, 2005; Cave, 2008). Evaluations of establishment of the fly are in progress.

2.3.1.2. Lobate lac scale in the Florida everglades. Paratachardina pseudolobata, an invasive Asian scale found in Florida and the Bahamas, attacks 95 of 155 native south Florida woody plants and 67 of 107 woody plants from the Bahamas. It caused death in 12 species (Pemberton, unpublished data). Scale infestations on four rare plant species, monitored for 2 years in Florida, remained high and caused progressive branch die back on *Eugenia confusa* and *Pavonia paludicola*, but declined on *Amorpha herbaceae* var. *crenulata* and *Dalea carthagenensis* (Liu and Pemberton, unpublished data). Comparison of naturally infested wild *Psychotria nervosa* with plants from which scales were excluded, showed that scales reduced fruit set (Liu and Pemberton, unpublished data). Surveys for natural enemies in India and Sri Lanka, the scale's presumed native range (Pemberton, 2003), found two Indian parasitoids that oviposited in Floridian lac scales, but eggs were unable to complete development because of encapsulation by the host (Schroer and Pemberton, 2007). Subsequently, molecular analysis of the lac scales in Florida showed the Floridian populations of lac scales are a distinct, undescribed species (Schroer et al., 2008), most likely native to Malaysia (Pemberton, unpublished data). Parasitoid collections from this region are planned.

2.3.1.3. Invasive scales affecting Australian forests. In Australia, several exotic scales attacking crops also damaged forest plants, but this impact was largely overlooked. These invasive coccids weakened native plants and their honeydew benefitted invasive ants, compromising native butterfly/ant mutualisms. Biological control of these coccids for crop protection benefitted native forest species. Examples below are drawn from Waterhouse and Sands (2001) and personal observations (Sands, unpublished data)

White wax scale (*Ceroplastes destructor*) from South Africa invaded Australia before 1893 (Zeck, 1932) and became a pest of fruit crops and ornamentals (Snowball, 1969). It also damaged native plants along roads, in woodlands, rainforests, and other natural ecosystems in temperate and subtropical eastern Australia. Principal hosts along roadsides were *Bursaria spinosa* and *Dodonaea*

triquetra; in woodlands, *Pittosporum undulatum*; and in rainforests, *Auranticarpa rhombifolia*, *Syzigium* spp. (Waterhouse and Sands, 2001), *Hymenosporum flavum*, *Syzigium australe*, and *Acmena smithii*. Heavy infestations produced copious honeydew, which nourished invasive tramp ants and sooty molds. Two relatively host-specific encyrtid parasitoids of white wax scale, *Anicetus communis* and *A. nyasicus*, were collected from South Africa (Snowball, 1969) and provided complete biological control (Sands et al., 1986). Since the 1970s, *C. destructor* has been uncommon in natural plant communities. Infested native plants in the national parks of southeastern Queensland regained vigor and the abundance of honeydew and sooty mold declined. Exotic ants (e.g., *Pheiodole megacephala*) declined in abundance on native plants formerly infested with wax scales. As a consequence, several native ants have reappeared on plants from which they were formerly excluded. This has benefitted some native, ant-tended lycaenids, such as *Hypochrysops miskini* and *Pseudodipsas cephenes*, which require the ant *Anonychomyma gilberti*, a species now more abundant following biological control of white wax scale. Similarly, in some eucalypt woodlands, the indigenous ant *Papyrius nitidus*, which attends larvae and pupae of the lycaenid *Hypochrysops ignitus*, was displaced by exotic ants foraging on the butterfly's scale-infested host plants. However, very few *P. nitidus* have returned to these plants following biological control of white wax scale, and both the butterfly and its attendant ant continue to be scarce.

Pink wax scale, *Ceroplastes rubens*, of African origin (Quin and Gullan, 1998), became a pest of citrus and ornamentals in Australia, but also fed on rainforest plants such as *Ficus* spp., *Syzygium* spp., *Shefflera actinophylla*, *Pittosporum* spp. (Smith et al., 1997), *Waterhousea floribunda*, and *Drypetes deplanchei*. It is most abundant in exposed locations. The introduced encyrtid *Anicetus beneficus* controlled the scale on citrus and on some of its native hosts (e.g., *S. actinophylla*), but not on others (e.g., *Syzygium* spp.). Heavy infestations in natural settings are now rare, except in forest regeneration plantings. Densities on forest plants no longer attract numerous exotic ants, and thus no longer affect indigenous rainforest species in eastern Australia or Norfolk Island (another formerly infested area).

2.3.2. Invasive plants

Invasive plants have been highly damaging in subtropical and tropical forest areas, although as with temperate forest pests, long-term monitoring and careful study of actual damage to native flora have been sporadic. Some examples of invasive plants with developing or completed biological control projects and their benefits follow. Examples occurring on islands (e.g., *Miconia calvescens* in Tahiti) are treated in another section ("Ocean Island Communities").

2.3.2.1. Mist flower in New Zealand. *Ageratina riparia*, native to Central America and Mexico, became a significant weed in northern New Zealand by the 1990s. Damage was greatest in river corridors and disturbed areas in native forests, but the weed also infested wetlands and forest margins (Anonymous, 1999). Mist flower was controlled biologically in Hawaii in the 1980s (Trujillo, 2005), and studies suggested the program could be transferred to New Zealand (Morin et al., 1997). The white smut fungus *Entyloma ageratinae* and the gall fly *Procecidochares alani* were released in New Zealand in 1998 and 2001, respectively, and the fungus in particular established and spread rapidly. Results were monitored from 1998 to 2008 (Barton et al., 2007; Landcare Research, unpublished data). The percentage of live leaves infected with fungus reached 60% within 2 years, maximum plant height declined significantly, and in heavy infestations the mean percentage cover of mist flower declined from 81% to 1.5%. By 2008, the gall fly reached a mean density of 0.6 galls/stem and the fungus remained abundant (averaging 55% leaf infection) despite mist flower cover remaining below 1%. As mist flower declined, the species richness and the mean percentage cover of native plants at forest sites increased, with no increase in other invasive plants, except a weak response by African club moss (*Selaginella kraussiana*). Many plants colonizing plots were native mid- or late-successional shrubs or trees. Concurrent with mist flower reduction, the number of reports of threats to rare endemic plants from mist flower decreased, indicating substantial benefit to native forests (Barton et al., 2007).

2.3.2.2. Cat's claw creeper in Australia. *Macfadyena unguis-cati*, native to South America, is an environmental weed of the Australian subtropical eastern seaboard, the southeastern USA, South Africa, India, Mauritius, and New Zealand (Downey and Turnbull, 2007). In forested riparian areas, this vine kills mature trees, causes bank destabilization, and is an intense root competitor with native plants (Downey and Turnbull, 2007). Ground-level vines smother low vegetation and prevent recruitment of native plants (Floyd, 1989). Biological control is under way in both South Africa and Australia. In Australia, the tingid *Carvalhotingis visenda* and the pyralid *Hypocosmia pyrochroma* have been released (Dhileepan et al., 2007a,b) and impacts are being monitored.

2.3.2.3. Brazilian peppertree in Florida. *Schinus terebinthifolius* is an invasive South American woody plant that rapidly colonizes both disturbed areas and intact natural habitats in over 20 countries in subtropical regions (Cuda et al., 2006). In Florida, this plant displaced populations of the rare or threatened plants *Jacquemontia reclinata* (Convolvulaceae) and *Remirea maritima* (Cyperaceae) (Austin, personal observations, in Langeland et al., 2008) and invaded the nesting habitat of the Florida state-listed gopher tortoise (*Gopherus polyphemus*). Insects attacking this plant in South America and Florida have been studied as potential biological control agents (Cuda et al., 2006; McKay et al., 2009). Field impact studies in Brazil and host-specificity testing in Brazil and Florida confirmed that a stem-feeding thrips, *Pseudophilothrips ichini* sensu lato, is a specialist on Brazilian peppertree and the Peruvian peppertree (*Schinus molle*) (Manrique et al., 2008; Cuda et al., 2009). In 2007, *P. ichini* sensu lato was recommended for field release, but thrips from different source populations were found to be genetically distinct, and more work is required to confirm population-level specificity before release.

2.3.2.4. Air potato in the southeastern USA. *Dioscorea bulbifera* is an herbaceous vine native to Old World tropics, which is now established along the Gulf of Mexico from Florida to Texas (Wheeler et al., 2007), where it climbs on and out-competes native vegetation for limited resources (Gordon et al., 1999; Wheeler et al., 2007). It occurred in 12 of 48 habitats surveyed in southern Florida (Gann et al., 2001), where it aggressively exploits disturbed sites, such as forest canopies damaged by hurricanes, and impedes the reestablishment of native species (Gordon et al., 1999). A potential biological control agent, the Nepalese leaf beetle *Lilioceris* nr. *impressa*, was found to be both damaging to the target weed and safe to native plants. A petition for its release has recently been approved (Pemberton, 2009).

2.3.2.5. Madeira vine in Australia. The South American plant *Anredera cordifolia* is a serious environmental weed in coastal areas of eastern Australia, Hawaii, New Zealand, and South Africa (Vivian-Smith et al., 2007). In Australia, Madeira vine threatens several endangered communities (Vivian-Smith et al., 2007) and is detrimental to riparian vegetation, tall open forest, and damp sclerophyll forests (Floyd, 1989). Its prolific growth and ability to climb 40 m into tree canopies has caused mature trees to collapse under the weight of its vines. Australia and South Africa are coordinating

biological control efforts. The leaf beetles *Plectonycha correntina* (Cagnotti et al., 2007) and *Phenrica* sp. (van der Westhuizen, 2006) have narrow host ranges, but neither insect has yet been released in either country. Further exploration in South America to find additional agents is planned.

2.4. Grasslands

As a biome, grasslands of the world have been extensively altered by people for farming and grazing, and a lower percentage of this biome has been conserved than of forests or wetlands. In many areas, grazing by livestock has changed plant competition in favor of invasive, grazing-tolerant exotic species, which themselves have often affected the fire regime, further promoting invasion (Brooks et al., 2004). Only in recent decades have the rich biotas of grasslands been identified as important subjects for conservation and restoration. Invasive plants, including both accidental introductions and grasses sown to increase forage on wildlands, have affected native grassland biodiversity worldwide. While introduced forage species have not been selected by governments for biological control, many invasive forbs have been, particularly in the USA, Canada, Chile, and Australia.

2.4.1. American grasslands

Biological control of invasive species affecting US grasslands was begun in order to restore productivity of rangelands infested with European forbs. At least 14 species were targeted for biological control (Nechols et al., 1995; Julien and Griffiths, 1998; Van Driesche et al., 2002), including knapweeds (*Centaurea* spp.), yellow starthistle (*Centaurea solstitialis*), tansy ragwort (*Senecio jacobaea*), St. Johnswort (*Hypericum perforatum*), spurges (*Euphorbia* spp.), and thistles (especially *Cirsium arvense*). The first successful weed biological control project in the USA was in the 1950s against St. Johnswort, an invader in natural grasslands in California. Its successful biological control (Huffaker and Kennett, 1959; McCaffrey et al., 1995) reduced St. Johnswort density by 99% in open areas, with the plant only persisting is shaded areas. The subsequent recovery of other vegetation was monitored in detail and showed that native grasses such as California oatgrass (*Danthonia californica*) and blue wild rye (*Elymus glaucus*) increased in abundance (Huffaker and Kennett, 1959). California oatgrass is used in restoration of degraded California coastal prairies (Buisson et al., 2006).

Another early project resulted in successful biological control of tansy ragwort, reducing the infestation by 93% in many areas (McEvoy et al., 1991; Turner and McEvoy, 1995; Coombs et al., 1996). In coastal prairies in Oregon, biological control of tansy ragwort led to a 40% increase of the rare hairy stemmed-checkered mallow (*Sidalcea hirtipes*) (Gruber and Whytemare, 1997). In California, biological control of tansy ragwort allowed the return of natural plants in coastal prairies, such as California poppy (*Eschscholzia californica*), beach strawberry (*Fragaria chiloensis*), Alameda County thistle (*Cirsium quercetorum*), coyote mint (*Monardella villosa*), and coyotebrush (*Baccharis pilularis*) (Pemberton and Turner, 1990). The recent release of one of the two tansy ragwort control agents, the arctiid *Tyria jacobaeae* in Montana, USA (Markin and Littlefield, 2008) raised concerns of potential non-target effects to *Senecio triangularis* (McEvoy et al., 2008).

Successful biological control is developing for yellow starthistle (Gutierrez et al., 2005; Pitcairn et al., 2005; Smith, 2007; Woods et al., 2009), leafy spurge (*Euphorbia esula*) (Cornett et al., 2006; Cline et al., 2008; Samuel et al., 2008), and diffuse (*Centaurea diffusa*) and spotted (*Centaurea stoebe*) knapweeds (Smith, 2004; Story et al., 2000, 2006, 2008; Seastedt et al., 2007; Myers et al., 2009). The value of these programs to the native biota of invaded grasslands requires further documentation. Harris (1988) noted that use of herbicides to suppress leafy spurge threatened populations of the western prairie fringed orchid (*Plantathera praeclara*) in North Dakota. Introduction of *Aphthona* flea beetles as biological control agents, plus targeted sheep or goat grazing, reduced leafy spurge to acceptable levels in parts of Montana and North Dakota and allowed native forage species to increase (Lym, 2005; Cline et al., 2008; Samuel et al., 2008). Integration of biological control agents with herbicide applications allowed recovery of the threatened orchid (Lym, 2005). A related native *Euphorbia* species (*E. robusta*), predicted to be within the host range of one of the leafy spurge control agents (*Aphthona nigriscutis*), was attacked in the field. However, this plant's population increased in the presence of this agent because of lowered competition pressure from leafy spurge, which declined due to biological control (Baker and Webber, 2008).

Solanum viarum (tropical soda apple), native to South America, has invaded 400,000 ha of grasslands and other natural habitats in Florida since 1988 (Medal et al., 2008). Surveys for biocontrol agents in South America started in 1994 and a leaf beetle, *Gratiana boliviana*, was released in Florida, Georgia, Alabama, and Texas in 2003–2008 (Diaz et al., 2008; Medal, unpublished data). The beetle established at most release sites in Florida, and caused 30–100% defoliation and reduced fruiting to virtually zero. Beetles dispersed 1.6–16.0 km/year and non-target effects were not observed during 6 years of monitoring (Medal et al., 2008). Petitions for release in the USA of three additional agents (the weevil *Anthonomus tenebrosus* and the leaf beetles *Metriona elatior* and *Gratiana graminea*) are under review.

Gorse (*Ulex europaeus*) is an invasive shrub that invades grasslands and other communities in the USA (Markin et al., 1995), New Zealand (Hill and Gourlay, 2002), Australia (Ireson et al., 2003), and Chile (Norambuena et al., 2007), where it forms dense stands that compete with native plants. In the USA, gorse replaced desirable vegetation in salt spray meadows (Coombs et al., 2004). In coastal areas in Oregon, gorse reduced habitat for the plant *Lycopodium inundatum* and the butterfly *Speyeria zerene* var. *hippolyta* (Pratt et al., 2003), and threatened the rare plant *Phaceila argentea* (Coombs, personal communication). In Chile, mechanical removal of gorse caused damage to *Berberis negeriana* plants (Norambuena, personal communication) in the Yani Hills (37°S), which is one of few areas still supporting this endemic barberry (Gomez et al., 2008). Gorse biological control is currently being attempted with ten agents in six countries or islands (Julien and Griffiths, 1998; Hill et al., 2008). The spider mite *Tetranychus lintearius* reduced gorse dry matter 36% in Tasmania (Davies et al., 2007), and shoot size and flowering 37% and 82%, respectively, in Hawaii (Hill et al., 2008; Markin, unpublished data). In Chile, late summer mite outbreaks reduced regrowth and flowering (Norambuena et al., 2007), and the seed weevil *Exapion ulicis* reduced seed production and seedling establishment (Norambuena, 1995; Norambuena and Piper, 2000).

Also in Chile, invasive blackberries (*Rubus* spp.) infested 5 million ha of arable or grazing land (Oehrens, 1977). The rust *Phragmidium violaceum*, was introduced for its control, became widely established within 3 years, and reduced the size and competitiveness of *Rubus*. Partial control of blackberry allowed an increase in the native pioneer shrub *Aristotelia chilensis*, a species important in limiting erosion (Oehrens, 1977; Oehrens and Gonzalez, 1977).

In the eastern USA, grasslands have been invaded by several weeds, some of which are the same as discussed above. Invaders unique to this area include two species of European swallow-worts, *Vincetoxicum nigrum* and *Vincetoxicum rossicum*, which are lethal oviposition sinks for monarch butterflies (*Danaus plexippus*) (Casagrande and Dacey, 2007). At high densities, they also lower site quality for nesting grasslands birds (DiTomaso et al., 2005). In Vermont, black swallow-wort (*V. nigrum*) threatens the endangered Jessop's milkvetch, *Astragalus robbinsii* (DiTomaso et al., 2005).

Surveys in Europe identified several potential biological control agents, which were collected for further study in US quarantine.

2.4.2. Australian grasslands

Grasslands constitute a high proportion of the Australian landscape. Consequently, plants invasive in this biome are of special importance, and many exotic plants are of concern across several regions of the country, including dry and wet tropical savannahs in Queensland and the Northern Territory. Lantana, *Lantana camara* (Verbenaceae), is perhaps the oldest target for biocontrol in Australia (Day, M.D., et al., 2003). It is found along the east coast and the Great Dividing Range from Cape York to southern New South Wales. Where abundant, lantana blocks plant succession, displaces native species, changes structure and floristics of natural communities, and decreases species richness (Day, M.D., et al., 2003; Day and Zalucki, 2009). It has also proven an extremely difficult biological control target because of its high genetic diversity caused by multiple (horticultural) introductions and subsequent hybridization (Swarbrick et al., 1995; Day, M.D., et al., 2003). Thirty biocontrol agents have been released in Australia over nearly a century. Several agents are effective in some areas (Day and Zalucki, 2009), but the plant remains at pest levels in most locations.

In the dry tropics of Queensland, rubber vine (*Cryptostegia grandiflora*) from Madagascar invaded forested areas along rivers and later spread into adjacent grasslands and savanna (Tomley, 1995). In riparian areas, dense stands killed eucalyptus trees and reduced native biodiversity. Successful biological control in drought-prone areas has been achieved by the rust *Maravalia cryptostegiae* (Evans and Tomley, 1994; Vogler and Lindsay, 2002) and, to a lesser extent, the pyralid moth *Euclasta whalleyi* (Mo et al., 2000), allowing increased growth of local grass species.

In central Queensland, *Parthenium hysterophorus* has invaded large areas and displaced native perennial grasses. Its domination of seedbanks suggests it has substantial impact on native plant communities (Navie et al., 2004). While nine biological control agents failed to establish or were ineffective, two species, the leaf-feeding beetle *Zygogramma bicolorata* and the stem-galling moth *Epiblema strenuana*, have controlled the plant in some areas (Dhileepan, 2003).

2.5. Deserts and arid shrublands

Several invaders of deserts and arid shrublands have been targets of weed biological control, including cacti (especially *Opuntia* spp.), saltcedars (*Tamarix* spp.), tumbleweeds (*Salsola* spp.), mesquite (*Prosopis* spp.), and hakea (*Hakea sericea*).

Opuntia cacti (native to the Neotropics), became widely invasive in dry regions of the Old World, especially Australia and South Africa, where native cacti do not occur. Invasive *Opuntia* cacti were successfully suppressed with biological control in both of these areas (Dodd, 1940; Zimmermann et al., 2009), but projects either were organized to restore rangeland productivity or remove cacti from parks, and effects on biodiversity were rarely investigated. Nevertheless, dense stands of cacti that dominated large regions in countries such as South Africa certainly caused declines in abundance of native species (Hoffmann, personal communication). Introduction of the *Opuntia*-feeding pyralid moth *Cactoblastis cactorum* into the Caribbean region in the 1950s for pasture enhancement, however, damaged – but did not extirpate – some native cacti species on Nevis and St. Kitts (Pemberton and Liu, 2007). This introduction added this pyralid moth into a region near the center of *Opuntia* biodiversity where it had not formerly occurred, without a non-target risk assessment.

Saltcedars (*Tamarix ramosissima*, other *Tamarix* species, and hybrids) infest about 650,000 ha in western North America, primarily along desert rivers where they displace native willow (*Salix* spp.) and cottonwood (*Populus* spp.) (Zavaleta, 2000). Fifty rare or endangered species of amphibians, arthropods, birds, fish, reptiles, or plants occur in saltcedar-infested areas (DeLoach and Tracy, 1997). Saltcedar has degraded their habitats through displacement of native vegetation (Lovich et al., 1998), change to physical conditions (Busch and Smith, 1993), loss of food resources (Kennedy and Hobbie, 2004), effects on aquatic invertebrates (Bailey et al., 2001), and water depletion (Davenport et al., 1982). Effects on endangered fish include the loss of shallow sandbar habitat for the Rio Grande silvery minnow (*Hybognathus amarus*), loss of low velocity nursery habitat for the Colorado pikeminnow (*Ptychocheilus lucius*), and reduction in water levels in springs supporting desert pupfish (*Cyprinodon macularius*). In some areas, rare fish were found for the first time only after saltcedar was removed (DeLoach et al., 2000; Kennedy et al., 2005). Introduced leaf-feeding beetles (*Diorhabda* spp.) have defoliated hundreds of thousands of hectares, and are beginning to kill saltcedar trees (Hudgeons et al., 2007; Carruthers et al., 2008; Deloach et al., 2008; Tracy and Robbins, 2009). If saltcedar tree deaths from biological control agents become widespread, this should significantly improve wildlife habitat, as physical removal of saltcedar is documented to benefit native plants (Lovich and Bainbridge, 1999), reptiles (Bateman et al., 2008), fishes (Kennedy et al., 2005), and birds (Longland and Dudley, 2008). Field assessments of potential non-target risk to native *Frankenia* species, the taxon identified as potentially at risk from *Diorhabda* feeding, found no significant impacts under field "worst case" conditions (Dudley and Kazmer, 2005).

Drought and disturbance promote invasion of tumbleweeds (*Salsola* spp.) in western North American, causing competition with desirable vegetation (Allen, 1982; Brandt and Rickard, 1994; Hrusa and Gaskin, 2008). Tumbleweeds infest large areas in the Carrizo Plain National Monument in southern California (Smith, personal communication). In Death Valley National Park, USA, *Salsola paulsenii* competes with endangered Eureka Dunes evening primrose (*Oenothera californica* ssp. *eurekensis*) and Eureka Valley dune grass (*Swallenia alexandrae*) (Smith, personal communication). A mite (*Aceria salsolae*) specific to the genus *Salsola* has been discovered that reduces plant size by 80% (Smith et al., 2009) and permission for its release has been requested (Smith, 2005).

In Australia,invasive mesquite shrubs (*Prosopis* spp.) form extensive, dense groves in some arid and semi-arid rangelands, excluding ground cover, especially in the more mesic areas (van Klinken et al., 2006). In the Pilbara region, the spread of mesquite has been reduced through biological control with a leaf-tying moth (a gelechiid, *Evippe* sp. #1) (van Klinken and Campbell, 2009; van Klinken, unpublished data).

In South Africa, the Australian shrub hakea invaded the Southwestern Cape and displaced fynbos (a floristic kingdom with 8700 plant species, 68% endemic) over large areas (Richardson et al., 1997; Holmes et al., 2000). The introduction of five herbivorous insects attacking the flowers, fruits, and stems (Gordon, 1999; Gordon, personal communication), together with the pathogen *Colletotrichum gloeosporioides*, caused considerable damage and mortality to *H. sericea.* This complemented mechanical control, resulting in substantial decline of hakea in invaded areas (Esler et al., 2010), benefiting fynbos communities.

2.6. Coastal areas and sand dunes

Dunes, coastal shrublands and tidal wetlands are fragile ecosystems that are under threat from invasive plants in many countries. In some instances, exotic plant species were deliberately introduced or extensively planted to stabilize and limit movement of wind-blown sand. The negative consequences of these invasive plants for native biodiversity were eventually recognized and triggered the implementation of biological control programs in several

countries. Here we discuss four plants and one insect that have seriously affected these early successional habitats: *Chrysanthemoides monilifera* ssp. *rotundata*, *Asparagus asparagoides*, *Spartina alterniflora*, *Acacia cyclops*, and the insect *Jamella australiae*.

Chrysanthemoides monilifera ssp. *rotundata* (bitou bush), a woody shrub native to South Africa, has invaded over 80% of the coastline of New South Wales, Australia, in the past century (Thomas and Leys, 2002). Dense stands dominate sand dunes, coastal grasslands, heath, woodlands, and rainforests and drastically alter these communities. Bitou bush out-competes native plants, particularly at the seedling stage (Ens and French, 2008), by exuding allelochemicals (Ens et al., 2009). Its invasion severely alters vegetation structure and richness (Mason and French, 2008) and produces a darker, cooler, moister environment that changes invertebrate assemblages (Lindsay and French, 2006). Bitou bush is the dominant threat to 150 native plant species in 24 coastal plant communities in New South Wales (DEC, 2006). A biological control program initiated in 1987 has established four insect species (Downey et al., 2007), of which the geometrid tip moth *Comostolopsis germana* and the seed fly *Mesoclanis polana* are widespread and significantly suppress flowering and seed production (Holtkamp, 2002; Edwards et al., 2009). Modeling suggests, however, that the introduction of foliage-feeding agents will be needed for complete control of the weed (Kriticos et al., 2004).

Asparagus asparagoides (bridal creeper) from South Africa is a major invader of coastal vegetation in temperate Australia (Morin et al., 2006a). It also occurs in inland shrublands, woodlands, and forests. It smothers areas of natural vegetation and severely limits growth of many native plants. In Western Australia, bridal creeper-infested areas had only half as many native plant species as nearby non-invaded areas (Turner et al., 2008a). It is also a threat to four endangered ecological communities in New South Wales – littoral rainforest, river-flat eucalypt forest on coastal floodplains, swamp-oak floodplain forest, and subtropical coastal floodplain forest (Downey, 2006) and to many native plants, including the orchid *Pterostylis arenicola* (Sorensen and Jusaitis, 1995) and the shrub *Pimelea spicata* (Willis et al., 2003). Three biological control agents have been released against bridal creeper in Australia: an undescribed leafhopper (previously referred to as *Zygina* sp.), the rust fungus *Puccinia myrsiphylli*, and the leaf beetle *Crioceris* sp. (Morin and Edwards, 2006; Morin et al., 2006b). The leafhopper and rust fungus have established widely across temperate Australia; the rust appears to be the more effective agent (Morin et al., unpublished data; Turner et al., 2008b). However, dead but persistent rhizomes and tubers in the soil after effective biological control remain an impediment to quick recolonization by native plants (Turner et al., 2006).

Spartina alterniflora (and the *foliosa* × *alterniflora* hybrid), *S. anglica*, *S. patens*, and *S. densiflora* (collectively, "cordgrasses") have invaded intertidal wetlands on the Pacific coast of the USA (Ayres et al., 2004), transforming mudflats into salt marshes and eliminating critical habitat for birds, fish and shellfish. Cordgrasses also outcompete native salt marsh plants in the upper intertidal zone (Daehler and Strong, 1996). In Oregon, cordgrasses invaded native stands of *D. cespitosa* and *Scirpus maritimus* (Callaway and Josselyn, 1992). In San Francisco Bay, invasion by a *Spartina foliosa* × *alterniflora* hybrid reduced macrofaunal species richness and increased dominance of subsurface detritus feeders (Neira et al., 2007). In 2000, the planthopper *Prokelisia marginata* (a common herbivore of *S. alterniflora* in its eastern USA native range) was introduced to Willapa Bay, Washington, to complement chemical and mechanical control (Grevstad et al., 2003). There, the planthopper reduced above-ground biomass of *S. alterniflora* by 50% soon after release (Grevstad et al., 2003). One *S. alterniflora* genotype, however, is tolerant to planthopper feeding and may gradually increase as vulnerable genotypes are suppressed (Garcia-Rossi et al., 2003). A meta-analysis of effectiveness of cordgrass management techniques concluded that the planthopper was highly effective against *S. anglica* (causing 92.5% reduction in density), but was less so against *S. alterniflora* (18.4% reduction in density) (Roberts and Pullin, 2008).

Acacia cyclops (rooikrans) is an Australian species invasive in coastal dune systems of South Africa, where it forms impenetrable stands in the lowlands fynbos of the Eastern and Western Cape Provinces (Richardson et al., 1996). Rooikrans is among three invasive species that are most threatening to native plant biodiversity in the Cape Peninsula (Higgins et al., 1999). However, because the plant is valued in some contexts, biological control agents were selected that attack plant reproduction, rather than cause death. The introduced seed-feeding weevil *Melanterius* cf *servulus* damages up to 90% of the seeds (Impson et al., 2004) but has been slow to increase and disperse. The flower-galling midge *Dasineura dielsi* more rapidly increased in density and spread (Adair, 2005; Impson et al., 2008), but its impact has been more variable between sites and years.

The flatid insect *J. australiae*, native to north Queensland, invaded south Queensland, where it killed native *Pandanus tectorius* trees, an ecologically important coastal species. An egg parasitoid, *Aphanomerus* sp., moved from north to south Queensland, brought the pest under control (Smith and Smith, 2000).

2.7. Oceanic island communities

Island biodiversity is not high, but often consists of endemic species derived from mainland immigrants. Many plants imported to islands for human use have escaped cultivation and become damaging environmental pests. Accidental insect introductions to islands frequently occur because of agriculture, movement of plants, trade, and tourism. About 20 exotic arthropod species invade the Hawaii Islands each year, and many of these become serious pests on native vegetation (Messing and Wright, 2006). Several human-assisted invasions have been linked to the species extinctions (Elton, 1958). Here we discuss the role of biological control in conserving the endemic biodiversity of islands.

2.7.1. Invasive insects attacking native plants

Invasive herbivorous insects are frequently transported to islands on introduced ornamentals or crop plants or they may hitch-hike unnoticed on cargo. Invasive insects can be highly damaging to native plants as well as to native invertebrate and vertebrate species that depend of them for refuge or food. Biological control of exotic insects attacking native flora is an extension of the use of biological control against arthropod pests of crops and ornamental plants, and its use is increasing.

2.7.1.1. Scales. A large number of scales, especially in the Diaspididae and Coccidae, have been moved around the world through the transportation of plants. Small founding population size frequently results in key parasitoids of invading scales being unrepresented in the material transported to new locations, allowing scale population explosions. Examples of the biodiversity impacts of invasive scales on tropical forests were discussed above for Australia. The same processes also occur on islands.

In 1991, the South American scale *Orthezia insignis* was recorded on St. Helena in the south Atlantic (Fowler, 2004). By 1992, the scale was killing endangered, endemic gumwood trees (*Commidendrum robustum*) (Fowler, 2004). The lady beetle *Hyperaspis pantherina* was released in 1993 (Booth et al., 1995; Fowler, 2004) and by 1995 scale density had decreased by 97% and tree death due to scale infestations no longer occurred (Fowler, 2004). Biological control of *O. insignis* saved the remnant gumwood stands, and removed the scale's threat to the three other *Commidendrum* spp. (Fowler,

2004), a genus which comprises a significant part of St. Helena's remaining native trees (Cronk, 1989). Additional conservation benefits included prevention of damage to the newly restored Millenium Forest (St. Helena National Trust, 2009), prevention of harm to natural regeneration of *Commidendrum rugosum* on 50% of St. Helena (Fowler, 2004; Anonymous, 2009; Joint Nature Conservation Committee, 2009), and the preservation of several endemic weevils (e.g., *Nesiotes* spp.) associated with gumwoods (Pearce-Kelly, personal communication in Booth et al., 1995; Joint Nature Conservation Committee, 2009).

Icerya scales (Margarodidae) have invaded various islands – the Galápagos, the Seychelles, Ascension, and various parts of Micronesia – and attacked native plants. The best known *Icerya* species is the polyphagous cottony cushion scale, *Icerya purchasi*, which in addition to being a major citrus pest (Hale, 1970; Ben-Dov et al., 2009), damages many native island plants, often ones with restricted distributions (Cronk, 1980; Causton, 2001; Causton et al., 2006). The scale also indirectly threatens rare insects that depend on these plants for food or shelter (e.g., Roque-Albelo, 2003). It has been repeatedly controlled by the specialized predatory coccinellid *Rodolia cardinalis* (Caltagirone and Doutt, 1989), which develops exclusively on monophlebine (Hemiptera: Margarodidae) scales, principally *Icerya* species (Causton, 2001; Causton et al., 2004). On the Galápagos, *I. purchasi* attacked 16 threatened plant species, as well as many other native plants (Causton, 2001, 2003). Scale-induced mortality of one rare plant, *Darwiniothamnus tenuifolius*, was linked to local population extirpations of three moths (Roque-Albelo, 2003). Important mangrove habitats were damaged by heavy scale infestations (Causton, 2003). *Rodolia cardinalis* was released on ten Galápagos islands in 2002 to protect threatened native plants (Causton et al., 2006; Causton, unpublished data). Exclusion experiments and post-introduction monitoring were conducted on heavily infested stands of white mangrove (*Laguncularia racemosa*) in Puerto Ayora, Santa Cruz Island, and data showed a marked decrease in scale density within 12 weeks of liberating *R. cardinalis* (Calderon Alvarez, 2002). More extensive evaluations of the impacts of this predator were begun in 2009. In the South Atlantic, *R. cardinalis* was released on Ascension Island in 1976 to control cottony cushion scale on ornamental plants (Cronk, 1980). The beetle also provided protection for the rare endemic spurge *Euphorbia origanoides*, which was suffering population decline due to scale attack (Cronk, 1980; Fowler, 2004). By 1995 scale density on the island was low, and the scale was completely absent on sampled *E. origanoides* populations, including one population specifically examined by Cronk (1980) (Fowler, unpublished data). *Icerya purchasi* was also absent on *E. origanoides* when the plant was re-surveyed in 1997 (Ashmole and Ashmole, 1997) (see Plate 2).

Other species of *Icerya* have threatened island plants, including *Icerya seychellarum* in the Seychelles and *Icerya aegyptiaca* on various coral atolls in the western Pacific (Waterhouse, 1993). *Icerya seychellarum* invaded Aldabra in the Seychelles around 1968 and quickly became damaging (Hill and Newbery, 1980). By the 1980s, native plant species such as *Avicennia marina*, *Euphorbia pyrifolia*, *Ficus lutea*, *Scaevola sericea*, and the endemic *Sideroxylon inerme* ssp. *cryptophlebium* were heavily damaged (Newbery and Hill, 1985; Newbery, 1988; Gery, 1991). The rare native species *Maillardia montana* and *Psychotria pervillei* were on the point of extinction from *I. seychellarum* and other stresses (Friedmann, 1994). *Rodolia chermesina* was released on Aldabra in 1989 to control *I. seychellarum* (Gery, 1991). Monitoring for 5 years following the release of *R. chermesina* showed reduced scale density and recuperation of the affected plant species (Johnson and Threadgold, 1999; Beaver, personal communication). In the western Pacific, destructive populations of *I. aegyptiaca* developed on various coral atolls including Kiribati, Federated States of Micronesia, the Mariannas, and Marshall and Wake Islands (Beardsley, 1955; Waterhouse, 1993). Native plants attacked included *Casuarina equisetifolia*, *Calophyllum inophyllum*, and the sand dune plants *Scaevola koenigii* and *Scaevola frutescens* (Manser, 1974; Maddison, 1976). From 1994 to 1999, CSIRO in Australia introduced *Rodolia limbata* into infested western Pacific atolls and within 2 years, control was achieved on atolls of the Federated States of Micronesia, Kiribati and Marshall Islands (Brancatini and Sands, 1997; Sands et al., 1999).

On Guam, an invasive cycad-attacking diaspidid scale, *Aulacaspis yasumatsui*, destroyed much of the island's native cycad forests. The scale is native to Thailand where it is a minor pest kept at low densities by parasitoids (Tang et al., 1997). In 2003, the scale was detected on ornamental cycads at two of Guam's hotels. It quickly spread into wild populations of Micronesia's endemic cycad, *Cycas micronesica*, which is the dominant tree-sized plant in Guam's limestone forests and a keystone species of the community. This scale, in combination with two other cycad-feeding invasive species (the lycaenid *Chilades pandava* and the tineid leafmining moth *Erechthias* sp. [Moore et al., 2005; Marler and Muniappan, 2006]), caused cycad death rates to reach 60–90% in some areas in 2004–2008. This high mortality led conservationists to place *C. micronesica* on the IUCN Red List (Marler, 2006). Biological control began after surveys in Guam found no attack of the scale by local parasitoids or predators. The aphelinid parasitoid *Coccobius fulvus* was introduced in 2005 from Florida (where it had suppressed the target scale) (Weise et al., 2005), but it failed to establish. The coccinellid *R. lophanthae* was introduced from Hawaii, established widely, and suppressed the scale on mature cycads. It was also established on Rota, Koror, and Babeldaup as the scale spread in Micronesia. However, this predator did not suppress the scale adequately on seedlings, which continued to die at elevated rates. Further biological control introductions, likely of parasitoids, are needed to protect seedlings and secure the future of Guam's cycad limestone forests.

2.7.1.2. Gall wasps. Like scales, galling insects are tightly associated with plants and may be moved with their hosts to new regions, where they may spread to native plants. The plant genus *Erythrina* has 112 species in tropical or warm temperate regions (Neill, 1988), several of which are on the IUCN Endangered Species List and are threatened by invasion of the gall wasp *Quadrastichus erythrinae*. In Hawaii, this eulophid wasp devastated stands of the wiliwili tree (*Erythrina sandwicensis*), causing severe tissue distortion, defoliation, and death (Kim et al., 2004; Yang et al., 2004). The wiliwili tree is an endemic keystone species in lowland Hawaiian forest, one of the most endangered ecosystems in the world (http://www.hear.org). The invader's area of origin is not certain (Gramling, 2005; Messing et al., 2009), but natural enemies surveys were conducted in Africa, where the parasitoid *Eurytoma erythrinae* was found attacking *Quadrastichus* spp. (Gates and Delvare, 2008). This parasitoid was evaluated in quarantine and released in Hawaii. Initial observations showed ready establishment, rapid spread, and high impact of *E. erythrinae*. A second parasitoid (*Aprostocetus* sp.) is also under study.

2.7.1.3. Vectors of plant pathogens. Certain invasive insects, especially leafhoppers and aphids, have the potential to introduce or more efficiently vector plant pathogens to native plants. The cicadellid leafhopper *Homalodisca vitripennis* (glassy-winged sharpshooter) is a polyphagous xylem feeder that vectors the plant pathogenic bacterium *Xylella fastidiosa*. Native to parts of the USA and Mexico, this leafhopper invaded French Polynesia (in 1999), Hawaii (2004), Easter Island (2005), and the Cook Islands (2007), most likely via the movement of ornamental plants. In the absence of the mymarid egg parasitoid *Gonatocerus ashmeadi*, dense leafhopper populations developed and retarded plant growth and fruit

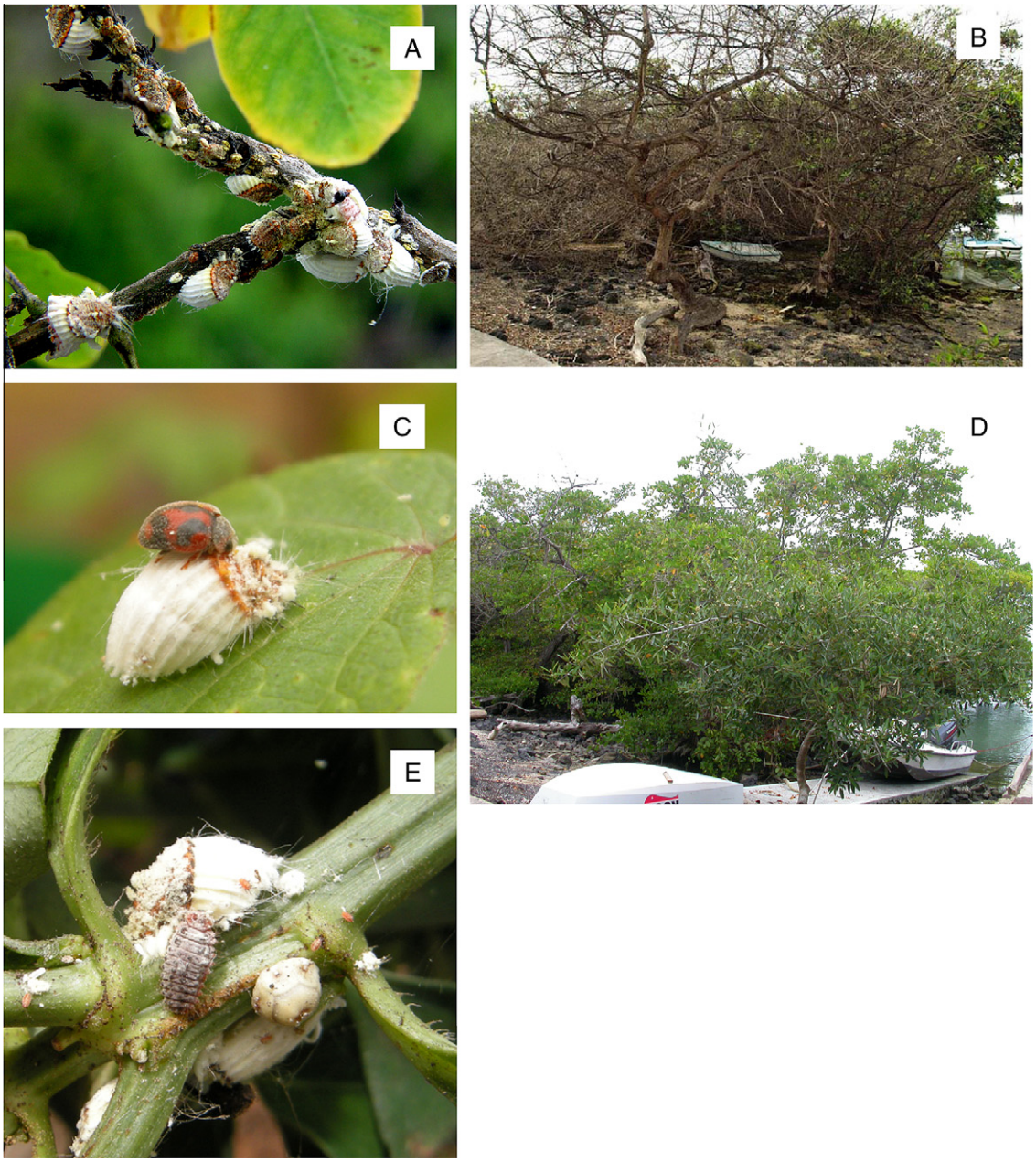


Plate 2. The invasion of the Galápagos National Park by the cottony cushion scale (*Icerya purchasi* Maskell) was highly damaging to a variety of native plants. Prior to the successful biological control of this scale, dense populations developed on white mangrove (*Laguncularia racemosa*) (A), a keystone species in the marine littoral habitat. By 2001, stands of white mangrove along the coast in Puerto Ayora on Santa Cruz island (background of photo B) had been heavily damaged by the scale. The biological control agent *Rodolia cardinalis* (adult – C; larva – E), introduced in 2002, suppressed scale density, allowing for full recovery of affected mangrove stands by 2005, as seen in a subsequent photo (D) of the same location. Photos courtesy of Helmuth Rogg, Charles Darwin Foundation (A), Mark Hoddle, University of California (C and E), Heidi Snell, Visual Escapes.smugmug.com (B), and Charlotte Causton, Charles Darwin Foundation (D).

yields, and produced copious watery excreta (Grandgirard et al., 2006). Nymphs and adult leafhoppers were toxic to some generalist predators, in particular native spiders (Suttle and Hoddle, 2006). Following risk assessment studies (Grandgirard et al., 2007), *G. ashmeadi* was released into French Polynesia and suppressed the leafhopper in all archipelagos within 7–10 months (Grandgirard et al., 2008; Petit et al., 2009). Suppression of leafhopper density protected native spiders and reduced the likelihood of infection of native plants with *X. fastidiosa*.

2.7.2. Invasive plants

Islands have been extensively invaded by introduced plants. Some of these have been subject to weed biological control, especially in Hawaii and New Zealand. Examples from small islands include miconia and gorse.

Miconia calvescens, a small, broad-leafed tree from Central and South America, escaped cultivation and established widely on Pacific islands, including Hawaii and Tahiti. It invaded natural forests and formed dense monospecific stands that were damaging to native vegetation (Meyer and Florence, 1996; Medeiros et al., 1997; Meyer, 1998). The fungus *Colletotrichum gloeosporioides* forma specialis *miconiae* from Brazil is specific to *M. calvescens* (Killgore et al., 1999). It was released in Tahiti in 2000, where it established from sea level to 1400 m and caused partial defoliation of miconia canopy trees in mesic and wet forests. Defoliation reached 47% and this allowed increases in cover and diversity of native vegetation

(Meyer et al., 2008, 2009). The fungus was also introduced into Hawaii, but had little impact, apparently due to higher temperatures. Additional agents, particularly insects, are under investigation (e.g., Seixas et al., 2004; Badenes-Perez et al., 2007).

Gorse is a thorny European shrub introduced into several countries, including Chile, where in the archipelago of Chiloé it became invasive on at least 10 islands (Norambuena et al., 2007). On Chiloé (and associated islands) releases have been made of the seed-feeding brentid *E. ulicis* and the spider mite *T. lintearius*, both of which established on three islands (Norambuena, unpublished data).

3. Protecting resources obtained from natural ecosystems

Many early biological control projects were started to protect resources harvested from wildlands, especially wood, forage, and water. Others were begun to protect the use of rivers for hydroelectric power generation, navigation, or fishing. Most of the species reviewed in the following section were previously discussed in regard to their impacts on biodiversity and here we elaborate further on the economic losses of natural resources caused by these invasive species. Details of their biological control, presented in the previous section, are summarized in Table 1 (insects) or Table 2 (plants). Values given below are in United States dollars.

3.1. Wood products from native forests

Damaging insects can reduce the ability of native forests to yield wood products. Some forest pests are native species, and as such are outside the scope of this article. Also, some invasive insects are serious pests in forest plantations, which are also not covered here, even though many have been successful targets of classical biological control. We restrict our review to invasive species that have reduced the productivity of native forests or increased mortality of key timber species. Most of the examples discussed are from North America, which has both extensive native forests and many invasive forest pests. Other regions have either been less often invaded by pests of native forests, or rely heavily on plantation forestry, whose biological control projects are outside the scope of this article. In North America, five species – introduced pine sawfly (*D. similis*), European spruce sawfly (*G. hercyniae*), larch casebearer (*C. laricella*), winter moth (*O. brumata*), and gypsy moth (*L. dispar*) – have been wholly or partly controlled with biological control. Two other important biological control projects targeted at emerald ash borer (*A. planipennis*) and hemlock woolly adelgid (*A. tsugae*) are in progress (Table 1).

3.1.1. Introduced sawflies and moths

All of the species discussed in this section have been successfully suppressed with biological control in all or part of the invaded range (Table 1). The introduced pine sawfly and European spruce sawfly invaded North America about 1914–1922 (Coppel et al., 1974; Drooz, 1985) and spread widely, attacking pines and spruce, respectively. By 1981, the introduced pine sawfly defoliated 2.2 million ha of pine forests in Virginia and North Carolina (Drooz et al., 1979; Ghent et al., 1982), but caused little tree death. In 1935, European spruce sawfly defoliated 1.5 million ha spruce in the Gaspé Peninsula, New Brunswick, Canada, with high tree mortality in some stands. At its peak, the European spruce sawfly infested 363,000 km^2 of forest (see Van Driesche et al., 1996).

Larch casebearer invaded Massachusetts about 1886 and spread into the Canadian maritime provinces and west to British Columbia (Drooz, 1985), tracking larch distributions. In eastern North America, outbreaks occurred from the early 1900s (Felt and Bromely, 1932) through the 1950s (Webb and Quednau, 1971), eventually ceasing due to introduced parasitoids. Outbreaks in Idaho and Oregon occurred from 1957 until larch casebearer was suppressed by natural enemies (Ryan, 1990). Before its biological control, this moth was among the top two pests of western larch (Schmidt et al., 1976). Repeated defoliation of larch in northern Idaho reduced tree growth by 80%, but growth returned to normal after successful biological control (Long, 1988).

Winter moth invaded the Canadian Maritimes in the 1930s and later British Columbia and Massachusetts. This polyphagous species feeds on a great range of deciduous trees, and repeated defoliation causes thin tops, dead branches, and tree death (Drooz, 1985). In Nova Scotia in a 1950s outbreak, damage to *Q. rubra* was greatest on trees with early bud break (due to better synchrony with the caterpillars), and in the most defoliated plots 40% of oaks died over several years (Embree, 1967). The infestation in eastern Canada peaked in 1954–1956 when it covered 60% of Nova Scotia, killing up to 100% of oaks in areas with greatest defoliation (Cuming, 1961). In 1977, a separate infestation in British Columbia covered 120 km^2 (Gillespie et al., 1978). A third infestation – in Massachusetts – defoliated 60,325 ha in 2003 (Anonymous, 2004). Damage from winter moth includes loss of oak lumber due to tree death, and loss of quality white pine regeneration in the absence of over story shade (i.e., increased forking from more oviposition by *Pissodes strobi*) (Embree, 1965).

Gypsy moth was imported to Massachusetts by an amateur entomologist in 1869 and escaped. It established and spread throughout many oak-dominated forests of the northeastern USA, eventually reaching Ontario, Michigan, and Virginia. The most intense defoliation occurred in 1911–1922 in New England (Houston, 1981) and the largest outbreaks were in 1980–1982 and 1989–1991 (10.7 and 5.8 million ha defoliated, respectively) (USDA Forest Service website). Depending on tree health and site conditions, defoliated oaks suffered varying degrees of mortality. In 1911–1931 in eastern New England, 35% of oaks in poor condition died from a single defoliation, while 7% of trees in good condition did so (Campbell and Sloan, 1977). Deaths occurred up to several years after defoliation.

3.1.2. Tree-killing borers and adelgids

Biological control projects against the two species discussed here are in progress (Table 1). By 2009, the emerald ash borer (Coleop.: Buprestidae) infested eleven US states and several Canadian provinces (http://www.emeraldashborer.info/). Infestations are currently expanding annually by 16–32 km due to adult flight, and new infestations are being created by long distance movement of fire wood or live infested trees. In Michigan, where 18.2 million cubic meters (7.7 billion board feet) of ash timber are harvested annually (USDA APHIS, 2007), more than 30 million ash (*Fraxinus* spp.) trees had been killed (Poland and McCullough, 2006; EAB, 2009). The loss to date in Michigan is estimated at 42.5 million cubic meters of wood (18 million board feet) valued at $4–9 million (Michigan Department of Natural Resources website). Many Michigan stands have lost up to 100% of their large ash trees. Nationally, US timberlands contain an estimated 8 billion ash trees, 7.5% by volume of all hardwoods. Thus future losses, given spread to the pest's ecological limits, could increase greatly (see www.aphis.usda.gov/plantpest/emerald_ash_borer).

Hemlock woolly adelgid invaded the USA from Japan (Havill et al., 2006) and has widely degraded eastern hemlock forests. Lumbering of eastern hemlock is modest due to its lower wood quality compared to other softwoods, but about 1.2 million cubic meters of wood (500 million board feet) are harvested annually (Brisbin et al., 1970; Howard et al., 2000). Hemlock bark is used for mulch (Howard et al., 2000) and its wood for log home construction, pulpwood, and composite materials (Winn and Araman, 2005). Since the 1950s, hemlock woolly adelgid has spread over 20–30% of eastern hemlock's range. In New Jersey in 1984 (before hemlock woolly

Table 1
Status of classical biological control programs for invasive insects mentioned in the text.

	Target species	Host plant	Nature of Impacts (X)[a]			Outcome (✓)[b]			Location/comments	References
			Biodiv.	Prod.	Eco. Sv.	C	P	IP		
1	*Adelges tsugae* Annand (hemlock woolly adelgid)	Hemlock	X	X	X			✓	Eastern USA	Evans (2002), Cheah and McClure (1998), McClure et al. (2000), Lu and Montgomery (2001), Montgomery et al. (2002), Zilahi-Balogh et al. (2002, 2003)
2	*Agrilus planipennis* (emerald ash borer)	Ash	X	X				✓	Agents confirmed established and impact being evaluated	Bauer et al. (2007)
3	*Aulacaspis yasumatsui* (cycad scale)	Cycads	X				✓		Guam; control effective only on mature plants, not seedlings	Ross Miller and Aubrey Moore (personal communication)
4	*Cinara cupressivora* (cypress aphid)	Cupressaceae	X	X			✓1		East/South Africa 1 – control due to several factors	
5	*Ceroplastes destructor* (white wax scale)	Diverse plants	X			✓			Queensland, Australia	Sands et al. (1986)
6	*Ceroplastes rubens* (pink wax scale)	Diverse plants	X				✓1		Queensland, Australia 1 – controlled on some native hosts but not others	Waterhouse and Sands (2001)
7	*Coleophora laricella* (larch case bearer)	Larch		X		✓			North America	Webb and Quednau (1971), Ryan (1990), Long (1988)
8	*Dendroctonus micans* (spruce beetle)	Spruce	X1	X2		✓			1 – Caucasus region 2 – Western Europe and Caucasus region	Grégoire (1988), Fielding and Evans (1997)
9	*Diprion similis* (pine sawfly)	Pine		X		✓			North America	McGugan and Coppel (1962)
10	*Dryocosmus kuriphilus* (chestnut gall wasp)	Chestnut	X	X		✓1		✓2	1 – Japan, USA 2 – Europe	Moriya et al. (2003), Cooper and Rieske (2007), Quacchia et al. (2008)
11	*Gilpinia hercyniae* (European spruce sawfly)	Spruce		X		✓			North America	Magasi and Syme (1984)
12	*Homalodisca vitripennis* (glassy-winged sharpshooter)	Diverse plants	X			✓1		✓2	1 – complete control in Tahiti 2 – project in progress in California, but control developing slowly	Grandgirard et al. (2008), Petit et al. (2009)
13	*Icerya aegyptiaca*	Diverse plants	X			✓			Kiribati, Federated States of Micronesia, the Mariannas, Marshall, and Wake Islands	Brancatini and Sands (1997), Sands et al. (1999)
14	*Icerya purchasi* (cottony cushion scale)	Diverse plants	X			✓1		✓2	1 – control complete on Ascension Island 2 – control being evaluated in Galapagos, but appears effective	Causton et al. (2006), Causton (unpublished data), Calderon Alvarez (2002), Fowler (unpublished data), Ashmole and Ashmole (1997)
15	*Icerya seychellarum*	Diverse plants	X			✓			Seychelles	Johnson and Threadgold (1999), Beaver (personal communication)
16	*Jamella australiae*	*Pandanus tectorius*	X			✓			Southern Queensland, Australia	Smith and Smith (2000)
17	*Lymantria dispar* (gypsy moth)	Oak	X	X			✓		Successful control in the core infested area of New England	Van Driesche et al. (1996, see pp. 85–88), Webb et al. (1999), Gillock and Hain (2001)
18	*Metamasius callizona* (bromeliad weevil)	bromeliads	X					✓	Florida (USA)	Frank and Cave (2005), Cave (2008)
19	*Operophtera brumata* (winter moth)	Oak		X		✓1		✓2	1 – Nova Scotia, British Columbia 2 – Massachusetts	Embree (1971), Embree and Otvos (1984)
20	*Paratachardina pseudolobata* (lobate lac scale)	Diverse plants	X					✓	Florida (USA)	Pemberton (2003), Schroer et al. (2008)
21	*Quadrastichus erythrinae* (erythrina gall wasp)	*Erythrina* spp.	X					✓	Hawaii; agents being evaluated; one released and established	Gates and Delvare (2008)

[a] Biodiv. (effects on biodiversity), Prod. (loss of products produced by natural ecosystems), Eco. Sv. (loss of ecosystem services).
[b] Degree of control achieved: C – complete control, P – partial control, IP – in progress.

Table 2
Invasive plants status of classical biological control programs for invasive plants mentioned in the text.

	Target species	Nature of impacts (X)[a]			Outcome (✓)[b]			Location/comments	References
		Biodiv.	Prod.	Eco. Sv.	C	P	IP		
1	*Acacia cyclops* (rooikrans)	X					✓	Coastal dunes of South Africa; 90% seed damage	Impson et al. (2004)
2	*Acacia longifolia* (long leafed wattle)	X	X	X	✓			South Africa, especially the fynbos region	Dennill et al. (1999), Moran et al. (2005)
3	*Acacia nilotica* subsp. indica (prickly acacia)	X	X	X			✓	Australia, especially Mitchell grass downs	Radford et al. (2001), Palmer et al. (2007)
4	*Acacia pycnantha* (golden wattle)	X	X	X	✓			South Africa, especially the fynbos region	Moran et al. (2005)
5	*Acacia saligna* (Port Jackson willow)	X	X	X	✓			South Africa, especially the fynbos region	Moran et al. (2005)
6	*Ageratina riparia* (mist flower)	X			✓			Hawaii and New Zealand	Trujillo (2005), Barton et al. (2007), Landcare Research (unpublished data)
7	*Ailanthus alitissima* (tree of heaven)	X					✓	Eastern USA	Ding et al. (2006), Kok et al. (2008)
8	*Alliaria petiolate* (garlic mustard)	X					✓	Northeast and north central USA; agents under evaluation	Blossey et al. (2001a)
9	*Alternanthera philoxeriodes* (alligator weed)	X	X		✓	✓		USA, Australia, New Zealand, and China; floating infestations generally controlled but terrestrial populations on edges of water bodies still a problem	Coulson (1977), Julien (1981), Julien and Griffiths (1998), Sainty et al. (1998)
10	*Arundo donax* (giant reed)	X	X	X			✓	Southwestern USA, especially Texas; first agents (gall wasp and armored scale) released in 2009	Tracey and DeLoach (1998); Goolsby (personal communication)
11	*Asparagus asparagoides* (bridal creeper)	X					✓	Coastal areas of temperate Australia; little control to date	Morin et al. (unpublished data), Turner et al. (2008b)
12	*Anredera cordifolia* (Madeira vine)	X					✓	Coastal eastern Australia, South Africa; agent surveys underway	Cagnotti et al. (2007), van der Westhuizen (2006)
13	*Azolla filiculoides* (red fern)	X			✓			South Africa	McConnachie et al. (2004)
14	*Centaurea diffusa* and *C. stoebe* (diffuse and spotted knapweeds)	X	X			✓		Western North America	Smith (2004), Story et al. (2000, 2006, 2008), Seastedt et al. (2007), Myers et al. (2009)
15	*Centaurea solstitialis* (yellow starthistle)	X	X				✓	Western North America; plant densities have not yet been reduced in most locations, but declines have occurred in Oregon and California	Gutierrez et al. (2005), Smith (2007), Pitcairn et al. (2005)
16	*Chromolaena odorata* (Siam weed)		X	X		✓ 1	✓2	1 – significant control in Papua New Guinea and East Timor of one biotype 2 – no control yet of second biotype in South Africa	Day and Bofeng (2007), Zachariades et al. (2009), Day (personal communication)
17	*Chrysanthemoides monilifera* ssp. Rotundata (bitou bush)	X				✓		Coastline of New South Wales, Australia; flowering and seed production widely suppressed	Holtkamp (2002), Edwards et al. (2009)
18	*Cryptostegia grandiflora* (rubber vine)	X	X			✓		Dry tropics of Australia; control achieved in droughty areas	Evans and Tomley (1994), Mo et al. (2000), Vogler and Lindsay (2002)
19	*Dioscorea bulbifera* (air potato)	X					✓	Florida, USA; petition for agent release approved	Pemberton (2009)
20	*Eichhornia crassipes* (waterhyacinth)	X	X		✓	✓		Southern USA, Mexico, East and West Africa, India, and other warm regions; complete control in many tropical areas; partial control in cooler regions	Beshir and Bennett (1985), Center et al. (2002), Coetzee et al. (2009)
21	*Euphorbia esula* (leafy spurge)	X	X			✓		Northern prairies of North America; complete control in many areas	Cornett et al. (2006), Cline et al. (2008), Samuel et al. (2008)
22	*Fallopia japonica* (Japanese knotweed)	X					✓	United States and United Kingdom; first agent approved for release	Shaw et al. (2009)
23	*Hakea sericea* (hakea)	X			✓			South Africa (fybos of Cape region); control achieved in combination with mechanical control	Gordon (1999), Gordon (personal communication), Esler et al. (2010)
24	*Hydrilla verticillata* (hydrilla)	X				✓	✓	Southern USA; partial control in a few areas	Balciunas et al. (2002), Grodowitz (personal communication)

(*continued on next page*)

Table 2 (*continued*)

	Target species	Nature of impacts (X)[a]			Outcome (✓)[b]			Location/comments	References
		Biodiv.	Prod.	Eco. Sv.	C	P	IP		
25	*Hypericum perforatum* (St. Johnswort)	X	X		✓1	✓2		Western USA, Australia; 1 – compete control in the USA 2 – partial control in Australia	Huffaker and Kennett (1959), McCaffrey et al. (1995), Briese (1997)
26	*Lantana camara* (lantana)	X	X	X			✓	Northern and eastern Australia; limited success in a few areas	Day and Zalucki (2009)
27	*Lygodium microphyllum* (Old World climbing fern)	X		X			✓	Southern Florida, USA; control is developing at release sites	Boughton and Pemberton (2009)
28	*Lythrum salicaria* (purple loosestrife)	X				✓		Northern USA and adjacent areas of Canada; control in some areas	Blossey et al. (2001b), Landis et al. (2003), Denoth and Myers (2005), Grevstad (2006)
29	*Macfadyena unguis-cati* (cats claw)	X					✓	South Africa, Australia	Dhileepan et al. (2007a,b)
30	*Melaleuca quinquenervia* (melaleuca)	X		X	✓			Southern Florida, USA; control very effective in combination with mechanical and chemical control of mature plants	Pratt et al. (2005), Center et al. (2007), Rayamajhi et al. (2007, 2008, 2009), Tipping et al. (2008, 2009)
31	*Miconia calvescens* (miconia)	X		X		✓1	✓2	1 – partial control in Tahiti 2 – no control yet in Hawaii	Meyer et al. (2008, 2009), Seixas et al. (2004), Badenes-Perez et al. (2007)
32	*Mimosa pigra* (mimosa)	X				✓		Northern Australian wetlands; seed production reduced and stands retreating at edges	Heard and Paynter (2009)
33	*Opuntia stricta* (prickly pear cactus)	X	X		✓			Australia, South Africa	Dodd (1940)
34	*Parthenium hysterophorus* (parthenium weed)	X	X			✓		Central Queensland, Australia; control achieved in some areas	Dhileepan (2003)
35	*Persicaria perfoliate* (mile-a-minute weed)	X					✓	Eastern USA	Hough-Goldstein et al. (2009)
36	*Pistia stratiotes* (water lettuce)	X	X		✓			Papua New Guinea, Australia; several regions in Africa; and warm parts of North America	Harley et al. (1990), Mbati and Neuenschwander (2005); Ajuonu and Neuenschwander (2003), Neuenschwander et al. (2009), Dray and Center (1992)
37	*Prosopis* spp. (mesquite)	X	X			✓		arid parts of Australia; control achieved in the Pilbara region	van Klinken and Campbell (2009), van Klinken (unpublished data)
38	*Rubus* spp. (blackberries)	X				✓		Chile; reduction in size and competitiveness of plants	Oehrens (1977), Oehrens and Gonzalez (1977)
39	*Salsola* spp. (tumble weeds)	X	X				✓	Western USA, especially California	Smith et al. (2009), Smith (2005)
40	*Salvinia molesta* (giant salvinia)	X	X		✓			Australia, Papua New Guinea, parts of the USA, and parts of Africa, especially the Congo basin	Room et al. (1981), Thomas and Room (1986a), Mbati and Neuenschwander (2005), Diop and Hill (2009), Julien et al. (2009)
41	*Schinus terebinthifolius* (Brazilian peppertree)	X					✓	Florida, USA; agents under evaluation	Manrique et al. (2008), Cuda et al. (2009)
42	*Senecio jacobaea* (tansy ragwort)	X	X		✓			Western USA	McEvoy et al. (1991), Turner and McEvoy (1995), Coombs et al. (1996), Pemberton and Turner (1990)
43	*Sesbania punicea* (sesbania)	X	X		✓			South Africa, especially the fynbos region	Hoffmann and Moran (1998)
44	*Solanum viarum* (tropical soda apple)	X					✓	South eastern USA; control achieved at release sites; agent spreading	Medal et al. (2008)
45	*Spartina alterniflora* (cordgrass)	X				✓		Esturaries of Washington state, USA; widespread reduction of biomass by 50%	Grevstad et al. (2003), Roberts and Pullin (2008)
46	*Tamarix ramosissima* (saltcedar)	X		X			✓	Western USA; control developing around release sites	Hudgeons et al. (2007), Carruthers et al. (2008), Deloach et al. (2008), Tracy and Robbins (2009)
47	*Triadica sebifera* (Chinese tallow tree)	X					✓	South eastern USA; agents under evaluation	Wang et al. (2009)
48	*Ulex europaeus* (gorse)	X	X	X			✓	Chile, Oregon (USA), Tasmania, Hawaii, New Zealand; some impact in Chile, Hawaii and Tasmania	Norambuena (1995), Norambuena and Piper (2000), Davies et al. (2007), Norambuena et al. (2007), Hill et al. (2008)
49	*Vincetoxicum nigrum*; *Vincetoxicum rossicum*	X					✓	Northeastern USA; surveys for agents in progress	

[a] Biodiv. (effects on biodiversity), Prod. (loss of products produced by natural ecosystems), Eco. Sv. (loss of ecosystem services).
[b] Degree of control achieved: C – complete control, P – partial control, IP – in progress.

adelgid), hemlock was the dominant tree on nearly 8000 ha, but in 1994 (after adelgid invasion), 44% of these trees had experienced moderate to severe defoliation, and 9% were dead (Royle and Lathrop, 1997). In Connecticut in 1998, all hemlocks in 7 of 8 stands were infested and over 90% suffered at least 50% foliar loss (Orwig and Foster, 1998).

3.2. Forage from natural grasslands

Invasive plants can reduce the "carrying capacity" (stock supported per ha) of natural grasslands by (1) lowering the quantity or quality of forage, (2) plant toxicity or repellency, or (3) conversion of grasslands to other vegetation.

3.2.1. Reduction of forage production

Desirable forage species in native grasslands may be displaced by less palatable invasive plants, especially when grasslands are over-grazed. Grasslands of the western USA have been extensively invaded by toxic or thorny forbs from Europe. More than 300 invasive plants on US rangelands collectively cause an estimated $2 billion in annual losses (DiTomaso, 2000). Many of the most important of these are exotic forbs that have been targets of classical biological control (Skinner et al., 2000), such as yellow starthistle, spotted knapweed, leafy spurge, and Russian knapweed (*Acroptilon repens*). Before biological control-induced change, these plants infested, respectively, 8, 3, 1.0, and 0.6 million ha in the USA (Lajeunesse et al., 1999; Duncan, 2001).

In California, moderate infestations of yellow starthistle (20–31% total vegetation) reduced carrying capacity for cattle 10–15%, and heavier infestations reduced forage up to 50% (Connor, 2003). Although ruminants can digest immature plants, spines on flower heads deter late season grazing (Sheley et al., 1999). In western Montana, spotted knapweed infestations reduced production of the dominant native forage (*Pseudoroegneria spicata*) up to 88% (Watson and Renney, 1974), while diffuse knapweed infestations in British Columbia reduced forage up to 90% (Harris and Cranston, 1979; Strang et al., 1979). Annual losses from both knapweeds were $600,000 in Oregon and $0.9–2.9 million in Idaho (Maddox, 1979; Roché and Roché, 1988). In Montana, the Dakotas, and Wyoming, leafy spurge caused annual losses of $40.5 million from reduced forage and control costs (Leitch et al., 1994). Successful biological control of leafy spurge produced direct economic benefits of $19.1 million annually, and total benefits of $58.4 million (Bangsund et al., 1999). In California in the late 1940s, St. Johnswort infested 900,000 ha, displacing forage and poisoning cattle. Its successful biological control brought about increases of species with forage value (Huffaker and Kennett, 1959; Goeden, 1978). Economic benefits of St. Johnswort's biological control in the USA were not estimated, but annual benefits in Australia, where control was only partial (McCaffrey et al., 1995; Briese, 1997) exceed $20.6 million (Paige and Lacey, 2006). In Oregon, biological control of a 1.2 million ha tansy ragwort infestation ended $5 million in annual losses from reduced pasture productivity and herbicide costs (Coombs et al., 1999).

Australian grasslands have also experienced numerous plant invasions. *Opuntia stricta* infested 25 million ha in the 1920s and 1930s and the infestation was expanding 0.5 million ha/year when the pyralid moth *C. cactorum* was released. Infested land had no economic use (Walton, 2005) until a successful biological control project returned land to productivity due to feeding of the larvae of *C. cactorum*, which facilitated attack by local pathogens in damaged tissues. In the 1980s, Patterson's curse (*Echium plantagineum*), which is not grazed by cows or horses, infested 5.2 million ha in Australia (Briese et al., 2004). Its biological control provided benefits of $1.2 billion (from 1972 to 2005) (Paige and Lacey, 2006). In 1996, musk thistle (*Carduus nutans*) infested 1.1 million ha of Australian grassland (Paige and Lacey, 2006). Its subsequent biological control provided $81.3 million in benefits (Paige and Lacey, 2006). Biological control of a 2.8 million ha Scotch thistle (*Onopordum* spp.) infestation provided $18 million in benefits (Paige and Lacey, 2006). For a discussion of the non-target impacts in North America of biological control agents released against thistles that are pests in pastures, see Louda and Potvin (1995), Louda et al. (1997, 2003), Louda (1998), and Rose et al. (2005).

3.2.2. Toxicity or repellency to livestock

Many invasive plants have toxins or structures that directly harm livestock or deter their grazing. Spotted and diffuse knapweeds, yellow starthistle, leafy spurge, Russian knapweed, houndstongue (*Cynoglossum officinale*), tansy ragwort, and St. Johnswort are all toxic or repellent to livestock (Kingsbury, 1964; DiTomaso, 2000). Leafy spurge latex contains ingenols and macrocyclic diterpenes that are toxic and irritating to cattle, which avoid feeding near leafy spurge (Lym and Kirby, 1987; Hohmann et al., 1997). In Montana, cattle avoided grazing in areas with ten percent or greater leafy spurge cover (Hein and Miller, 1992). Russian knapweed and yellow starthistle contain repin, a sesquiterpene lactone that causes mouth ulcers and brain lesions in horses (Cordy, 1978; Robles et al., 1997). St. Johnswort contains hypericin, which causes symptoms ranging from severe dermatitis to hyperthermia when ingested by sheep or cattle (Bourke and White, 2004). Tansy ragwort and houndstongue contain pyrrolizidine alkaloids poisonous to cattle (Baker et al., 1991). In the 1970s along the Oregon coast, dairy herds suffered 2–10% annual losses due to tansy ragwort poisoning (Coombs et al., 1999). Successful biological control of tansy ragwort has reduced associated animal poisonings (Turner and McEvoy, 1995; Coombs et al., 1999).

3.2.3. Conversion of grasslands to other vegetation

Woody invasive species reduce forage production by converting grasslands to shrublands. For example, prickly acacia (*Acacia nilotica* subsp. *indica*) was introduced into grasslands in western Queensland for livestock shade and as reserve forage in droughts. It now infests 6 million ha (Mackey, 1997), displacing native grass species and causing soil erosion (Johnson, 2004). In areas that are heavily infested, it is often uneconomical to reclaim the land, other than by biological control. Several agents have been introduced, including the moth *Chiasmia assimilis*, which is causing large scale defoliation in coastal areas (Palmer et al., 2007), and the bruchid beetle *Bruchidius sahlbergi*, which is widespread and attacks up to 65% of developing seeds (Radford et al., 2001). However, the problem is not yet resolved and further exploration for agents is occurring in India.

3.3. Water from rivers

In drier areas of the world, invasive plants can be a major threat to water supplies from rivers. Among the species contributing most to water loss are invasive riparian plants such as Australian *Acacia* and*Eucalyptus*, northern hemisphere *Pinus*, Asian *Tamarix* (saltcedar) (Nagler et al., 2008; van Wilgen et al., 2008), and European *Arundo donax* (giant reed) (Seawright et al., 2009). Such plants reduce water flow by clogging channels and increase water loses from evapotranspiration. Although the amount of water being lost is debated (Shafroth et al., 2005), Zavaleta (2000) estimated that losses in the western USA from effects of saltcedar on irrigation water, municipal water, hydropower, and flood control were $133–285 million/year. Similarly, Seawright et al. (2009) estimated that $4.75 million worth of water could potentially be saved annually through biological control of giant reed in the lower Rio Grande Valley of Texas. In South Africa, plant invasion models showed that up to 58% of the nation's water could be lost if

invasive plant populations went uncontrolled (van Wilgen et al., 2008), and a massive campaign ('Working for Water') was created to remove invasive trees from water courses. Other management programs to suppress invasive riparian plants exist in North America, Australia, and the Middle East, principally against giant reed and saltcedar (Bell, 1997; Kelly et al., 1998; Csurhes and Edwards, 1998; Williams and West, 2000).

Although cutting, burning, and herbicide applications are commonly used for immediate removal of invasive woody plants, biological control is a key element for effective programs, to slow spread and prevent re-infestation. This is often achieved by releasing agents that lower seed production and/or seedling survival. In some cases, mature plants may be directly affected by biological control agents, as for example defoliation of *Tamarix* spp. by *Diorhabda* chrysomelids in the USA (Carruthers et al., 2008).

South Africa's struggle to protect its water supplies from invasive woody plants is the clearest example of the threat from such invasive plants and the potential role of biological control. Particularly in the mountains of the Western Cape, invasive *Pinus*, *Acacia*, *Hakea*, and *Sesbania* have greatly increased the total plant biomass compared to that of the native vegetation, thus increasing water use. This has led to localized reductions of river outflow of 30-80% (van Wilgen et al., 1992; Le Maitre et al., 1996). These invasive trees were imported mainly for use as timber or ornamentals. In most cases, the public wants these uses to continue. Therefore, biological control agents could not be used to kill mature plants. The goal, rather, was to reduce spread outside of cities and forestry plantations by limiting seed production and/or lowering seedling survival. These effects, combined with mechanical removal of mature trees, allowed plant populations to be suppressed in desired areas, without threatening economic and aesthetic uses of these trees in other areas. To date, no success has been achieved against *Eucalyptus* or *Pinus*. Biological control, however, has been effective against species of *Acacia* and *Sesbania* (Moran et al., 2005), with best success against *Acacia longifolia*, *Acacia saligna*, *Acacia pycnantha*, and *Sesbania punicea* (Hoffmann and Moran, 1998; Dennill et al., 1999). Before its biological control, *A. longifolia* was a top-ranked South African weed. Two biological control agents, the flower-galling pteromalid wasp *Trichilogaster acaciaelongifoliae* and the seed weevil *Melanterius ventralis*, reduced seed production of *A. longifolia* by >95% (Dennill et al., 1999). As existing stands were killed by fires, lack of seed prevented their replacement. *Acacia longifolia* is concentrated along water courses and in the absence of its biological control, this species would have continued to deplete water resources in many catchments.

Sesbania punicea is a leguminous tree from South America that forms dense bands 20–30 m wide along South African rivers. The impact of the tree on water flow was never quantified but it grows where water is plentiful, suggesting strong demand and high transpiration rates. Three beetle species were introduced for its biological control in the 1970s: *Trichapion lativentre*, a bud feeding apionid; *Rhyssomatus marginatus*, a seed-feeding weevil; and *Neodiplogrammus quadrivittatus*, a stem boring weevil (Hoffmann and Moran, 1991). Collectively they curtailed *S. punicea* reproduction and destroyed existing plants. Plant density declined by >95% in most areas and current levels are not problematic (Hoffmann and Moran, 1998). In many regions, stretches of rivers once clogged with *S. punicea* are again open and free flowing (Hoffmann, personal observations).

3.4. Electricity generation

Production of hydroelectric power depends on reliable water flow. Blockage by invasive plants such as waterhyacinth, water lettuce, and giant salvinia, can create flow shortages (Holm et al., 1969; Rørslett, 2006; Liabunya, 2007). Invasive aquatic plants can also increase siltation and detritus build-up, reducing the life of reservoirs (Moorhead et al., 1988; Liabunya, 2007). The Jebel Aulia Dam on the White Nile in Sudan, for example, became clogged by waterhyacinth within 10 years of its invasion (Holm et al., 1969; Beshir and Bennett, 1985). A power station on the Waikato River in New Zealand had to be shut down due to a massive infestation by the invasive submersed plant *Ceratophyllum demersum* (Chapman et al., 1974). Operations of power stations on the Shire River in Malawi were disrupted in the 1990s by floating islands of waterhyacinth, giant salvinia, and water lettuce, which choked intake screens and caused silt build-up at intake ponds. The resulting interruptions in the electrical power supply affected the economy by reducing industrial production (Liabunya, 2007). Similar problems occurred at stations on the Kafue River in Zambia (Chola, 2001) and at Owen Falls in Uganda (Appelgren et al., 2000). Biological control of waterhyacinth, water lettuce, and giant salvinia – the weeds most disruptive to electrical power generation in warm regions – has been achieved in many locations (Table 2) and details of the biological control of these species are presented in the previous section on biodiversity.

3.5. Commercial, recreational, or subsistence fishing or hunting

Wildlands are widely used for harvesting wild fish or game species for commerce, recreation, or subsistence consumption. Invasive species, especially plants, can lower the quality of fish or game habitat, reducing this form of human use of wildlands.

3.5.1. Fishing

Damaging effects of invasive plants on commercial or subsistence fishing are well documented. In Benin (Africa), waterhyacinth infestations interfered with the use of nets and destroyed fish breeding grounds, causing annual losses of $84 million/year (De Groote et al., 2003). After suppression of this invasive plant with biological control, fishing resumed (Ajuonu et al., 2003), and fishermen incomes increased $30.5 million/year (De Groote et al., 2003). In Kenya, the Lake Victoria fishery in the Winam Gulf, with a net worth of $83 billion that supports 15 million people (Opande et al., 2004), was reduced when waterhyacinth blocked fish landing spots, destroyed fishing gear, and interfered with water transportation of the catch (Opande et al., 2004). Biological control of waterhyacinth on Lake Victoria restored economic viability to the fishing industry. In Papua New Guinea, infestations of salvinia prevented fishermen from setting fish nets and fouled nets set in open water (Mitchell, 1981). By 1978, salted fish production from infested areas dropped 30%. Biological control of salvinia cleared plant mats (Thomas and Room, 1986a), permitting fishing to return to normal levels. In the Congo, fishing ceased in salvinia- or water lettuce-infested areas, but resumed after there plants were suppressed by biological control (Mbati and Neuenschwander, 2005).

3.5.2. Hunting

Invasive plants affect game hunting in wild areas by changing forage levels and habitat features. In Idaho, areas infested by yellow starthistle were used 33% less than uninfested areas by chukars (*Alectoris chukar*), a popular game bird (Lindbloom et al., 2004). In the western USA, elk (*Cervus elaphus*) hunting is a popular sport carried out in natural habitats that are now widely invaded by plants such as Russian knapweed, St. Johnswort, leafy spurge, yellow starthistle, and knapweeds (Stalling, 1998). In western Montana, areas dominated by spotted knapweed are not used as major feeding areas by elk, which prefer grasses (Kufeld, 1973). Spotted knapweed-infested areas received only 2% as much elk use as areas with bluebunch wheatgrass (*P. spicata*) (Hakim, 1979). Infestation of elk winter range in Montana by spotted knapweed caused an estimated loss of 220 elk (Spoon et al., 1983). At

$1063 value per animal (Fried et al., 1995), this is an annual loss of $234,000. Similarly, infestation of rangeland with leafy spurge reduced use from bison (*Bison bison*) 83% and from deer by 70% (Trammell and Butler, 1995). Leafy spurge reduced browsing by big game animals in green ash (*Fraxinus pennsylvanica*)-chokecherry (*Prunus virginiana*) habitat by 32% (Trammell and Butler, 1995). Tansy ragwort has very low palatability to black-tailed deer (*Odocoileus hemionus*) (Dean and Winward, 1974). Biological control projects against spotted knapweed, leafy spurge, and tansy ragwort have been successful in many areas (Table 2).

3.6. Water transport

Aquatic invasive plants infesting navigable waterways can impede boat traffic. Waterhyacinth blocked steamboat traffic on the St. John's River in Florida in the late 1800s (Buker, 1982). During this period, steamboats and other craft were unable to reach docks or pass through navigable channels beneath bridges because of waterhyacinth (Zeiger, 1962). Waterhyacinth also interfered with use of seaplanes in the 1940s (Zeiger, 1962). In developing countries where roads may be non-existent, and local people may depend on small boats for their livelihood, trade, or for access to critical services, such blockages of rivers or lakes can be life-threatening. Salvinia infestations have fouled the propellers of small boats (Abbasi and Nipaney, 1986) and damaged their engines (Mitchell, 1980). On the Sepik River in Papua New Guinea, blockages caused by salvinia and waterhyacinth cut off many people's access to villages, schools, market places, as well as to fishing, hunting and gardening grounds, and to locations of administrative and health services. Some people subsisted on dried coconuts because they could not reach fishing areas, or obtain sago palm, or trade for food. Some villages were abandoned (Thomas and Room, 1986b) but were re-occupied after successful biological control of salvinia (Room and Thomas, 1985). Similarly, villages were abandoned in the Congo when waterways were blocked by waterhyacinth (Mbati and Neuenschwander, 2005). In the 1980s, waterhyacinth prevented navigation on the River Niger (Farri and Boroffice, 1999) and in the 1990s, prevented movement of ferries in and out of the port at Mwanza, Tanzania (Mallya, 1999). From 1995 to 1997, police boats based in Kisumu, Kenya could not operate because waterhyacinth infestations blocked their access to the lake. In this same period, waterhyacinth prevented large vessels that transported goods and people between Kenya, Uganda, and Tanzania from docking at the Kisumu Railway Pier, resulting in substantial economic losses (Mailu et al., 1999). Weed clearance to maintain ship passage for docking at Port Bell, Uganda cost US $3–5 million from 1994 to 1997 (Mailu, 2001).

3.7. Recreational land use

Invasive plants can impede outdoor recreation. In Nevada (USA), economic costs of invasive plants on wildlife-related recreation were estimated as $6–12 million/year (Eiswerth et al., 2005). The US National Park Service funds a team in California whose sole function is to remove invasive plants in National Parks. Yellow starthistle, which is toxic to horses (Cordy, 1978), increases the cost of keeping horses for recreation because of the need to keep the weed out of pastures and forage fed to horses. In South Africa, *O. stricta* invaded a large portion of Kruger National Park, used for game viewing. To remove the aesthetic blemish of dense invasive cacti in an otherwise pristine area, substantial funds were spent on an herbicide program, which ultimately failed (Hoffmann et al., 1998). Subsequently, two introduced biological control agents, the pyralid moth *C. cactorum* and the cochineal insect *Dactylopius opuntiae*, reduced the opuntia biomass in the park by >90% (Hoffmann and Moran, 2008).

4. Protecting valuable ecosystem services

In addition to being sources of raw materials for human societies, natural ecosystems perform ecosystem services supporting environmental conditions that are beneficial and sustainable for many species, including humans. Some services are to provide habitat for vertebrate wildlife, protect soils, maintain hydrological, biogeochemical, or fire cycles, and preserve air quality. Some invasive species diminish these services and such changes are often permanent because affected areas are too large or remote for use of pest control approaches other than biological control. Biological control projects against the species discussed below have either been successful or are in progress as discussed above (see also Table 2).

4.1. Maintenance of soils

Invasive species can affect soil attributes, including erosion rate, moisture, salinity, pH, nitrogen availability, tilth, and leaf litter depth. Of these, impacts on erosion, moisture, salinity, and nitrogen levels have been reduced in some instances through biological control of invasive plants and are discussed here.

4.1.1. Soil erosion

Increased rates of soil erosion, often from agriculture or other human use of land, have long been of concern. In general, any change in vegetative cover has potential to change erosion rates. Some accidentally introduced plants accelerate erosion by reducing ground cover, as is the case when grasslands are invaded by shrubs, vines, or forbs. Examples include knapweeds (Lacey et al., 1989; Wilcox et al., 1996) in Montana, and prickly acacia (Mackey, 1997) and rubber vine in Australia (Vogler and Lindsay, 2002). In extreme cases, invasive plants may increase landslides, as does miconia, a shallow rooted tree that replaced native forests on steep slopes in Tahiti (Meyer and Florence, 1996). Conversely, some reductions in soil erosion rates may be biologically undesirable, such as the use of exotic plants to "stabilize" dune systems (e.g., Reckendorf et al., 1985; see also earlier discussions under "Coastal Areas and Sand Dunes"), which harms the unique native biota associated with these high disturbance environments. Restoration of normal erosion rates depends on a return of the habitat to a vegetation cover level similar to that before invasion. Biological control projects are currently making significant progress against knapweeds, rubber vine, and miconia (Table 2).

4.1.2. Increased dryness and salinity

In the southwestern USA, removal of water for irrigation and loss of pulse flooding over river banks (due to dams) have made riparian areas drier and more saline (Glenn and Nagler, 2005). These conditions have been worsened by saltcedar infestations, which are more tolerant of increased groundwater salinity than many local native trees. As local species such as *Populus fremontii* declined (Pataki et al., 2005; Cleverly et al., 1997), saltcedars expanded their ecological dominance in riparian areas in the region. Saltcedar's high water use further increased groundwater salinity (at sites not immediately adjacent to rivers) (Nagler et al., 2008) and depressed native plant recruitment (Sher et al., 2002). Dryness of soil surfaces under saltcedar increased fires, leading to even higher levels of aridity and salinity (Busch and Smith, 1993). Reversing these outcomes will require substantial reductions in saltcedar coverage. Biological control of saltcedar is emerging, with widespread defoliation occurring at sites where agents have been released (Table 2).

In another case, infestation of yellow starthistle have made soils in some California annual grasslands drier, both to a greater depth and longer in the year, than uninfested areas (Enloe et al., 2004).

Reversal of this condition will also depend on the biological control of the invasive plant. Biological control of yellow starthistle is developing and has been successful in some areas (Table 2).

4.1.3. Changes in fertility

Habitats with low soil fertility, such as the fynbos of South Africa, have experienced increased fertility when invaded by nitrogen-fixing plants. Change in soil fertility may facilitate additional invasions and depress native plant growth. In the fynbos, invasion of several *Acacia* species has enhanced soil organic matter and nitrogen levels (Stock et al., 1995). In the Riverlands Nature Reserve in the Western Cape, *A. saligna* stands produced four times the litter fall of pristine fynbos, and acacia litter had twice as much nitrogen per gram as fynbos litter. Levels of nitrogen returned to the soil by the above-ground biomass were 10-fold higher under acacia than fynbos plants (Yelenik et al., 2004). Nitrogen inputs stimulated the growth of invasive native grasses such as *Erharta calycina* (Yelenik et al., 2004) and promoted invasion by exotic grasses (Holmes and Cowling, 1997). Growth of some fynbos species is reduced under elevated nitrogen (Lamb and Klaussner, 1988). In response to threats posed by *A. saligna* to fynbos biodiversity and water outflows from infested catchments, *A. saligna* was controlled with an introduced fungus, *Uromycladium tepperianum* (Saccado), which lowered tree density 87–98% (Wood and Morris, 2007). Five other invasive *Acacia* species have also been targets of biological control in South Africa, with considerable success (Moran et al., 2005), especially against *A. longifolia* and *A. pycnantha*.

4.2. Maintenance of historical hydrological conditions

Some invasive plants have the capacity to alter hydrological conditions, increasing flood crests or diminishing river outflows. Flooding, while damaging at times to human interests, is necessary to create and maintain natural flood-adapted communities along riparian corridors (e.g., Stromberg et al., 1997). As with fire, flood regimes become ecologically problematic if they depart from historical norms. In this regard, the major factor driving change is physical modification of rivers (channelization, bank stabilization, and damming). However, invasive species may also alter flood regimes. Dense stands of giant reed can increase flooding by several mechanisms, including increased stream sedimentation during non-flood periods in rivers and floodway channels, which can decrease channel depth by more than 1 m (Frandsen and Jackson, 1994). Secondly, flood heights can be increased by reduction in flood water velocity as floods push through dense reed stands. Lower velocity can increase sedimentation during floods, further narrowing and clogging channels (Graf, 1980). Thirdly, piles of loose reeds, lodged against bridges and other structures, can increase over-bank flooding (Frandsen and Jackson, 1994). Similar problems are caused by saltcedar in the southwestern USA, where riparian infestations reduce channel width and depth, increasing frequency and severity of flooding (Graf, 1978, 1980; Blackburn et al., 1982). Biological control against giant reed has been initiated (Tracey and DeLoach, 1998), with a gall wasp and an armored scale first released in the Rio Grande River valley in Texas in 2009 (Goolsby, personal communication).

Another effect of invasive plants in dry areas is to reduce discharge volumes of rivers by using more water than the displaced native vegetation. In South Africa's Western Cape, native *Protea* shrubs were displaced by invasive woody trees. These trees increased plant biomass in the mountain fynbos up to 10-fold (Versfeld and van Wilgen, 1986), decreasing river discharge volumes 30-80% (van Wilgen et al., 1992; Le Maitre et al., 1996). This problem has been reduced through successful biological control of several of the most important invasive species (Moran et al., 2005), in combination with manual clearance.

4.3. Conservation of normal fire regimes

Many plant communities have characteristic fire regimes (seasonality, frequency and intensity) that structure community composition and interspecific interactions. Such fire-mediated relationships can be disrupted if invasive plants change the nature of the available fuels, including quantity, spatial distribution, and ignitability (Brooks et al., 2004). Altered fire regimes can in turn dramatically change community structure, composition, or function. Some invasive plants gain a competitive advantage over native plants by their extreme fire tolerance or quick regrowth after fire, creating a positive feedback between invasion and fire. Biological control can help restore fire regimes to historical norms favorable to native plants and insects. Grasses are the invasive plant group that has most changed fire regimes (Brooks and Pyke, 2001), but they have rarely been biological control targets because many invasive grasses are valued as forage, set abundant seed, and regrow quickly after defoliation. Also, many grass-feeding insects are generalists that could pose non-target risks. However, some specialized insects and plant pathogens of grasses are known and with study more will be discovered. Therefore, it is likely that in the future some of the projects against invasive grasses that have been suggested will be carried out. Currently only a few species of grass (e.g., *A. donax* and *Panicum maximum* in the USA and *Nassella* spp. in Australia) are targets of on-going biocontrol projects (Goolsby and Moran, 2009). Here we discuss four fire-altering invasive plants – *Chromolaena odorata*, melaleuca, Old World climbing fern, and gorse – that are targets of biological control projects (Table 2).

Chromolaena odorata is a Neotropical shrub that has become widely invasive in the Old World. In areas with a distinct dry season, *C. odorata* increases the fire hazard because its dry pithy stems and leaves contain oils and increase fuel loads (McFadyen, 2004). In South Africa, the plant grows along forest margins, replacing vegetation of low flammability, and allows fires to penetrate the forest. Two biotypes of *C. odorata* have invaded different countries. The biotype in Asia has been substantially controlled in Papua New Guinea (Day and Bofeng, 2007) and East Timor (Zachariades et al., 2009; Day, personal communication) by the gall fly *Cecidochares connexa*. Natural enemy releases in South African against another biotype have resulted in establishment, but control has not yet occurred (Zachariades et al., 2009).

Melaleuca has invaded swamp and marsh habitats in southern Florida. Dense stands increase fuel loads and fire intensity. In pine and cypress habitats, melaleuca litter and standing trees can change ground fires into canopy fires that kill native pines and cypress (Wade, 1981). Loss of these dominant native tree species, coupled with high survival of older melaleuca and intense post-fire melaleuca seeding (Hofstetter, 1991), produces melaleuca monocultures. Similarly, the slower decomposition of melaleuca litter (compared to grass) raises fuel loads in sawgrass marshes, increasing fire intensity (Flowers, 1991). Increased fire, coupled with structural and vegetative conversion, has greatly changed these native plant communities (Serbesoff-King, 2003). Biological control agents, together with cutting and use of herbicides, have controlled melaleuca in Florida, as discussed earlier in the biodiversity section (see also Table 2).

Old World climbing fern is invasive in many habitats in south Florida, where it forms thick skirts of dead fronds around tree trunks. These flammable skirts can carry ground fires into tree canopies. Trees that could withstand ground fires (normal to the region) are killed by such canopy fires. The wet soils of cypress sloughs naturally cause ground fires to die out at slough margins. But fern-coated trees draw fire into cypress stands when burning debris kites from tree to tree, bringing fire effects into new communities (Pemberton and Ferriter, 1998). Biological control of this fern is developing (Boughton and Pemberton, 2009) (Table 2).

Gorse is a spiny European shrub that is a major invasive plant in Australia, western North America, Hawaii, New Zealand, and Chile, forming flammable thickets. Gorse quickly regrows after fire (Reyes et al., 2009), and seeds germinate from a long-lived seed bank. In Chile, gorse fires now occur in areas where fires were rarely started naturally by lightning and are most common between 36°S and 42 °S latitude (Maldonado, 2006), a world biodiversity 'hotspot' (Arroyo et al., 2004).

4.4. Air pollution reduction

In dry-land cropping areas, invasive plants in fallow fields can increase the need for tillage, which produces wind-blown soil. Tumbleweeds (*Salsola* spp.) have this effect in the wheat areas of eastern Washington (USA) and surrounding states (Young, 2006). The fine soil particles (<10 μm) produced are considered an air pollutant by the US-EPA (Sharratt and Lauer, 2006; Sharratt et al., 2007). Similar problems from *Salsola* occur in the San Joaquin Valley, California (http://www.arb.ca.gov/research/aaqs/pm/pm.htm). Biological control of *Salsola* is in progress (Smith, 2005; Smith et al., 2009; see also Table 2).

Air quality can also be lowered by allergenic pollens of invasive plants. Parthenium weed is a potent allergen (McFadyen, 1995). Although contact dermatitis is the greater problem, wind-borne parthenium pollen causes allergic rhinitis or nasobronchial allergy (Towers and Subba Rao, 1992; Agarwal and D'Souza, 2009). Biological control in Australia and India has succeeded in lowering flowering 40–82% at two study locations (Dhileepan, 2001; Dhileepan and Strathie, 2009).

4.5. Provision of habitat for vertebrate wildlife

Native plants provide essential food and habitat for native vertebrates, and invasive plants may displace essential species. While invasive plants sometimes are used by native wildlife, more often they lower wildlife habitat quality. Invasive insects may greatly reduce densities of particular plants. If these are foundation or keystone species, their loss may affect dependent wildlife.

4.5.1. Loss of food

Reduction in availability of wildlife food is a common effect of many invasive plants because they convert diverse plant communities into weed monocultures. The effects of spotted knapweed, leafy spurge, and tansy ragwort on ungulates in western North America were discussed previously. In Queensland, dense infestations of rubber vine along rivers are largely empty of native birds (Bengsen and Pearson, 2006), and rubber vine leaf litter is avoided by native lizards in preference to litter of native trees (Valentine et al., 2007). In North American wetlands, purple loosestrife has reduced food availability for amphibians (Brown et al., 2006). When cattails (*Typha* spp.) are replaced by loosestrife, tannin (which reduces digestibility) concentration in detritus increases, and algae found on submerged macrophyte stems shift from green algae (e.g., *Spirogyra*) toward less palatable blue green groups (e.g., *Oscillatoria*). In combination, these effects reduce performance of native amphibians such as the toad *Bufo americanus* (Brown et al., 2006).

4.5.2. Lower habitat quality

When invasive plants cause physical restructuring of communities or large vegetative changes, wildlife habitat quality is likely to decline. Invasion of subtropical riparian forests in Texas and southern California by giant reed caused a shift in structure from open forests to dense cane stands of little value to wildlife. In southern California, giant reed invasion affected birds most strongly, including the federally endangered bird *Vireo bellii pusillus* (Bell, 1997). Giant reed has the potential to dry up small desert rivers and its invasion of the Cuatro Ciénegas basin in northern Mexico threatens both the endemic darter *Etheostoma segrex* (Hendrickson and McGaugh, 2005) and rare freshwater microbial stromatolites (Garcia-Pichel et al., 2004).

In northern Australia, the invasion of *M. pigra* caused widespread loss of sedgelands, paperbark forests, lakes, and channels. In place of a floristic mosaic of structurally diverse habitats, *M. pigra* created a uniform shrubland of low biodiversity. Birds and lizards declined in response to this habitat change (Braithwaite et al., 1989). Loss of sedgelands affected the magpie goose (*Anseranas semipalmata*) and the brolga (*Grus rubicunda*). Loss of wet forests affected sacred ibis (*Threskiornis aethiopicus*), royal spoonbill (*Platalea regia*), and the rufous owl (*Ninox rufa*).

In South Africa, invasion by *C. odorata* around Lake St. Lucia (a World Heritage Site) lowered the temperature of soils used for nesting by Nile crocodiles (*Crocodylus niloticus*), unbalancing hatchling sex-ratio and threatening the species' persistence at the site (Leslie and Spotila, 2001).

In Chile, gorse invasions of native rainforests and grasslands have caused habitat loss for Darwin's fox, *Pseudalopex fulvipes*, one of the world's most endangered canids and for "Monito del monte" (*Dromiciops gliroides*), the only living representative of the marsupial order Microbiotheria, found in *Nothofagus* rainforest and *Chusquea* bamboo (CONAMA, 2009).

4.5.3. Effects of invasive insects

Insect invasions, unlike plant invasions that add a new dominant species, typically remove or degrade one or several native plants. The largest impacts of invasive insects are usually on their host plant and its monospecific herbivorous insects. Effects on vertebrates, however, may sometimes occur if the affected plants are keystone species with no functional substitute available. For example, loss of hemlock in the Appalachian Mts. (USA) due to hemlock woolly adelgid reduced native brook trout (*Salvelinus fontinalis*) density by as much 67% in parts of the Delaware Water Gap (Ross et al., 2003). In some instances, invasive insects may affect native vertebrates via mechanisms other than killing native plants. In New Zealand, invasive wasps (*Vespula* spp.) consumed honeydew deposits of native scales on southern beech (*Nothofagus* sp.), which formerly were an important food for bell birds, tuis and stichbirds (Beggs, 2001). *Sphecophaga vesparum*, a parasitoid of yellow jacket brood, was introduced but did not lower yellow jacket density (Beggs et al., 2008).

5. Integration of biological control into comprehensive wildland invasive species management

As illustrated by the case studies reviewed here, classical biological control is a powerful tool that can potentially resolve many invasive plant and insect problems in natural ecosystems. However, not all invasive species problems will be amenable to biological control, and the use of natural enemies should not be viewed as a panacea for unwanted exotic species. In some cases, effective agents may not be available, or agents may lack adequate specificity, especially if the targeted invasive species has many native congeneric relatives in the invaded area. In such cases, non-target risks may be too great to warrant the release of additional exotic species

Several other factors affect biological control's use in management plans. In some instances, several invasive species may all require control, such as groups of similar invasive plants. In such cases, biological control of one invader by itself may be insufficient to achieve a community's ecological restoration because a different resident weed may increase as the targeted species declines. In aquatic systems for example, waterhyacinth, water lettuce and giant salvinia may all be present in the same region. Biological control of just one member of the invasive floating-plant guild may

lead to eruption of another invader that was formerly out-competed for control of space or resources by the dominant invader.

In other cases, a target plant may have uses society wishes to retain. Invasive wattles, acacias, and pines in South Africa are desired for their timber, beauty and shade, and biological control can only target their flowers and seeds in order to reduce their spread into natural ecosystems. In such cases, combining a biological control program against reproductive structures and seedlings with mechanical elimination of mature plants (by cutting and application of herbicides) may be necessary to suppress the invasive plant in wildlands.

More complex cases may arise if basic ecological processes have been damaged or terminated in ways that reduce the competitive abilities of native plants in the community. In dam-controlled desert river systems, loss of pulse flooding through controlled water releases may greatly reduce seedling establishment of native plants such as cottonwoods and willows that are needed as competitors in order to reduce invaders such as saltcedar. In such cases, biological control of saltcedar by itself may be inadequate for ecosystem restoration, and altered water management to allow floods and deliberate planting of native trees may be needed to recreate riparian able to sustain native biodiversity. Such programs may combine habitat management, biological control, and mechanical or chemical control.

6. Conclusions

Classical biological control is a powerful tool for suppression of invasive plants and insects in natural ecosystems. It will play an increasingly important part in ecological restoration because it provides a means to permanently suppress invaders over large landscapes without long-term resource commitments and hence is sustainable. As such, it merits use against many invasive plants and insects that are environmental pests in sensitive landscapes. Biological control efforts that are part of ecological restoration projects should set goals in concert with conservation biologists and ecologists and define the changes sought in the damaged native community. These goals should be unambiguous, peer-reviewed, and published in the public domain. As biological control projects unfold, monitoring of changes in pest density, together with responses of native species, particularly the non-target taxa identified as potentially at risk, should be carried out to quantify and document the program's effects (Morin et al., 2009). There should be a clear commitment to measure if and to what degree the target pest's density or range changes, and if native biodiversity is improved as a direct result of a given biological control project. Since population changes and community responses induced by biological control programs often require long periods (5–20 years) to reach stable end points, governments and other participating groups must be advised accordingly and projects must be planned and funded to cover such time periods. When carried out in this comprehensive manner, biological control of invasive plants and insects holds great promise for safeguarding biodiversity and wildlands, preserving and restoring ecosystem services and protecting valued natural resources.

References

Abbasi, S.A., Nipaney, P.C., 1986. Infestation of the fern genus *Salvinia*: its status and control. Environmental Conservation 13, 235–241.

Adair, R.J., 2005. The biology of *Dasineura dielsi* Rübsaamen (Diptera: Cecidomyiidae) in relation to the biological control of *Acacia cyclops* (Mimosaceae) in South Africa. Australian Journal of Entomology 44, 446–456.

Agarwal, K.K., D'Souza, M., 2009. Airborne contact dermatitis induced by parthenium: a study of 50 cases in South India. Clinical and Experimental Dermatology 34, E4–E6.

Ajuonu, O., Neuenschwander, P., 2003. Release, establishment, spread and impact of the weevil *Neohydronomus affinis* (Coleoptera: Curculionidae) on water lettuce (*Pistia stratiotes*) in Bénin, West Africa. African Entomology 11, 205–211.

Ajuonu, O., Schade, V., Veltman, B., Sedjro, K., Neuenschwander, P., 2003. Impact of the weevils *Neochetina eichhorniae* and *N. bruchi* (Coleoptera: Curculionidae) on waterhyacinth, *Eichhornia crassipes* (Pontederiaceae), in Benin, West Africa. African Entomology 11, 153–161.

Allen, E.B., 1982. Water and nutrient competition between *Salsola kali* and two native grass species (*Agropyron smithii* and *Bouteloua gracilis*). Ecology 63, 732–741.

Appelgren, B., Klohn, W., Alam, U., 2000. Water and Agriculture in the Nile Basin. Nile Basin Initiative Report to ICCON. Food and Agriculture Organization of the United Nations, Land and Water Division, Rome, Italy.

Anonymous, 1999. Mistflower *Ageratina riparia*. Auckland Regional Council Pest Facts Sheet No. 46. Available from: <http://www.arc.govt.nz/arc/library/c28786_2.pdf/>.

Anonymous, 2000. Harvesters get that sinking feeling. Biocontrol News and Information 21, 1N–8N.

Anonymous, 2004. Forest Insect and Disease Conditions in the United States 2003. United States Department of Agriculture, Forest Service, Forest Health Protection, p. 89.

Anonymous, 2009. Scrubwood regeneration website: <http://home.swipnet.se/~w-17282/endemic/scrubwood.html/> (accessed 23.06.09).

Arroyo, M.T.K., Marquet, P., Marticorena, C., Simonetii, J., Cavieres, L., Squeo, F.A., Rozzi, R., 2004. Chilean winter rainfall – Valdivian forests. In: Mittermeier, R.A., Robles Gil, P., Hoffmann, M., Pilgrim, J., Brooks, T., Goettsch, C., Lamoreux, J., Fonseca, G.A.B. (Eds.), Hotspots Revisited. CEMEX, México, pp. 99–103.

Ashmole, N.P., Ashmole, M.J., 1997. The land fauna of Ascension Island: new data from caves and lava flows, and a reconstruction of the prehistoric ecosystem. Journal of Biogeography 24, 549–589.

Austin, D.F., 1978. Exotic plants and their effects in southeastern Florida. Environmental Conservation 5, 25–34.

Ayres, D.R., Smith, D.L., Zaremba, K., Klohr, S., Strong, D.R., 2004. Spread of exotic cordgrasses and hybrids (*Spartina* sp.) in the tidal marshes of San Francisco Bay, California, USA. Biological Invasions 6, 221–231.

Badenes-Perez, F.R., Alfaro-Alpizar, M.A., Castillo-Castillo, A., Johnson, M.T., 2007. Biological control of *Miconia calvescens* with a suite of insect herbivores from Costa Rica and Brazil. In: Julien, M.H., Sforza, R., Bon, M.C., Evans, H.C., Hatcher, P.E., Hinz, H.L., Rector, B.G. (Eds.), Proceedings of the XII International Symposium of Biological Control of Weeds, La Grande Motte, France, 22–27 April, 2007. CAB International, Wallingford, UK, pp. 129–132.

Bailey, J., Schweitzer, J., Whitham, T., 2001. Saltcedar negatively effects biodiversity of aquatic macroinvertebrates. Wetlands 21, 442–447.

Baker, D.C., Pfister, J.A., Molyneux, R.J., Kechele, P., 1991. *Cynoglossum officinale* toxicity in calves. Journal of Comparative Pathology 104, 403–410.

Baker, J.L., Webber, A.P., 2008. Feeding impacts of a leafy spurge (*Euphorbia esula*) biological control agent on a native plant, *Euphorbia robusta*. Invasive Plant Science and Management 1, 26–30.

Balciunas, J.K., Grodowitz, M.J., Cofrancesco, A.F., Shearer, J.F., 2002. Hydrilla. In: Van Driesche, R., Blossey, B., Hoddle, M., Lyon, S., Reardon, R. (Eds.), Biological Control of Invasive Plants in the Eastern United States. FHTET-2002-04, United States Department of Agriculture, Forest Service, Morgantown, West Virginia, USA, pp. 91–114.

Baldini, A., Oltremari, J., Holmgren, A., 2007. Effect of *Cinara cupressi* (Hemiptera: Aphididae) on Cordinellran cypress (*Austrocedrus chilensis*) after applying a chemical control. Ciencia e Investigación Agraria 35 (3), 289–298.

Bangsund, D.A., Leistritz, F.L., Leitch, J.A., 1999. Assessing economic impacts of biological control of weeds: the case of leafy spurge in the northern Great Plains of the United States. Journal of Environmental Management 56, 35–43.

Barton, J., Fowler, S.V., Gianotti, A.F., Winks, C.J., Beurs, M.D., Arnold, G.C., Forrester, G., 2007. Successful biological control of mist flower (*Ageratina riparia*) in New Zealand: agent establishment, impact and benefits to the native flora. Biological Control 40, 370–385.

Bateman, H.L., Chung-MacCoubrey, A., Snell, H., 2008. Impact of non-native plant removal on lizards in riparian habitats in the southwestern United States. Restoration Ecology 16, 180–190.

Bauer, L.S., Liu, H., Gould, J.R., Reardon, R.C., 2007. Progress on biological control of the emerald ash borer in North America. Biocontrol News and Information 28 (3), 51N–54N.

Baylis, J., Makungwa, S., Hecht, J., Nagoma, D., Bruessow, C., 2007. Saving the island in the sky: the plight of the Mount Mulanje cedar, *Widdringtonia whytei* in Malawi. Oryx 41 (1), 64–69.

Beardsley, J.W., 1955. Fluted scales and their biological control in United States administered Micronesia. Proceedings of the Hawaiian Entomological Society 15, 391–399.

Beggs, J., 2001. The ecological consequences of social wasps (*Vespula* spp.) invading an ecosystem that has an abundant carbohydrate resource. Biological Conservation 99, 17–28.

Beggs, J.R., Rees, J.S., Toft, R.J., Dennis, T.E., Barlow, N.D., 2008. Evaluating the impact of a biological control parasitoid on invasive *Vespula* wasps in a natural forest ecosystem. Biological Control 44, 399–407.

Bell, G.P., 1997. Ecology and management of *Arundo donax*, and approaches to riparian habitat restoration in southern California. Available from: <http://teamarundo.org/ecology_impacts/arundo_ecology.pdf/>.

Ben-Dov, Y., Miller, D.R., Gibson, G.A.P., 2009. ScaleNet, *Icerya purchasi*, 12 August 2009. Available from: <http://www.sel.barc.usda.gov/catalogs/margarod/Iceryapurchasi.htm/>.

Bengsen, A.J., Pearson, R.G., 2006. Examination of factors potentially affecting riparian bird assemblages in a tropical Queensland savanna. Ecological Management and Restoration 7, 141–144.

Beshir, M.O., Bennett, F.D., 1985. Biological control of waterhyacinth on the White Nile, Sudan. In: Delfosse, E.S. (Ed.), Proceedings of the VI International Symposium on Biological Control of Weeds. Agriculture Canada, Ottawa, Canada, pp. 491–496.

Blackburn, W.H., Knight, R.W., Schuster, J.L., 1982. Saltcedar influence on sedimentation in the Brazos River. Journal of Soil and Water Conservation 37, 298–301.

Blossey, B., Nuzzo, V., Hinz, H., Gerber, E., 2001a. Developing biological control of *Alliaria petiolata* (M. Bieb.) Cavara and Grande (garlic mustard). Natural Areas Journal 21, 357–367.

Blossey, B., Skinner, L.C., Taylor, J., 2001b. Impact and management of purple loosestrife (*Lythrum salicaria*) in North America. Biodiversity and Conservation 10, 1787–1807.

Boettner, G.H., Elkinton, J.S., Boettner, C.J., 2000. Effects of a biological control introduction on three nontarget native species of saturniid moths. Conservation Biology 14, 1798–1806.

Booth, R.G., Cross, A., Fowler, S.V., Shaw, R.H., 1995. The biology and taxonomy of *Hyperaspis pantherina* (Coleoptera: Coccinellidae) and the classical biological control of its prey, *Orthezia insignis* (Homoptera: Ortheziidae). Bulletin of Entomological Research 85, 307–314.

Boughton, A.J., Pemberton, R.W., 2009. Establishment of an imported natural enemy, *Neomusotima conspurcatalis* (Lepidoptera; Crambidae) against an invasive weed, Old World climbing fern, *Lygodium microphyllum*, in Florida. Biocontrol Science and Technology 19, 769–772.

Bourke, C.A., White, J.G., 2004. Reassessment of the toxicity of *Hypericum perforatum* (St. John's wort) for cattle. Australian Veterinary Journal 82, 707–710.

Braithwaite, R.W., Lonsdale, W.M., Estbergs, J.A., 1989. Alien vegetation and native biota in tropical Australia: the impact of *Mimosa pigra*. Biological Conservation 48, 189–210.

Brancatini, V.A., Sands, D.P.A., 1997. Control or no control of breadfruit mealybug (*Icerya aegyptiaca*): selecting the "right" species of *Rodolia*. In: Waterhouse, D.F., Ferrar, P. (Eds.), Second Workshop on Biological Control in the Pacific at Nadi, Fiji in 1995. South Pacific Commission, Noumea, New Caledonia, p. 56.

Brandt, C.A., Rickard, W.H., 1994. Alien taxa in the North American shrub-steppe four decades after cessation of livestock grazing and cultivation agriculture. Biological Conservation 68, 95–105.

Briese, D.T., 1997. Biological control of St. John's wort: past, present and future. Plant Protection Quarterly 12 (2), 73–80.

Briese, D.T., Pettit, W.J., Walker, A., 2004. Evaluation of the biological control agent, *Lixus cardui*, on *Onopordum* thistles: experimental studies on agent demography and impact. Biological Control: Theory and Application in Pest Management 31 (2), 165–171.

Brisbin, R.L., 1970. Eastern Hemlock. U.S. Department of Agriculture, Forest Service. American Woods – FS-239. Washington, DC, 8 pp.

Brooks, M.L., Pyke, D.A., 2001. Invasive plants and fire in the deserts of North America. In: Galley, K.E.M., Wilson, T.P. (Eds.), Proceedings of the Invasive Plant Workshop: The Role of Fire in the Control and Spread of Invasive Species. Tall Timbers Research Station, Tallahassee, FL, pp. 1–14.

Brooks, M.L., D'Antonio, C.M., Richardson, D.M., Grace, J.B., Keeley, J.E., DiTomaso, J.M., Hobbs, R.J., Pellant, M., Pyke, D., 2004. Effects of invasive alien plants on fire regimes. BioScience 54, 677–688.

Brown, C.J., Blossey, B., Maerz, J.C., Joule, S.J., 2006. Invasive plant and experimental venue affect tadpole performance. Biological Invasions 8, 327–338.

Buckingham, G.R., 2002. Alligatorweed. In: Van Driesche, R., Blossey, B., Hoddle, M., Lyon, S., Reardon, R. (Eds.), Biological Control of Invasive Plants in the Eastern United States. FHTET-2002-04, United States Department of Agriculture, Forest Service, Morgantown, West Virginia, USA, pp. 5–15.

Buisson, E., Holl, K.D., Anderson, S., Corcket, E., Hayes, G.F., Torre, F., Peters, A., Dutoit, T., 2006. Effects of seed source, topsoil removal, and plant neighbor removal on restoring California coastal prairies. Restoration Ecology 14, 569–577.

Buker, G.E., 1982. Engineers vs. Florida's green menace. The Florida Historical Quarterly 60, 413–427.

Busch, D.E., Smith, S.D., 1993. Effects of fires on water and salinity relations of riparian woody taxa. Oecologia 94, 186–194.

Cagnotti, C., Mc Kay, F., Gandolfo, D., 2007. Biology and host specificity of *Plectonycha correntina* Lacordaire (Chrysomelidae), a candidate for the biological control of *Anredera cordifolia* (Tenore) Steenis (Basellaceae). African Entomology 15, 300–309.

Calderon Alvarez, C., 2002. Evaluación de la Eficací a de *Rodolia cardinalis* (Mulsant) (Coleoptera: Coccinellidae) en el Control Biológico de *Icerya purchasi* Maskell (Homptera: Margarodidae) en las Islas Galápagos. Tésis de grado. Pontifica Universidad Javeriana, Faculdad de Estudios Ambientales y Rurales, Bogota, Colombia.

Callaway, J.C., Josselyn, M.N., 1992. The introduction and spread of smooth cordgrass (*Spartina alterniflora*) in South San Francisco Bay. Estuaries 15, 218–226.

Callaway, R.M., Cipollini, D., Barto, K., Thelen, G.C., Hallett, S.G., Prati, D., Stinson, K., Klironomos, J., 2008. Novel weapons: invasive plant suppresses fungal mutualists in America but not in its native Europe. Ecology 89, 1043–1055.

Caltagirone, L.E., Doutt, R.L., 1989. The history of the vedalia beetle importation to California and its impact on the development of biological control. Annual Review of Entomology 34, 1–16.

Campbell, F.T., Schlarbaum, S.E., 1994. Fading forests: North American trees and the threat of exotic pests. Natural Resource Defense Council Report, 47 pp.

Campbell, F.T., Schlarbaum, S.E., 2002. Fading Forests II. Trading Away North America's Natural Heritage. University of Tennessee, Knoxville, Tennessee, USA.

Campbell, R.W., Sloan, R.J., 1977. Forest stand responses to defoliation by the gypsy moth. Forest Science Monograph No. 19, 34 pp.

Carruthers, R.I., DeLoach, C.J., Herr, J., Anderson, G.L., Knutson, A.E., 2008. Saltcedar areawide pest management in the Western United States. In: Koul, O., Cuperus, G., Elliott, N. (Eds.), Areawide Pest Management: Theory and Practice. CABI, Cambridge, UK, pp. 271–299.

Casagrande, R.A., Dacey, J., 2007. Monarch butterfly oviposition on swallow-wort (*Vincetoxicum* spp.). Environmental Entomology 36, 631–636.

Causton, C.E., 2001. Dossier on *Rodolia cardinalis* Mulsant (Coccinellidae: Cocinellinae), a potential biological control agent for the cottony cushion scale, *Icerya purchasi* Maskell (Margarodidae). Charles Darwin Research Station, Galápagos Islands.

Causton, C.E., 2003. Ensuring compatibility of biological control of *Icerya purchasi* Maskell with conservation in Galapagos: development of procedure to evaluate risk. In: Van Driesche, R.G. (Ed.), Proceedings of the First International Symposium for the Biological Control of Arthropods. 14–18 January 2002, Honolulu, HI. FHTET-03-05, USDA-FS, Morgantown, WV, pp. 448–457.

Causton, C.E., Lincango, M.P., Poulsom, T.G.A., 2004. Feeding range studies of *Rodolia cardinalis* (Mulsant), candidate biological control agent of *Icerya purchasi* Maskell in the Galápagos Islands. Biological Control 29, 315–325.

Causton, C.E., Peck, S.B., Sinclair, B.J., Roque-Albelo, L., Hodgson, C.J., Landry, B., 2006. Alien insects: threats and implications for the conservation of the Galápagos Islands. Annals Entomological Society America 99, 121–143.

Cave, R.D., 2008. Biological control of the Mexican bromeliad weevil. Biocontrol News and Information 29, 1N–2N.

Center, T.D., Hill, M.P., Cordo, H., Julien, M.H., 2002. Waterhyacinth. In: Van Driesche, R., Blossey, B., Hoddle, M., Lyon, S., Reardon, R. (Eds.), Biological Control of Invasive Plants in the Eastern United States. FHTET-2002-04, United States Department of Agriculture, Forest Service, Morgantown, West Virginia, USA, pp. 41–64.

Center, T.D., Pratt, P.D., Tipping, P.W., Rayamajhi, M.B., Van, T.K., Wineriter, S.A., Dray Jr., F.A., 2007. Initial impacts and field validation of host range for *Boreioglycaspis melaleucae* Moore (Hemiptera: Psyllidae), a biological control agent of the invasive tree *Melaleuca quinquenervia* (Cav.) Blake (Myrtales: Myrtaceae: Leptospermoideae). Environmental Entomology 36, 569–576.

Chapman, V.J., Brown, J.M.A., Carr, J.L., 1974. Biology of excessive weed growth in the hydro-electric lakes of the Waikato River, New Zealand. Hydrobiologia 44, 349–363.

Cheah, C.A., McClure, M.S., 1998. Life history and development of *Pseudoscymnus tsugae* (Coleoptera: Coccinellidae), a new predator of the hemlock woolly adelgid (Homoptera: Adelgidae). Environmental Entomology 27, 1531–1536.

Chola, P., 2001. Management of aquatic weeds on the Kafue river in Zambia. In: Proceedings of the 27th WEDC Conference, Lusaka, Zambia, pp. 381–382.

Cleverly, J.R., Smith, S.D., Sala, A., Devitt, D.A., 1997. Invasive capacity of *Tamarix ramosissima* in a Mojave Desert floodplain: the role of drought. Oecologia 111, 12–18.

Cline, D., Juricek, C., Lym, R.G., Kirby, D.R., 2008. Leafy spurge (*Euphorbia esula*) control with *Aphthona* spp. affects seedbank composition and native grass reestablishment. Invasive Plant Science and Management 1, 120–132.

Coetzee, J.A., Hill, M.P., Julien, M.H., Center, T.D., Cordo, H.A., 2009. *Eichhornia crassipes* (Mart.) Solms-Laub. (Pontederiaceae). In: Muniappan, R., Reddy, G.V., Raman, A. (Eds.), Biological Control of Tropical Weeds using Arthropods. Cambridge University Press, New York, NY, pp. 183–210.

CONAMA, 2009. Corporación Nacional del Medio Ambiente website. Available from: <http://www.conama.cl/> (accessed June 2009).

Connor, J.M., 2003. Impacts of invasive species on rangelands. Proceedings California Weed Science Society 55, 26–31.

Cook, G.D., Setterfield, S.A., Maddison, J.P., 1996. Shrub invasion of a tropical wetland: implications for weed management. Ecological Applications 6, 531–537.

Coombs, E.M., Radtke, H., Isaacson, D.L., Synder, S.P., 1996. Economic and regional benefits from the biological control of tansy ragwort, *Senecio jacobaea*, in Oregon. In: Moran, V.C., Hoffman, J.H. (Eds.), Proceedings of the IX International Symposium on Biological Control of Weeds, 19–26 January 1996, Stellenbosch, South Africa. University of Cape Town, Cape Town, South Africa, pp. 489–494.

Coombs, E.M., McEvoy, P.B., Turner, C.E., 1999. Tansy ragwort. In: Sheley, R.L., Petroff, J.K. (Eds.), Biology and Management of Noxious Rangeland Weeds. Oregon State University Press, Corvallis, pp. 389–400.

Coombs, E.M., Clark, J.K., Piper, G.L., Cofrancesco Jr., A., 2004. Biological Control of Invasive Plants in the United States. Oregon State University Press, Corvallis. 467 pp..

Cooper, W.P., Rieske, L.K., 2007. Community associates of an exotic gallmaker, *Dryocosmus kuriphilus* (Hymenoptera: Cynipidae), in eastern North America. Annals of the Entomological Society of America 100, 236–244.

Coppel, H.C., Mertins, J.W., Harris, J.W.E., 1974. The introduced pine sawfly, *Diprion similis* (Hartig) (Hymenoptera: Diprionidae). A review with emphasis on studies in Wisconsin. University of Wisconsin, Research Division, Research Bulletin R2393, 74 pp.

Cordy, D.R., 1978. *Centaurea* species and equine nigropallidal encephalomalacia. In: Keeler, R.F., Van Kampen, K.R., James, L.F. (Eds.), Effects of Poisonous Plants on Livestock. Academic Press, New York, pp. 327–336.

Cornett, M.W., Bauman, P.J., Breyfogle, D.D., 2006. Can we control leafy spurge? Adaptive management and the recovery of native vegetation. Ecological Restoration 24, 145–150.

Coulson, J.R. 1977. Biological control of alligatorweed, 1959–1972. A review and evolution. ARS-USDA Technical Bulletin No. 1547, 98 pp.
Courant, A.V., Holbrook, A.E., Van Der Reijden, E.D., Chew, F.S., 1994. Native pierine butterfly (Pieridae) adapting to naturalized crucifer? Journal of the Lepidopterists' Society 48, 168–170.
Cox, G.W., 1999. Alien Species in North America and Hawaii. Impacts on Natural Ecosystems. Island Press, Washington, DC.
Cronk, Q.C.B., 1980. Extinction and survival in the endemic vascular flora of Ascension Island. Biological Conservation 17, 207–219.
Cronk, Q.C.B., 1989. The past and present vegetation of St. Helena. Journal of Biogeography 16, 47–64.
Csurhes, S., Edwards, R., 1998. Potential environmental weeds in Australia. National Weeds Program, Biodiversity Group, Environment Australia, Canberra, 205 pp.
Cuda, J.P., Ferriter, A.P., Manrique, V., Medal, J.C. (Eds.), 2006. Interagency Brazilian peppertree (*Schinus terebinthifolius*) Management Plan for Florida, second ed. Recommendations from the Brazilian Peppertree Task Force, Florida Exotic Pest Plant Council. South Florida Water Management District, West Palm Beach, FL. Available from: <http://www.fleppc.org/Manage_Plans/2006BPmanagePlan5.pdf/>.
Cuda, J.P., Medal, J.C., Gillmore, J.L., Habeck, D.H., Pedrosa-Macedo, J.H., 2009. Fundamental host range of *Pseudophilothrips ichini* sensu lato (Thysanoptera: Phlaeothripidae), a candidate biological control agent of *Schinus terebinthifolius* (Sapindales: Anacardiaceae) in the USA. Environmental Entomology 38, 1642–1652.
Cuming, F.G., 1961. The distribution, life history, and economic importance of the winter moth, *Operophtera brumata* (L.) (Lepidoptera: Geometridae) in Nova Scotia. Canadian Entomologist 93, 135–142.
Daehler, C.C., Strong, D.R., 1996. Status, prediction and prevention of introduced cordgrass *Spartina* spp. invasions in Pacific estuaries, USA. Biological Conservation 78, 51–58.
Davenport, D.C., Martin, P.E., Hagan, R.M., 1982. Evapotranspiration from riparian vegetation: conserving water by reducing saltcedar transpiration. Journal of Soil and Water Conservation 37 (4), 237–239.
Davies, J.T., Ireson, J.E., Allen, G.R., 2007. The impact of the gorse spider mite, *Tetranychus lintearius*, on the growth and development of gorse, *Ulex europaeus*. Biological Control 41, 86–93.
Davis, A.S., Landis, D.A., Nuzzo, V., Blossey, B., Gerber, E., Hinz, H.L., 2006. Demographic models inform selection of biocontrol agents for garlic mustard (*Alliaria petiolata*). Ecological Applications 16, 2399–2410.
Day, M.D., Wiley, C.J., Playford, J., Zalucki, M.P., 2003. Lantana: Current Management Status and Future Prospects. ACIAR, Canberra. 128 pp.
Day, M.D., Bofeng, I., 2007. Biocontrol of *Chromolaena odorata* in Papua New Guinea. In: Lai, P.-Y., Reddy, G.V.P., Muniappan, R. (Eds.), Proceedings of the 7th International Workshop on the Biological Control and Management of *Chromolaena odorata* and *Mikania micrantha*. National Pingtung University of Science and Technology, Taiwan, pp. 53–67.
Day, M.D., Zalucki, M.P., 2009. *Lantana camara* Linn. (Verbenaceae). In: Muniappan, R., Reddy, G.V.P., Raman, A. (Eds.), Biological Control of Tropical Weeds Using Arthropods. Cambridge University Press, Cambridge, UK, pp. 211–246.
Day, R., Kairo, M.T.K., Abraham, Y.J., Kfir, R., Murphy, S.T., Mutitu, K.E., Chilima, C.Z., 2003. Homopteran pests of conifers. In: Neuenschwander, P., Borgemeister, C. (Eds.), Biological Control in IPM Systems in Africa. CAB International, Wallingford, pp. 101–112.
Dean, R.E., Winward, A.H., 1974. An investigation into the possibility of tansy ragwort poisoning of black-tailed deer. Journal of Wildlife Diseases 10, 166–169.
DEC, 2006. NSW Threat Abatement Plan: Invasion of Native Plant Communities by *Chrysanthemoides monilifera* (Bitou Bush and Boneseed). Department of Environment and Conservation, NSW, Hurstville, Australia.
De Groote, H., Ajuonu, O., Attignon, S., Djessou, R., Neuenschwander, P., 2003. Economic impact of biological control of waterhyacinth in southern Benin. Ecological Economics 45, 105–107.
DeLoach, C.J., Tracy, J.L., 1997. Effects of biocontrol of saltcedar (*Tamarix ramosissima*) on endangered species: draft biological assessment, 17 October 1997. Produced by USDA/ARS, Temple, Texas for the U.S. Fish and Wildlife Service, Region 2, Albuquerque, New Mexico, USA.
DeLoach, C.J., Carruthers, R.I., Lovich, J.E., Dudley, T.L., 2000. Ecological interactions in the biological control of saltcedar (*Tamarix* spp.) in the United States. In: Spencer, N. (Ed.), Proceedings of the International Symposium on Biological Control of Weeds. Bozeman, Montana, USA, pp. 819–873.
Deloach, C.J., Moran, P.J., Knutson, A.E., Thompson, D.C., Carruthers, R.I., Michels, J., Herr, J.C., Muegge, M., Eberts, D., Randal, C., Everitt, J., O'Meara, S., Sanabria, J., 2008. Beginning success of biological control of saltcedars (*Tamarix* spp.) in the southwestern USA. In: Julien, M.H., Sforza, R., Bon, M.C., Evans, H.C., Hatcher, P.E., Hinz, H.L., Rector, B.G. (Eds.), XII International Symposium on Biological Control of Weeds. La Grande Motte, France, 22–27, April 2007. CABI, Wallingford, UK, pp. 535–539.
Dennill, G.B., Donnelly, D., Stewart, K., Impson, F.A.C., 1999. Insect agents used for the biological control of Australian *Acacia* species and *Paraserianthes lophantha* (Willd.) Nielsen (Fabaceae) in South Africa. African Entomology, Memoir No. 1, pp. 45–54.
Denoth, M., Myers, J.H., 2005. Variable success of biological control of *Lythrum salicaria* in British Columbia. Biological Control 32, 269–279.
Dhileepan, K., 2001. Effectiveness of introduced biocontrol insects on the weed *Parthenium hysterophorus* (Asteraceae) in Australia. Bulletin of Entomological Research 91, 167–176.
Dhileepan, K., 2003. Seasonal variation in the effectiveness of the leaf-feeding beetle *Zygogramma bicolorata* (Coleoptera: Chrysomelidae) and stem-galling moth *Epiblema strenuana* (Lepidoptera: Tortricidae) as biocontrol agents on the weed *Parthenium hysterophorus* (Asteraceae). Bulletin of Entomological Research 93, 393–401.
Dhileepan, K., Strathie, L., 2009. *Parthenium hysterophorus* L. (Asteraceae). In: Muniappan, R., Reddy, D.V.R., Raman, A. (Eds.), Biological Control of Tropical Weeds Using Arthropods. Cambridge University Press, UK, pp. 272–316.
Dhileepan, K., Snow, E.L., Rafter, M.A., Treviño, M., McCarthy, J., Senaratne, K.A.D.W., 2007a. The leaf-tying moth *Hypocosmia pyrochroma* (Lep., Pyralidae), a host-specific biological control agent for cat's claw creeper *Macfadyena unguis-cati* (Bignoniaceae) in Australia. Journal of Applied Entomology 131, 564–568.
Dhileepan, K., Treviño, M., Snow, E.L., 2007b. Specificity of *Carvalhotingis visenda* (Hemiptera: Tingidae) as a biological control agent for cat's claw creeper *Macfadyena unguis-cati* (Bignoniaceae) in Australia. Biological Control 41, 283–290.
Diaz, R., Overholt, W.A., Samayoa, A., Sosa, F., Cordeau, D., Medal, J., 2008. Temperature-dependent development, cold tolerance, and potential distribution of *Gratiana boliviana* (Coleoptera: Chrysomelidae), a biological control agent of tropical soda apple, *Solanum viarum* (Solanaceae). Biocontrol Science and Technology 18, 193–207.
Ding, J., Reardon, R., Wu, Y., Zheng, H., Fu, W., 2006. Biological control of invasive plants through collaboration between China and the United States of America: a perspective. Biological Invasions 8, 1439–1450.
Diop, O., Hill, M.P., 2009. Quantitative post-release evaluation of biological control of floating fern, *Salvinia molesta* D.S. Mitchell (Salviniaceae), with *Cyrtobagous salviniae* Calder and Sands (Coleoptera: Curculionidae) on the Senegal River and Senegal River Delta. African Entomology 17, 64–71.
DiTomaso, J.M., 2000. Invasive weeds in rangelands: species, impacts and management. Weed Science 48, 255–265.
DiTomaso, A., Lawlor, F.M., Darbyshire, S.J., 2005. The biology of invasive alien plants in Canada. 2. *Cynanchum rossicum* (Kleopow) Borhidi [=*Vincetoxicum rossicum* (Kleopow) Barbar.] and *Cynanchum louiseae* (L.) Kartesz & Gandhi [=*Vincetoxicum nigrum* (L.) Moench]. Canadian Journal of Plant Science 85, 243–263.
Doane, C.C., McManus, M.L. (Eds.), 1981. The Gypsy Moth: Research Toward Integrated Pest Management. Technical Bulletin No. 1584. US Department of Agriculture, Forest Service, Washington, DC.
Dodd, A.P., 1940. The Biological Campaign Against Prickly Pear. Commonwealth Prickly Pear Board Bulletin, Brisbane. 177 pp.
Downey, P.O., 2006. The weed impact to native species (WINS) assessment tool – results from a trial for bridal creeper (*Asparagus asparagoides* (L.) Druce) and ground asparagus (*Asparagus aethiopicus* L.) in southern New South Wales. Plant Protection Quarterly 21, 109–116.
Downey, P.O., Turnbull, I., 2007. The biology of Australian weeds 48. *Macfadyena unguis-cati* (L.) A.H. Gentry. Plant Protection Quarterly 22, 82–91.
Downey, P.O., Holtkamp, R.H., Ireson, J.E., Kwong, R.M., Swirepik, A.E., 2007. A review of the *Chrysanthemoides monilifera* biological control program in Australia: 1987–2005. Plant Protection Quarterly 22, 24–32.
Dray, F.A., Center, T.D., 1992. Biological Control of *Pistia stratiotes* L. (Waterlettuce) using *Neohydronomus affinis* Hustache (Coleoptera: Curculionidae). Miscellaneous Paper A-92-1. U.S. Army Engineers, Waterways Experiment Station, Vicksburg, MS.
Drooz, A.T. (Ed.), 1985. Insects of Eastern Forests, Miscellaneous Publication No. 1426, USDA Forest Service, Washington, DC.
Drooz, A.T., Doggett, C.A., Coppel, H.C., 1979. The introduced pine sawfly, a defoliator of white pine new to North Carolina. USDA Forest Service Research Note SE-273, Southeast Forest Experiment Station, Ashville, North Carolina, 3 pp.
Dudley, T.L., Kazmer, D.J., 2005. Field assessment of the risk posed by *Diorhabda elongata*, a biocontrol agent for control of saltcedar (*Tamarix* spp.), to a nontarget plant, *Frankenia salina*. Biological Control 35, 265–275.
Duncan, C.L., 2001. Knapweed management: another decade of change. In: Smith, L. (Ed.), Proceedings of the First International Knapweed Symposium of the Twenty-First Century, March 15–16, 2001, Coeur d'Alene, Idaho. USDA-ARS, Albany, CA, pp. 1–7.
EAB, 2009. Emerald Ash Borer. Available from: <http://www.emeraldashborer.info/index.cfm/> (accessed March 2009).
Edwards, P.B., Adair, R.J., Holtkamp, R.H., Wanjura, W.J., Bruzzese, A.S., Forrester, R.I., 2009. Impact of the biological control agent *Mesoclanis polana* (Tephritidae) on bitou bush (*Chrysanthemoides monilifera* subsp. *rotundata*) in eastern Australia. Bulletin of Entomological Research 99, 51–63.
Eiswerth, M.E., Darden, T.D., Johnson, W.S., Agapoff, J., Harris, T.R., 2005. Input–output modeling, outdoor recreation, and the economic impacts of weeds. Weed Science 53, 130–137.
Elton, C.S., 1958. The Ecology of Invasions by Animals and Plants. The University of Chicago Press, Chicago, USA.
Embree, D.G., 1965. The population dynamics of the winter moth in Nova Scotia, 1954–1961. Memoirs of the Entomological Society of Canada No. 46, 57 pp.
Embree, D.G., 1967. Effects of the winter moth on growth and mortality of red oak in Nova Scotia. Forest Science 13, 295–299.
Embree, D.G., 1971. *Operophtera brumata* (L.), winter moth (Lepidoptera: Geometridae). In: Anonymous (Ed.), Biological Control Programmes Against Insects and Weeds in Canada, 1959–1968. Commonwealth Agricultural Bureaux, Farnham Royal, UK, pp. 167–175.

Embree, D.G., Otvos, I.S., 1984. *Operophtera brumata* (L.) winter moth (Lepidoptera: Geometridae). In: Kelleher, J.S., Hulme, M.A. (Eds.), Biological Control Programmes in Against Insects and Weeds in Canada, 1969–1980. Commonwealth Agricultural Bureaux, Slough, UK, pp. 353–357.

Enloe, S.F., DiTomaso, J.M., Orloff, S.B., Drake, D.J., 2004. Soil water dynamics differ among rangeland plant communities dominated by yellow starthistle (*Centaurea solstitialis*), annual grasses, or perennial grasses. Weed Science 52, 929–935.

Ens, E.J., French, K., 2008. Exotic woody invader limits the recruitment of three indigenous plant species. Biological Conservation 141, 590–595.

Ens, E.J., Bremner, J.B., French, K., Korth, J., 2009. Identification of volatile compounds released by roots of an invasive plant, bitou bush (*Chrysanthemoides monilifera* spp. *rotundata*), and their inhibition of native seedling growth. Biological Invasions 11, 275–287.

Eschtruth, A.K., Cleavitt, N.L., Battles, J.J., Evans, R.A., Fahey, T.J., 2006. Vegetation dynamics in declining eastern hemlock stands: 9 years of forest response to hemlock woolly adelgid infestation. Canadian Journal of Forest Research 36, 1435–1450.

Esler, K.J., Van Wilgen, B.W., Roller, K.S., Wood, A.R., van der Merwe, J.H., 2010. A landscape-scale assessment of the long-term integrated control of an invasive shrub in South Africa. Biological Invasions 12, 211–218.

Evans, H.C., Tomley, A.J., 1994. Studies on the rust, *Maravalia cryptostegiae*, a potential biological control agent of rubber-vine weed, *Cryptostegia grandiflora* (Asclepiadaceae: Periplocoideae), in Australia, III: host range. Mycopathologia 126, 93–108.

Evans, R.A., 2002. An ecosystem unraveling? In: Onken, B., Reardon, R., Lashomb, J. (Eds.), Proceedings: Hemlock Woolly Adelgid in the Eastern United States Symposium, February 5–7, 2002. East Brunswick, New Jersey, The State University of New Jersey, Rutgers, New Jersey, pp. 23–33.

Farri, T.A., Boroffice, R.A., 1999. An overview on the status and control of waterhyacinth in Nigeria. In: Hill, M.P., Julien, M.H., Center, T.D. (Eds.), Proceedings of the First Global Working Group Meeting for the Biological and Integrated Control of Waterhyacinth. Harare, Zimbabwe, 1998, pp. 18–24.

Felt, E.P., Bromely, S.W., 1932. Observations on shade tree insects. Journal of Economic Entomology 28, 390–393.

Fielding, N.J., Evans, H.F., 1997. Biological control of *Dendroctonus micans* (Scolytidae) in Great Britain. Biocontrol News and Information 18 (2), 51N–60N.

Floyd, A.G., 1989. The vine weeds of coastal rainforest. In: Gorham, P. (Ed.), Noxious plant control: responsibility, safety and benefits, Proceedings of the 5th Biennial Noxious Plants Conference, vol. 1. New South Wales Agriculture and Fisheries, Sydney, pp. 109–115.

Flowers, J.D. II., 1991. Subtropical fire suppression in *Melaleuca quinquenervia*. In: Center, T.D., Doren, R.F., Hofstetter, R.L., Myers, R.L., Whiteaker, L.D. (Eds.), Proceedings of the Symposium on Exotic Pest Pants. National Park Service, Denver, CO, NPS/NREVER/NRTR-91/06, pp. 151–158.

Fowler, S.V., 2004. Biological control of an exotic scale, *Orthezia insignis* Browne (Homoptera: Ortheziidae), saves the endemic gumwood tree, *Commidendrum robustum* (Roxb.) DC. (Asteraceae) on the island of St. Helena. Biological Control 29, 367–374.

Frandsen, P., Jackson, N., 1994. The impact of *Arundo donax* on flood control and endangered species. In: Jackson, N.E., Frandsen, P., Duthoit, S. (Eds.), *Arundo donax* Workshop Proceedings, 19 November, 1993, Ontario, California. Team Arundo and California Exotic Pest Plant Council, Pismo Beach, California, pp. 13–16.

Frank, J.H., Cave, R.D., 2005. *Metamasius callizona* is destroying Florida's native bromeliads. In: Hoddle, M.S. (Ed.), Second International Symposium on Biological Control of Arthropods, Davos, Switzerland, September 12–16, 2005, vol. 1. FHTET-2005-08, USDA Forest Service Publication, pp. 91–101.

Frank, J.H., Fish, D., 2008. Potential biodiversity loss in Florida bromeliad phytotelmata due to *Metamasius callizona* (Coleoptera: Dryophthoridae), an invasive species. Florida Entomologist 91, 1–8.

Frank, J.H., Thomas, M.C., 1994. *Metamasius callizona* (Chevrolat) (Coleoptera: Curculionidae), an immigrant pest, destroys bromeliads in Florida. Canadian Entomologist 126, 673–682.

Fried, B.M., Adams, R.M., Berrens, R.P., Bergland, O., 1995. Willingness to pay for a change in elk hunting quality. Wildlife Society Bulletin 23, 680–686.

Friedmann, F., 1994. Flore des Seychelles – Dicotyledones. Editions de l'Orstom, Paris. 663 pp.

Gann, G.D., Bradley, K., Woodmansee, S.W., 2001. Floristic Inventory of South Florida Database. Available from: <www.regionalconservation.org/>.

Garcia-Pichel, F.A., Al-Horani, J.D., Farmer, R., Ludwing, B.D.Wade., 2004. Balance between microbial calcification and metazoan bioerosion in modern stromatolitic oncolites. Geobiology 2, 1–49.

Garcia-Rossi, D., Rank, N., Strong, D.R., 2003. Potential for self-defeating biological control? Variation in herbivore vulnerability among invasive *Spartina* genotypes. Ecological Applications 13, 1640–1649.

Gates, M., Delvare, G., 2008. A new species of *Eurytoma* (Hymenoptera: Eurytomidae) attacking *Quadrastichus* spp. (Hymenoptera: Eulophidae) galling *Erythrina* spp. (Fabaceae), with a summary of African *Eurytoma* biology and species checklist. Zootaxa 1751, 1–24.

Gerber, E., Krebs, C., Murrell, C., Moretti, M., Rocklin, R., Schaffner, U., 2008. Exotic invasive knotweeds (*Fallopia* spp.) negatively affect native plant and invertebrate assemblages in European riparian habitats. Biological Conservation 141, 646–654.

Gery, R., 1991. Etude expérimentale de la prédation de la cochenille des Seychelles *Icerya seychellarum* (Westwood) par deux coccinelidae *Rodolia cardinalis* (Mulsant) et *Rodolia chermesina* (Mulsant). Application a lutte biologique sur L'Atoll Aldabra. Thèse de Doctorate de L'Université de Rennes, France.

Ghent, J.H., Huber, C.M., Williams, R.S., 1982. Status report of the introduced pine sawfly in the southern Appalachians. USDA, Forest Service, State and Private Forestry, Southeast Area, Forest Pest Management Report 83-1-1. Atlanta, Georgia, 18 pp.

Gillespie, D.R., Finlayson, T., Tonks, N.V., Ross, D.A., 1978. Occurrence of the winter moth, *Operophtera brumata* (Lepidoptera: Geometridae), on southern Vancouver Island, British Columbia. The Canadian Entomologist 110, 223–224.

Gillock, H.H., Hain, F.P., 2001. A historical overview of North American gypsy moth controls, chemical and biological, with emphasis on the pathogenic fungus, *Entomophaga maimaiga*. Reviews in Toxicology 4, 105–128.

Glenn, E.P., Nagler, P.L., 2005. Comparative ecophysiology of *Tamarix ramosissima* and native trees in western U.S. riparian zones. Journal of Arid Environments 61, 419–446.

Goeden, R.D., 1978. Biological control of weeds. In: Clausen, C.L. (Ed.), Introduced Parasites and Predators of Arthropods Pests and Weeds: A World Review. USDA Agriculture Handbook No. 480, Washington, DC, pp. 357–314.

Gomez, P., Belov, M., San Martín, J., 2008. New Geographical locality for *Berberis negeriana* Tischle (Berberidaceae) in the province of Arauco, Bio- Bio region, Chile. Gayana Botánica 65, 109–110.

Goolsby, J.A., Moran, P.J., 2009. Host range of *Tetramesa romana* Walker (Hymenoptera: Eurytomidae), a potential biological control of giant reed, *Arundo donax* L. in North America. Biological Control 49, 160–168.

Gordon, A.J., 1999. A review of established and new insect agents for the biological control of *Hakea sericea* Schrader (Proteaceae) in South Africa. African Entomology Memoir No. 1, pp. 35–43.

Gordon, D.R., Gann, G.D., Carter, E., Thomas, K., 1999. Post-hurricane vegetation response in South Florida Hammocks with and without *Dioscorea bulbifera* L. control. In: Jones, D.T., Gamble, B.W. (Eds.), Florida's Garden of Good and Evil. South Florida Water Management District, West Palm Beach, pp. 309–326.

Graf, W.L., 1978. Fluvial adjustments to the spread of tamarisk in the Colorado Plateau region. Geological Society of America Bulletin 89, 1491–1501.

Graf, W.L., 1980. Riparian management: a flood control perspective. Journal of Soil and Water Conservation 35, 158–161.

Gramling, C., 2005. Hawaii's coral trees feel the sting of foreign wasps. Science 310, 1759–1760.

Grandgirard, J., Hoddle, M.S., Roderick, G.K., Petit, J., Percy, D., Putoa, R., Garnier, C., Davies, N., 2006. Invasion of French Polynesia by the glassy-winged sharpshooter, *Homalodisca coagulata* (Hemiptera: Cicadellidae): a threat to the South Pacific. Pacific Science 60, 429–438.

Grandgirard, J., Hoddle, M.S., Petit, J.N., Percy, D.N., Roderick, G.K., Davies, N., 2007. Pre-introductory risk assessment studies of *Gonatocerus ashmeadi* (Hymenoptera: Mymaridae) for use as a classical biological control agent against *Homalodisca vitripennis* (Hemiptera: Cicadellidae) in the Society Islands of French Polynesia. Biocontrol Science and Technology 17, 809–822.

Grandgirard, J., Hoddle, M.S., Petit, J.A., Roderick, G.K., Davies, N., 2008. Engineering an invasion: classical biological control of the glassy-winged sharpshooter, *Homalodisca vitripennis*, by the egg parasitoid *Gonatocerus ashmeadi* in Tahiti and Moorea, French Polynesia. Biological Invasions 10, 135–148.

Gratwicke, B., Marshall, B.E., 2001. The impact of *Azolla filiculoides* Lam. on animal biodiversity in streams in Zimbabwe. African Journal of Ecology 38, 1–4.

Grégoire, J.C., 1988. The greater European spruce beetle. In: Berryman, A.A. (Ed.), Dynamics of Forest Insect Populations. Plenum Publishing Corporation, New York, USA, pp. 455–478.

Grevstad, F.S., 2006. Ten-year impacts of the biological control agents *Galerucella pusilla* and *G. calmariensis* (Coleoptera: Chrysomelidae) on purple loosestrife (*Lythrum salicaria*) in central New York. Biological Control 39, 1–8.

Grevstad, F.S., Strong, D.R., Garcia-Rossi, D., Switzer, R.W., Wecker, M.S., 2003. Biological control of *Spartina alterniflora* in Willapa Bay, Washington using the planthopper *Prokelisia marginata*: agent specificity and early results. Biological Control 27, 32–42.

Grodowitz, M.J., Cofrancesco, A.F., Stewart, R.M., Madsen, J., Morgan, D., 2003. Possible impact of Lake Seminole Hydrilla by the introduced leaf-mining fly *Hydrellia pakistanae*. ERDC/EL TR-03-18, U.S. Army Engineer Research and Development Center, Vicksburg, MS.

Gruber, E., Whytemare, A., 1997. The return of the native? *Sidalcea hirtipes* in coastal Oregon. In: Kaye, T.N., Liston, A., Love, R.M., Luoma, D.L., Meinke, R.J., Wilson, M.V. (Eds.), Conservation and Management of Native Plants and Fungi. Proceedings of the Oregon Conference on the Conservation and Management of Native Vascular Plants, Bryophytes, and Fungi. Native Plant Society of Oregon, Corvallis, OR, pp. 121–124.

Gutierrez, A.P., Pitcairn, M.J., Ellis, C.K., Carruthers, N., Ghezelbash, R., 2005. Evaluating biological control of yellow starthistle (*Centaurea solstitialis*) in California: a GIS based supply-demand demographic model. Biological Control 34, 115–131.

Hakim, S.E.A., 1979. Range condition on the Threemile Game Range in Western Montana. M.S. thesis. University of Montana, Missoula, MT.

Hale, L.D., 1970. Biology of *Icerya purchasi* and its natural enemies in Hawaii. Proceedings of the Hawaiian Entomological Society 20, 533–550.

Hansen, K.L., Ruby, E.G., Thompson, R.L., 1971. Trophic relationships in the waterhyacinth community. Quarterly Journal of the Florida Academy of Science 34 (2), 107–113.

Harley, K.L.S., Kassulke, R.C., Sands, D.P.A., Day, M.D., 1990. Biological control of water lettuce, *Pistia stratiotes* [Araceae] by *Neohydronomus affinis* [Coleoptera: Curculionidae]. Entomophaga 35, 363–374.

Harris, P., 1988. Environmental impact of weed-control insects. BioScience 38 (8), 542–548.
Harris, P., Cranston, R., 1979. An economic evaluation of control methods for diffuse and spotted knapweed in western Canada. Canadian Journal of Plant Science 59, 375–382.
Havill, N.P., Montgomery, M.E., Yu, G., Shiyake, S., Caccone, A., 2006. Mitochondrial DNA from hemlock woolly adelgid (Hemiptera: Adelgidae) suggests cryptic speciation and pinpoints the source of the introduction to eastern North America. Annals of the Entomological Society of America 99, 195–203.
Heard, T.A., Paynter, Q., 2009. *Mimosa pigra* (Leguminosae). In: Muniappan, R., Reddy, G.V.P., Raman, A. (Eds.), Biological Control of Tropical Weeds using Arthropods. Cambridge University Press, Cambridge, UK, pp. 256–273.
Hein, D.G., Miller, S.D., 1992. Influence of leafy spurge on forage utilization by cattle. Journal of Range Management 45, 405–407.
Hendrickson, D.A., McGaugh, S., 2005. *Arundo donax* (Carrizo Grande/Giant Cane) in Cuatro Ciénegas. Available from: <http://desertfishes.org/cuatroc/organisms/non-native/arundo/Arundo.html/>.
Higgins, S.I., Richardson, D.M., Cowling, R.M., Trinder-Smith, T.H., 1999. Predicting the landscape-scale distribution of alien plants and their threat to plant diversity. Conservation Biology 13, 303–313.
Hill, M.G., Newbery, D.M., 1980. The distribution and abundance of the coccid *Icerya seychellarum* Westw. on Aldabra atoll. Ecological Entomology 5, 115–122.
Hill, M.P., 1999. Biological control of red water fern, *Azolla filiculoides* Lamarck (Pteridophyta: Azollaceae) in South Africa. In: Olckers, T., Hill, M.P. (Eds.), Biological Control of Weeds in South Africa (1990–1998), vol. 1. African Entomology Memoir, pp. 119–124.
Hill, M.P., McConnachie, A.J., 2009. *Azolla filiculoides*. In: Muniappan, R., Reddy, G.V.P., Raman, A., Gandhi, V.P. (Eds.), Weed Biological Control with Arthropods in the Tropics. Cambridge University Press, Cambridge, UK, pp. 74–87.
Hill, R.L., Gourlay, A.H., 2002. Host-range testing, introduction and establishment of *Cydia succedana* (Lepidoptera: Tortricidae) for biological control of gorse, *Ulex europaeus* L., in New Zealand. Biological Control 25, 173–186.
Hill, R.L., Ireson, J., Sheppard, A.W., Gourlay, A.H., Norambuena, H., Markin, G., Kwong, R., Coombs, E., 2008. A global view of the future for biological control of gorse. In: Julien, M.H., Sforza, R., Bon, M.C., Evans, H.C., Hatcher, P.E., Hinz, H.L., Rector, B.G. (Eds.), XII International Symposium on Biological Control of Weeds. La Grande Motte, France, 22–27, April 2007. CABI, Wallingford, UK, pp. 680–686.
Henneman, M.L., Memmott, J., 2001. Infiltration of a Hawaiian community by introduced biological control agents. Science 293, 1314–1316.
Hoffmann, J.H., Moran, V.C., 1991. Biological control of *Sesbania punicea* (Fabaceae) in South Africa. Agriculture, Ecosystems, and Environment 37, 157–173.
Hoffmann, J.H., Moran, V.C., 1998. The population dynamics of an introduced tree, *Sesbania punicea*, in South Africa, in response to long-term damage caused by different combinations of three species of biological control agents. Oecologia 114, 343–348.
Hoffmann, J.H., Moran, V.C., 2008. Assigning success in biological weed control: what do we really mean? In: Julien, M.H., Sforza, R., Bon, M.C., Evans, H.C., Hatcher, P.E., Hinz, H.L., Rector, B.G. (Eds.), XII International Symposium on Biological Control of Weeds. CAB International, Wallingford, UK, pp. 685–690.
Hoffmann, J.H., Moran, V.C., Zeller, D.A., 1998. Long-term population studies and the development of an integrated management programme for control of *Opuntia stricta* in Kruger National Park, South Africa. Journal of Applied Ecology 35, 156–160.
Hofstetter, R.H., 1991. The current status of *Melaleuca quinquenervia* in southern Florida. In: Center, T.D., Doren, R.F., Hofstetter, R.L., Myers, R.L., Whiteaker, L.D. (Eds.), Proceedings of a Symposium on Exotic Pests Plants. National Park Service, Denver, CO, NPS/NREVER/NRTR-91/06, pp. 159–176.
Hohmann, J., Vasas, A., Günther, G., Máthé, I., Evanice, F., Dombi, G., Jerkovich, G., 1997. Macrocyclic diterpene polyesters of the jatrophane type from *Euphorbia esula*. Journal of Natural Products 60, 331–335.
Holm, L.G., Weldon, L.W., Blackburn, R.D., 1969. Aquatic weeds. Science 166, 699–709.
Holm, L., Doll, J., Holm, E., Pancho, J., Herberger, J., 1997. World Weeds Natural Histories and Distribution. John Wiley & Sons, Inc., New York. pp. 393–411.
Holmes, P.M., Cowling, R.M., 1997. The effects of invasion by *Acacia saligna* on the guild structure and regeneration capabilities of South African fynbos shrublands. Journal of Applied Ecology 34, 317–332.
Holmes, P.M., Richardson, D.M., van Wilgen, B.W., Gelderblom, C., 2000. Recovery of South African fynbos vegetation following alien woody plant clearing and fire: implications for restoration. Austral Ecology 25, 631–639.
Holtkamp, R.H., 2002. Impact of the bitou bush tip moth, *Comostolopsis germana*, on bitou bush in New South Wales. In: Spafford Jacob, H., Dodd, J., Moore, J.H. (Eds.), Proceedings of 13th Australian Weeds. Plant Protection Society of Western Australia, Perth, Australia, pp. 405–406.
Hough-Goldstein, J., Lake, E., Reardon, R., Wu, Y., 2008. Biology and Biological Control of Mile-a-Minute Weed. USDA Forest Service, FHTET-2008-10.
Hough-Goldstein, J., Mayer, M.A., Hudson, W., Robbins, G., Morrison, P., Reardon, R., 2009. Monitored releases of *Rhinoncomimus latipes* (Coleoptera: Curculionidae), a biological control agent of mile-a-minute weed (*Persicaria perfoliata*), 2004–2008. Biological Control 51, 450–457.
Houston, D.R., 1981. Oak decline and mortality. In: Doane, C.C., McManus, M.L. (Eds.), The Gypsy Moth: Research toward Integrated Pest Management. Technical Bulletin No. 1584. US Department of Agriculture, Forest Service, Washington, DC, pp. 217–297.
Howard, T., Sendak, P., Codrescu, C., 2000. Eastern hemlock: a market perspective. In: McManus, K., Shields, K., Souto, D. (Eds.), Proceedings: Symposium on Sustainable Management of Hemlock Ecosystems in Eastern North America. General Technical Report NE-267, Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station, pp. 161–166.
Howarth, F.G., 1991. Environmental impacts of classical biological control. Annual Review of Entomology 36, 485–509.
Howes, F.N., 1979. Plants and Beekeeping. Faber and Faber, London, UK.
Hrusa, G.F., Gaskin, J.F., 2008. The *Salsola tragus* complex in California (Chenopodiaceae): characterization and status of *Salsola australis* and the autochthonous allopolyploid *Salsola ryanii* sp. nov.. Madroño 55 (2), 113–131.
Hudgeons, J.L., Knutson, A.E., Heinz, K.M., DeLoach, C.J., Dudley, T.L., Pattison, R.R., Kiniry, J.R., 2007. Defoliation by introduced *Diorhabda elongata* leaf beetles (Coleoptera: Chrysomelidae) reduces carbohydrate reserves and regrowth of *Tamarix* (Tamaricaceae). Biological Control 43, 213–221.
Huffaker, C.B., 1957. Fundamentals of biological control of weeds. Hilgardia 27, 101–157.
Huffaker, C.B., Kennett, C.E., 1959. A ten-year study of vegetational changes associated with biological control of Klamath weed. Journal of Range Management 12, 69–82.
Impson, F.A.C., Moran, V.C., Hoffmann, J.H., 2004. Biological control of an alien tree, *Acacia cyclops*, in South Africa: impact and dispersal of a seed-feeding weevil, *Melanterius servulus*. Biological Control 29, 375–381.
Impson, F.A.C., Moran, V.C., Kleinjan, C., Hoffman, J.H., Moore, J.A., 2008. Multiple-species introductions of biological control agents against weeds: look before you leap. In: Julien, M.H., Sforza, R., Bon, M.C., Evans, H.C., Hatcher, P.E., Hinz, H.L., Rector, B.G. (Eds.), Proceedings of the XII International Symposium on Biological Control of Weeds. CABI International, Wallingford, UK, pp. 26–31.
Ireson, J.E., Gourlay, A.H., Kwong, R.M., Holloway, R.J., Chatterton, W.S., 2003. Host specificity, release and establishment of the gorse spider mite, *Tetranychus lintearius* Dufour (Acarina: Tetranychidae), for the biological control of gorse, *Ulex europaeus* L. (Fabaceae), in Australia. Biological Control 26, 117–127.
Johnson, R.W., 2004. Environmental impacts of prickly acacia. In: Spies, P., March, N. (Eds.), Prickly Acacia, National Case Studies Manual. The State of Queensland, Brisbane, pp. 90–91.
Johnson, S., Threadgold, R., 1999. Report on the monitoring and status of the coccid (*Icerya seychellarum*) on Aldabra from 1980 to 1999. Unpublished report, Seychelles Islands Foundation.
Joint Nature Conservation Committee, 2009. Available from: <http://www.jncc.gov.uk/pdf/OT_StHelena.pdf/> (accessed 23.06.09).
Julien, M.H., 1981. Control of aquatic *Alternanthera philoxeroides* in Australia: another success for *Agasicles hygrophila*. In: Delfosse, E.S. (Ed.), Proceedings of the V International Symposium on Biological Control of Weeds, 22–29 July 1980. Brisbane, Australia, pp. 583–588.
Julien, M.H., 1995. The biology of Australian weeds 3. *Alternanthera philoxeroides* (Mart.) Griseb. In: Groves, R.H., Shepherd, R.C.H., Richardson, R.G. (Eds.), The Biology of Australian Weeds, R.G. and F.J. Richardson, Frankston. Victoria, Australia, pp. 1–12.
Julien, M.H., Griffiths, M.W., 1998. Biological Control of Weeds: A World Catalogue of Agents and their Target Weeds. CABI Publishing, Wallingford, UK.
Julien, M.H., Hill, M.P., Tipping, P.W., 2009. *Salvinia molesta* D.S. Mitchell (Salviniaceae). In: Muniappan, R., Reddy, G.V.P., Raman, A., Gandhi, V.P. (Eds.), Weed Biological Control with Arthropods in the Tropics. Cambridge University Press, Cambridge, pp. 378–407.
Kato, K., Hijii, N., 1997. Effects of gall formation by *Dryocosmus kuriphilus* Yasumatsu (Hym., Cynipidae) on the growth of chestnut trees. Journal of Applied Entomology 121, 9–15.
Keeler, M.S., Chew, F.S., 2008. Escaping an evolutionary trap: preference and performance of a native insect on an exotic invasive host. Oecologia 156, 559–568.
Kelly, M., Wagner, E., Warner, P., 1998. In: Proceedings California Exotic Pest Plant Council Symposium, vol. 4, pp. 1–70.
Kennedy, T.A., Hobbie, S.E., 2004. Saltcedar (*Tamarix ramosissima*) invasion alters organic matter dynamics in a desert stream. Freshwater Biology 49, 65–76.
Kennedy, T.A., Finlay, J.C., Hobbie, S.E., 2005. Eradication of invasive *Tamarix ramosissima* along a desert stream increases native fish density. Ecological Applications 15, 2072–2083.
Killgore, E.M., Sugiyama, L.S., Barreto, R., Gardner, D.E., 1999. Evaluation of *Colletrotrichum gloeosporioides* for biological control of *Miconia calvescens* in Hawaii. Plant Disease 83, 964.
Kim, I.K., Delvare, G., La Salle, J., 2004. A new species of *Quadrastichus* (Hymenoptera: Eulophidae): a gall-inducing pest on *Erythrina* (Fabaceae). Journal of Hymenoptera Research 13, 243–249.
Kingsbury, J.M., 1964. Poisonous Plants of the United States and Canada. Prentice-Hall, Inc., Englewood Cliffs, NJ.
Kobachidze, D., 1967. Der Riesenbastkäfer (*Dendroctonus micans* Kugel.) in Georgien (UdSSR). Anzeiger für Schädlingskunde 40, 65–68.
Kok, L.T., Salom, S.M., Yan, S., Herrick, N., McAvoy, T.J., 2008. Quarantine evaluation of *Eucryptorrhynchus brandti* (Harold) (Coleoptera: Curculionidae), a potential biological control agent of tree of heaven, *Ailanthus altissima* in Virginia, USA. In: Julien, M.H., Sforza, R., Bon, M.C., Evans, H.C., Hatcher, P.E., Hinz, H.L., Rector, B.G. (Eds.), Proceedings of the XII International Symposium on Biological Control of Weeds. CAB International, Wallingford, UK, pp. 292–300.
Kriticos, D.J., Stuart, R.M., Ash, J.E., 2004. Exploring interactions between cultural and biological control techniques: modelling bitou bush (*Chrysantehmoides*

monilifera spp. *rotundata*) and a seed fly (*Mesoclanis polana*). In: Cullen, J.M., Briese, D.T., Kriticos, D.J., Lonsdale, W.M., Morin, L., Scott, J.K. (Eds.), Proceedings of the XI International Symposium on Biological Control of Weeds. CSIRO Entomology, Canberra, Australia, pp. 559–566.

Kufeld, R.C., 1973. Foods eaten by the Rocky Mountain elk. Journal of Range Management 26, 106–113.

Lacey, J.R., Marlow, C.B., Lane, J.R., 1989. Influence of spotted knapweed (*Centaurea maculosa*) on surface runoff and sediment yield. Weed Technology 3, 627–631.

Lajeunesse, S., Sheley, R., Duncan, C., Lym, R., 1999. Leafy spurge. In: Sheley, R.L., Petroff, J.K. (Eds.), Biology and Management of Noxious Rangeland Weeds. Oregon State University Press, Corvallis, pp. 249–260.

Lamb, A.J., Klaussner, E., 1988. Response of the fynbos shrubs *Protea repens* and *Erica plukenetii* to low levels of nitrogen and phosphorus applications. South African Journal of Botany 54, 558–564.

Landis, D.A., Sebolt, D.C., Haas, M.J., Klepinger, M., 2003. Establishment and impact of *Galerucella calmariensis* L. (Coleoptera: Chrysomelidae) on *Lythrum salicaria* L. and associated plant communities in Michigan. Biological Control 28, 78–91.

Langeland, K.A., Cherry, H.M., McCormick, C.M., Craddock Burks, K.A. (Eds.), 2008. Identification and Biology of Nonnative Plants in Florida's Natural Areas, second ed. SP257, University of Florida, IFAS Communication Services, Gainesville, Florida, USA.

Leitch, J.A., Leistritz, F.L., Bangsund, D.A., 1994. Economic Effect of Leafy Spurge in the Upper Great Plains: Methods, Models, and Results. Agricultural Economics Report No. 316.

Le Maitre, D.C., van Wilgen, B.W., Chapman, R.A., McKelly, D.H., 1996. Invasive plants and water resources in the Western Caper Province, South Africa: modeling and the consequences of a lack of management. Journal of Applied Ecology 33, 161–172.

Leslie, A.J., Spotila, J.R., 2001. Alien plant threatens Nile crocodile (*Crocodylus niloticus*) breeding in Lake St. Lucia, South Africa. Biological Conservation 98, 347–355.

Liabunya, W.W., 2007. Malawi aquatic weeds management at hydro power plants. In: Proceedings of Hydro Sri Lanka, The International Conference on Small Hydropower, Kandy, Sri Lanka, 22–24 October 2007.

Lindbloom, A.J., Reese, K.P., Zager, P., 2004. Seasonal habitat use and selection of Chukars in west central Idaho. Western North American Naturalist 64 (3), 338–345.

Lindsay, E.A., French, K., 2006. The impact of the weed *Chrysanthemoides monilifera* ssp. *rotundata* on coastal leaf litter invertebrates. Biological Invasions 8, 177–192.

Lockwood, J.A., Hopper, M.F., Marchetti, M., 2006. Invasion Ecology. Wiley-Blackwell Publications, London.

Long, G.E., 1988. The larch casebearer in the intermountain northwest. In: Berryman, A.A. (Ed.), Dynamics of Forest Insect Populations, Patterns, Causes, Implications. Plenum Press, New York, pp. 233–242.

Longland, W.S., Dudley, T., 2008. Effects of a biological control agent on the use of saltcedar habitat by passerine birds. Great Basin Birds 10, 21–26.

Lovich, J.E., Bainbridge, D., 1999. Anthropogenic degradation of the southern California desert ecosystem and prospects for natural recovery and restoration. Environmental Management 24, 309–326.

Lovich, J.E., DeGouvenain, R.C., 1998. Saltcedar invasion in desert wetlands of the southwestern United States: ecological and political implications. In: Majumdar, S.K. et al. (Eds.), Ecology of Wetlands and Associated Systems. Pennsylvania Academy of Science, pp. 447–467.

Louda, S.M., 1998. Population growth of *Rhinocyllus conicus* (Coleoptera: Curculionidae) on two species of native thistles in prairie. Environmental Entomology 27, 834–841.

Louda, S.M., Potvin, M.A., 1995. Effect of inflorescence-feeding insects on the demography and lifetime fitness of a native plant. Ecology 76, 229–245.

Louda, S.M., Kendall, D., Connor, J., Simberloff, D., 1997. Ecological effects of an insect introduced for the biological control of weeds. Science 277, 1088–1090.

Louda, S.A., Pemberton, R.W., Johnson, M.T., Follett, P.A., 2003. Nontarget effects – the Achilles heel of biological control? Retrospective analysis to reduce risk associated with biocontrol introductions. Annual Review of Entomology 48, 365–396.

Lu, W., Montgomery, M.E., 2001. Oviposition, development and feeding of *Scymnus* (*Neopullus*) *sinuanodulus* (Coleoptera: Coccinellidae): a predator of *Adelges tsugae* (Homoptera: Adelgidae). Annals of the Entomological Society of America 94, 64–70.

Lym, R.G., 2005. Integration of biological control agents with other weed management technologies: successes from the leafy spurge (*Euphorbia esula*) IPM program. Biological Control 35, 366–375.

Lym, R.G., Kirby, D.R., 1987. Cattle foraging behavior in leafy spurge (*Euphorbia esula* L.) infested rangeland. Weed Technology 1, 314–318.

Lynch, L.D., Thomas, M.B., 2000. Nontarget effects in the biocontrol of insects with insects, nematodes, and microbial agents: the evidence. Biocontrol News and Information 21 (4), 117N–130N.

MacFarlane, D.W., Meyer, S.P., 2005. Characteristics and distribution of potential ash tree hosts for emerald ash borer. Forest Ecology and Management 213, 15–24.

Mackey, A.P., 1997. The biology of Australian weeds 29. *Acacia nilotica* ssp. *indica* (Benth.) Brenan. Plant Protection Quarterly 12 (1), 7–17.

Maddison, P.A., 1976. Coccoidea from Tarawa, Gilbert Islands. UNDP/FAO Pests and Diseases Surveys in the South Pacific Region. Technical Document No. 29, 6 pp.

Maddox, D.M., 1979. The knapweeds: their economics and biological control in the western states, U.S.A. Rangelands 1 (4), 139–143.

Maerz, J.C., Brown, C.J., Chapin, C.T., Blossey, B., 2005a. Can secondary compounds of an invasive plant affect larval amphibians? Functional Ecology 19, 970–975.

Maerz, J.C., Blossey, B., Nuzzo, V., 2005b. Green frogs show reduced foraging success in habitats invaded by Japanese knotweed. Biodiversity and Conservation 14, 2901–2912.

Magasi, L.P., Syme, P.D., 1984. *Gilpinia hercyniae* (Hartig), European spruce sawfly (Hymenoptera: Diprionidae). In: Kelleher, J.S., Hulme, M.A. (Eds.), Biological Control Programmes Against Insects and Weeds in Canada 1969–1980. Commonwealth Agricultural Bureaux Franham Royal, UK, pp. 295–297.

Mailu, A.M., Ochiel, G.R.S. Gitonga, W., Njoka, S.W., 1999. Waterhyacinth: an environmental disaster in the Winum Gulf of Lake Victoria and its control. In: Hill, M.P., Julien, M.H., Center, T.D. (Eds.), Proceedings of the First Global Working Group Meeting for the Biological and Integrated Control of Waterhyacinth. Harare, Zimbabwe, 16–19 November 1998, pp. 101–105.

Mailu, A.M., 2001. Preliminary assessment of the social, economic and environmental impacts of waterhyacinth in the Lake Victoria Basin and the status of control. In: Julien, M.H., Hill, M.P., Center, T.D., Ding Jianqing (Eds.), Biological and Integrated control of waterhyacinth, *Eichhornia crassipes*. Proceedings of the Second Global Working Group Meeting for the Biological and Integrated Control of Waterhyacinth. Beijing, China, 9–12 October 2000. ACIAR Proceedings No. 102, pp. 130–139.

Maldonado, F., 2006. La protección de Chile contra los incendios forestales. Chile Forestal 326, 3–10.

Mallya, G.A., 1999. Waterhyacinth in Tanzania. In: Hill, M.P., Julien, M.H., Center, T.D. (Eds.), Proceedings of the First Global Working Group Meeting for the Biological and Integrated Control of Waterhyacinth. Harare, Zimbabwe, 16–19 November 1998, pp. 25–29.

Manrique, V., Cuda, J.P., Overholt, W.A., Williams, D.A., 2008. Effect of host–plant genotypes on the performance of two candidate biological control agents of Brazilian peppertree in Florida. Biological Control 47, 167–171.

Manser, P.D., 1974. Report to the Government of the Gilbert and Ellis Islands colony on a survey of insect pets of crops. United Nations Development Programme, Food and Agriculture Organisation Programme GEI/70/002. Report TA3246. Multigraph, 35 pp.

Markin, G.P, Yoshioka, E.R., Brown, R.E., 1995. Gorse. In: Nechols, J.R., Andres, L.A., Beardsley, J.W., Goeden, R.D., Jackson, C.G. (Eds.), Biological Control in the Western United States: Accomplishments and Benefits of Regional Research Project W-84, 1964–1989. University of California, Division of Agriculture and Natural Resources, Oakland, Publication No. 3361, pp. 299–302.

Markin, G.P., Littlefield, J.L., 2008. Biological control of tansy ragwort (*Senecio jacobaeae* L.) by the cinnabar moth, *Tyria jacobaeae* (CL) (Lepidoptera: Arctiidae), in the northern Rocky Mountains. In: Julien, M.H., Sforza, R., Bon, M.C., Evans, H.C., Hatcher, P.E., Hinz, H.L., Rector, B.G. (Eds.), Proceedings of the XII International Symposium on Biological Control of Weeds, La Grande Motte, France, 22–227 April, 2007. CAB International, Wallingford, pp. 583–588.

Marler, T.E., Muniappan, R., 2006. Pests of *Cycas micronesica* leaf, stem, and male reproductive tissues with notes on current threat status. Micronesica 39 (1), 1–9. Available from: <http://www.uog.edu/up/micronesica/dynamicdata/assetmanager/images/pdf/marler.pdf/>.

Marler, T., Haynes, J., Lindstrom, A., 2006. *Cycas micronesica*. In: IUCN 2009. IUCN Red List of Threatened Species. Version 2009.1. Available from: <http://www.iucnredlist.org/details/61316/0/>.

Masifwa, W.F., Twongo, T., Denny, P., 2001. The impact of waterhyacinth, *Eichhornia crassipes* (Mart.) Solms on the abundance and diversity of aquatic macroinvertibrates along the shores of northern Lake Victoria, Uganda. Hydrobiologia 452, 79–88.

Mason, T.J., French, K., 2008. Impacts of a woody invader vary in different vegetation communities. Diversity and Distributions 14, 829–838.

Mbati, G., Neuenschwander, P., 2005. Biological control of three floating water weeds, *Eichhornia crassipes*, *Pistia stratiotes*, and *Salvinia molesta* in the Republic of Congo. Biocontrol 50, 635–645.

McCaffrey, J.P., Campbell, C.L., Andres, L.A., 1995. St. Johnswort. In: Nechols, J.R., Andres, L.A., Beardsley, J.W., Goeden, R.D., Jackson, C.G. (Eds.), Biological Control in the Western United States: Accomplishments and Benefits of Regional Research Project W-84, 1964-1989. University of California, Division of Agriculture and Natural Resources, Oakland, Publication No. 3361, pp. 281–285.

McConnachie, A.J., Hill, M.P., Byrne, M.J., 2004. Field assessment of a frond-feeding weevil, a successful biological control agent of red water fern, *Azolla filiculoides*, in southern Africa. Biological Control 29, 326–331.

McEvoy, P.B., Cox, C.S., Coombs, E.M., 1991. Successful biological control of ragwort. Ecological Applications 1, 430–442.

McEvoy, P.B., Karacetin, E., Bruck, D.J., 2008. Can a pathogen provide insurance against host shifts by a biological control organism? In: Julien, M.H., Sforza, R., Bon, M.C., Evans, H.C., Hatcher, P.E., Hinz, H.L., Rector, B.G. (Eds.), Proceedings of the XII International Symposium on Biological Control of Weeds, La Grande Motte, France, 22–227 April, 2007. CAB International, Wallingford, pp. 37–42.

McClure, M.S., Cheah, C.A. S.-J., Tigner, T.C., 2000. Is *Pseudoscymnus tsugae* the solution to the hemlock woolly adelgid problem? An early perspective, In: McManus, K.A., Shields, K.S., Souto, D.R. (Eds.), Proceedings, Symposium on Sustainable Management of Hemlock Ecosystems in Eastern North America, 22–24 June 1999, Durham, NH. USDA Forest Service General Technical Report NE-267, pp. 89–96.

McFadyen, R.E., 1995. Parthenium weed and human health in Queensland. Australian Family Physician 24, 1455–1459.

McFadyen, R.C., 2004. *Chromolaena odorata* in East Timor: history, extent, and control. In: Day, M.D., McFadyen, R.E. (Eds.), Proceedings of the 6th

International Workshop on Biological Control and Management of *Chromolaena*. ACIAR Technical Report # 55. Canberra, Australia, pp. 8–10.
McGugan, B.M., Coppel, H.C., 1962. Biological control of forest insects – 1910–1958. In: A Review of the Biological Control Attempts Against Insects and Weeds in Canada. Commonwealth Agricultural Bureaux Franham Royal, UK, pp. 35–127.
McKay, F., Oleiro, M., Walsh, G.C., Gandolfo, D., Cuda, J.P., Wheeler, G.S., 2009. Natural enemies of Brazilian peppertree (*Schinus terebinthifolius*: Anacardiaceae) from Argentina: their possible use for biological control in the USA. Florida Entomologist 92, 292–303.
McManus, M.L., McIntyre, T., 1981. Introduction In: Doane, C.C., McManus, M.L. (Eds.), 1981. The Gypsy Moth: Research toward Integrated Pest Management. Technical Bulletin No. 1584. US Department of Agriculture, Forest Service, Washington, DC, pp. 1–7.
McVea, C., Boyd, C.E., 1975. Effects of waterhyacinth cover on water chemistry, phytoplankton, and fish in ponds. Journal of Environmental Quality 4, 375–378.
Medal, J., Overholt, W., Stansly, P., Roda, A., Osborne, L., Hibbard, K., Gaskalla, R., Burns, E., Chong, J., Sellers, B., Hight, S., Cuda, J., Vitorino, M., Bredow, E., Pedrosa-Macedo, J., Wikler, C., 2008. Establishment, spread, and initial impacts of *Gratiana boliviana* (Chrysomelidae) on *Solanum viarum* in Florida. In: Julien, M.H., Sforza, R., Bon, M.C., Evans, H.C., Hatcher, P.E., Hinz, H.L., Rector, B.G. (Eds.), Proceedings XII International Symposium on Biological Control of Weeds. La Grande Motte, France, pp. 591–596.
Medeiros, A.C., Loope, L.L., Conant, P., McElvaney, S., 1997. Status, ecology, and management of the invasive plant *Miconia calvescens* DC (Melastomataceae) in the Hawaiian Islands. Bishop Museum Occasional Papers, No. 48, pp. 23–36.
Messing, R.H., Wright, M.G., 2006. Biological control of invasive species: solution or pollution? Frontiers in Ecology and the Environment 4, 132–140.
Messing, R.H., Noser, S., Hunkeler, J., 2009. Using host plant relationships to determine the origin of the invasive Erythrina Gall Wasp. Biological Invasions. doi:10.1007/s10530-008-9379-y.
Meyer, J.-Y., 1998. Observation on the reproductive biology of *Miconia calvescens* DC (Melastomataceae), an alien invasive tree on the island of Tahiti (South Pacific Ocean). Biotropica 30, 609–624.
Meyer, J.-Y., Florence, J., 1996. Tahiti's native flora endangered by the invasion of *Miconia calvescens* DC (Melastomataceae). Journal of Biogeography 23, 775–781.
Meyer, J.-Y., Taputuarai, R., Killgore, E., 2008. Dissemination and impacts of the fungal pathogen, *Colletotrichum gloeosporioides* f. sp. *miconiae*, on the invasive alien tree, *Miconia calvescens*, in Tahiti (South Pacific). In: Julien, M.H., Sforza, R., Bon, M.C., Evans, H.C., Hatcher, P.E., Hinz, H.L., Rector, B.G. (Eds.), XII International Symposium on Biological Control of Weeds. La Grande Motte, France, 22–27, April 2007. CABI, Wallingford, UK, pp. 594–600.
Meyer, J.-Y., Fourdrigniez, M. Taputuarai, R., 2009. Habitat restoration using a biocontrol agent: the positive effects of the fungal pathogen *Colletotrichum gloeosporioides* f. sp. *miconiae* on native plant recruitment in Tahiti (French Polynesia). Abstract of talk at Pacific Science Inter-Congress in Tahiti, February, 2009.
Michigan Department of Natural Resources. Available from: <http://www.michigan.gov/dnr/>.
Midgley, J.M., Hill, M.P., Villet, M.H., 2006. The effect of waterhyacinth, *Eichhornia crassipes* (Martius) Solms-Laubach (Pontederiaceae), on benthic biodiversity in two impoundments on the New Year's River, South Africa. African Journal of Aquatic Science 31, 25–30.
Mitchell, D.S., 1978. Aquatic Weeds in Australian Waters. Australian Government Publishing Service, Canberra. 189 pp.
Mitchell, D.S., 1980. The water-fern *Salvinia molesta* in the Sepik River, Papua New Guinea. Environmental Conservation 7, 115–122.
Mitchell, D.S., 1981. The management of *Salvinia molesta* in Papua New Guinea. In: Delfosse, E.S. (Ed.), Proceedings of the Fifth International Symposium on Biological Control of Weeds. Commonwealth Scientific and Industrial Research Organization, Melbourne, Australia, pp. 31–34.
Mo, J., Treviño, M., Palmer, W.A., 2000. Establishment and distribution of the rubber vine moth, *Euclasta whalleyi* Popescu-Gorj and Constantinescu (Lepidoptera: Pyralidae) following its release in Australia. Australian Journal of Entomology 39, 344–350.
Montgomery, M.E., Lyon, S.M., 1996. Natural enemies of adelgids in North America: their prospect for biological control of *Adelges tsugae* (Homoptera: Adelgidae). In: Salom, S.M., Tigner, T.C., Reardon, R.C. (Eds.), Proceedings, First Hemlock Woolly Adelgid Review, 1995. USDA Forest Service, FHTET 96-10, Charlottesville, Virginia, pp. 89–102.
Montgomery, M.E., Wang, H., Yao, D., Lu, W., Havill, N., Li, G., 2002. Biology of *Scymnus ningshanensis* (Coleoptera: Coccinellidae): a predator of *Adelges tsugae* (Homoptera: Adelgidae). In: Onken, B., Reardon, R., Lashomb, J. (Eds.), Proceedings: Hemlock Woolly Adelgid in the Eastern United States Symposium, February 5–7, 2002, East Brunswick, New Jersey. USDA Forest Service and New Jersey Agricultural Experiment Station Publication, pp. 181–188.
Moore, A., Marler, T., Miller, R.H., Muniappan, R., 2005. Biological control of cycad *Aulacaspis* scale on Guam. The Cycad Newsletter 28 (5), 6–8. http://www.cycadsg.org/publications/CAS/TCS-Moore-etal.pdf.
Moorhead, K.K., Reddy, K.R., Graetz, D.A., 1988. Waterhyacinth productivity and detritus accumulation. Hydrobiologia 157, 179–185.
Moran, V.C., Hoffmann, J.H., Zimmermann, H.G., 2005. Biological control of invasive alien plants in South Africa: necessity, circumspection, and success. Frontiers of Ecology and the Environment 3, 71–77.
Morin, L., Edwards, P.B., 2006. Selection of biological control agents for bridal creeper – a retrospective review. Australian Journal of Entomology 45, 286–290.
Morin, L., Hill, R.L., Matayoshi, S., 1997. Hawaii's successful biological control strategy for mist flower (*Ageratina riparia*) – can it be transferred to New Zealand? Biocontrol News and Information 18, 77–88.
Morin, L., Batchelor, K.L., Scott, J.K., 2006a. The biology of Australian weeds. *Asparagus asparagoides* (L.) Druce. Plant Protection Quarterly 21, 46–62.
Morin, L., Neave, M., Batchelor, K.L., Reid, A., 2006b. Biological control: a promising tool for managing bridal creeper in Australia. Plant Protection Quarterly 21, 69–77.
Morin, L., Reid, A.M., Sims-Chilton, N.M., Buckley, Y.M., Dhileepan, K., Hastwell, G.T., Nordblom, T.L., Raghu, S., 2009. Review of approaches to evaluate the effectiveness of weed biological control agents. Biological Control 51, 1–15.
Moriya, S., Shiga, M., Adachi, I., 2003. Classical biological control of the chestnut gall wasp in Japan. In: Van Driesche, R.G. (Ed.), Proceedings of the 1st International Symposium on Biological Control of Arthropods, Honolulu, Hawaii, 14–18 January 2002. USDA Forest Service, Morgantown, USA, pp. 407–415.
Muniappan, R., McFadyen, R.E., 2005. Gall-inducing arthropods in the biological control of weeds. In: Raman, A., Schaefer, C.W., Wither, T.M. (Eds.), Biology, Ecology, and Evolution of Gall-inducing Arthropods, vols. 1 and 2. Science Publishers, Inc., Enfield, New Hampshire, USA, pp. 709–730.
Muzika, R.M., Gottschalk, K.W., 1995. Gypsy moth role in forest ecosystems: the good, the bad, and the indifferent. In: Eskew, L.G. (Ed.), Forest Health Through Silviculture: Proceedings of the 1995 National Silviculture Workshop, Mescalero, New Mexico, May 8–11, 1995. Gen. Tech. Rep. RM-GTR-267. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO, pp. 99–104.
Myers, J.H., Jackson, C., Quinn, H., White, S., Cory, J.S., 2009. Successful biological control of diffuse knapweed, *Centaurea diffusa*, in British Columbia. Biological Control 50, 66–72.
Nagler, P.L., Glenn, E.P., Didan, K., Osterberg, J., 2008. Wide-area estimates of stand structure and water use of *Tamarix* spp. on the lower Colorado River: implications for restoration and water management projects. Restoration Ecology 16, 136–145.
Navie, S.C., Panetta, F.D., McFadyen, R.E., Adkins, S.W., 2004. Germinable soil seedbanks of central Queensland rangelands invaded by the exotic weed *Parthenium hysterophorus* L.. Weed Biology and Management 4 (3), 154–167.
Nechols, J.R., Andres, L.A., Beardsley, J.W., Goeden, R.D., Jackson, C.G., 1995. Biological Control in the Western United States, Accomplishments and Benefits of Regional Project W-84, 1964–1989. University of California, Oakland, CA.
Neill, D.A., 1988. Experimental studies on species relationships in Erythrina (Leguminosae: Papilionideae). Annals of Missouri Botanical Garden 75, 886–969.
Neira, C., Levin, L.A., Grosholz, E.D., Mendoza, G., 2007. Influence of invasive *Spartina* growth stages on associated macrofaunal communities. Biological Invasions 9, 975–993.
Neuenschwander, P., Julien, M.H., Center, T.D., Hill, M.P., 2009. *Pistia stratiotes* L. (Araceae). In: Muniappan, R., Reddy, G.V., Raman, A. (Eds.), Biological Control of Tropical Weeds Using Arthropods. Cambridge University Press, New York, NY, pp. 332–352.
Newbery, D.M., 1988. Recently monitored trends in the abundance of *Icerya seychellarum* Westw. (Insecta: Homoptera) on Aldabra Atoll, with suggestions for its biological control. Bulletin Biological Society of Washington 8, 30–39.
Newbery, D.M., Hill, M.G., 1985. Changes in the distribution of the coccid *Icerya seychellarum* Westw. on Aldabra atoll in relation to vegetation density Atoll Research Bulletin No. 291.
Norambuena, H., 1995. Impact of *Apion ulicis* Forster (Coleoptera: Apionidae) on gorse *Ulex europaeus* L. (Fabaceae) in agricultural and silvicultural habitats in Southern Chile. Ph.D. Entomology Department, Washington State University, Pullman, WA.
Norambuena, H., Piper, G.L., 2000. Impact of *Apion ulicis* on *Ulex europaeus* seed dispersal. Biological Control 17, 267–271.
Norambuena, H., Martinez, G., Carillo, R., Neira, M., 2007. Host specificity and establishment of *Tetranychus lintearius* (Acari: Tetranychidae) for biological control of gorse (*Ulex europaeus*). Biological Control 40, 204–212.
Nuzzo, V., 1993. Distribution and spread of the invasive biennial garlic mustard (*Alliaria petiolata*) in North America. In: McNight, B.N. (Ed.), Biological Pollution: The Control and Impact of Invasive Exotic Species. Indiana Academy of Sciences, Indianapolis, pp. 137–146.
Oehrens, E., 1977. Biological control of the blackberry through the introduction of rust, *Phragmidium violaceum*. FAO Plant Protection Bulletin 25, 26–28.
Oehrens, E.B., Gonzalez, S.M., 1977. Dispersion, ciclo biologico y daños causados por *Phragmidium violaceum* (Schultz) Winter en zarzamora (*Rubus constrictus* Lef. Et M. y *R. ulmifolius* Schott.) en la zonas centro sur y sur de Chile. Agro Sur 5, 73–85.
Opande, G.O., Onyango, J.C., Wagai, S.O., 2004. Lake Victoria: The waterhyacinth (*Eichhornia crassipes* [Mart.] Solms), its socio-economic effects, control measures and resurgence in the Winam gulf. Limnologica 34, 105–109.
Orwig, D.A., Foster, D.R., 1998. Forest response to the introduced hemlock woolly adelgid in southern New England, USA. Journal of the Torrey Botanical Society 125 (1), 60–73.
Paige, A.R., Lacey, K.L., 2006. Economic impact assessment of Australian weed biological control. CRC for Australian Weed Management Technical Series No. 10, 150 pp.
Palmer, W.A., Lockett, C.J., Senaratne, K.A.D.W., McLennan, A., 2007. The introduction and release of *Chiasmia inconspicua* and *C.assimilis* (Lepidoptera:

Geometridae) for the biological control of *Acacia nilotica* in Australia. Biological Control 41 (3), 368–378.
Pataki, D.E., Bush, S.E., Gardner, P., Solomon, D.K., Ehleringer, J.R., 2005. Ecohydrology in a Colorado River riparian forest: implications for the decline of *Populus fremontii*. Ecological Applications 15, 1009–1018.
Pattison, R.R., Mack, R.N., 2007. Potential distribution of the invasive tree *Triadica sebifera* (Euphorbiaceae) in the United States: evaluating climex predictions with field trials. Global Change Biology 14, 813–826.
Pemberton, R.W., 2000. Predictable risk to native plants in weed biological control. Oecologia 125, 489–494.
Pemberton, R.W., 2003. Potential for biological control for control of the lobate lac scale, *Paratachardina lobata lobata* (Chamberlin) (Hemiptera: Kerridae). Florida Entomologist 86, 354–361.
Pemberton, R.W., 2009. Proposed field release of *Liliioceris* sp. near *impressa* (Fabricius) (Coleoptera: Chrysomelidae), a leaf and bulbil feeder of air potato, *Dioscorea bulbifera* L. (Dioscoreaceae) in Florida. Petition to release a biological control agent, submitted February 2, 2009. On file at the U.S. Department of Agriculture, Agricultural Research Service Biological Control Documentation Center, National Agricultural Library, Beltsville, Maryland, USA.
Pemberton, R.W., Ferriter, A., 1998. Old World climbing fern (*Lygodium microphyllum*); a dangerous weed in Florida. American Fern Journal 88, 165–175.
Pemberton, R.W., Liu, H., 2007. Control and persistence of native *Opuntia* on Nevis and St. Kitts 50 years after the introduction of *Cactoblastis cactorum*. Biological Control 41, 272–282.
Pemberton, R.W., Turner, C.E., 1990. Biological control of *Senecio jacobaea* in northern California, an enduring success. Entomophaga 35, 71–77.
Petit, J.N., Hoddle, M.S., Grandgirard, J., Roderick, G.K., Davies, N., 2009. Successful spread of a biocontrol agent reveals a biosecurity failure: elucidating long distance invasion pathways for *Gonatocerus ashmeadi* in French Polynesia. Biocontrol 54, 485–495.
Pitcairn, M.J., Woods, D.M., Popescu, V., 2005. Update on the long-term monitoring of the combined impact of biological control insects on yellow starthistle. In: Woods, D.M. (Ed.), Biological Control Program Annual Summary, 2004. California Department of Food and Agriculture, Plant Health and Pest Prevention Services, Sacramento, CA, pp. 27–30.
Poland, T.M., McCullough, D., 2006. Emerald ash borer: invasion of the urban forest and the threat to North America's ash resource. Journal of Forestry 104, 118–124.
Porter, A., 1994. Implications of introduced garlic mustard (*Alliaria petiolata*) in the habitat of *Pieris virginiensis* (Pieridae). Journal of the Lepidopterists' Society 48, 171–172.
Pratt, P.D., Coombs, E.M., Croft, B.A., 2003. Predation by phytoseiid mites on *Tetranychus lintearius* (Acari: Tetranychidae), an established weed biological control agent of gorse (*Ulex europaeus*). Biological Control 26, 40–47.
Pratt, P.D., Rayamajhi, M.B., Van, T.K., Center, T.D., 2005. Herbivory alters resource allocation and compensation in the invasive tree *Melaleuca quinquenervia*. Ecological Entomology 15, 443–462.
Quacchia, A., Moriya, S., Bosio, G., Scapin, I., Alma, A., 2008. Rearing, release and settlement prospect in Italy of *Torymus sinensis*, the biological control agent of the chestnut gall wasp *Dryocosmus kuriphilus*. Biocontrol 53, 829–839.
Quin, T.K., Gullan, P.J., 1998. Systematics as a tool for pest management: case studies using scale insects and mites. In: Sixth Australian Applied Entomological Research Conference, Brisbane, 29 September–2 October 1998, pp. 479–488.
Radford, I., Nicholas, D.M., Brown, J.R., 2001. Assessment of the biological control impact of seed predators on the invasive shrub *Acacia nilotica* (Prickly Acacia) in Australia. Biological Control 20, 261–268.
Rayamajhi, M.B., Purcell, M.F., Van, T.K., Center, T.D., Pratt, P.D., Buckingham, G.R., 2002. Australian paperbark tree (*Melaleuca*). In: Van Driesche, R.G., Blossey, B., Hoddle, M.S., Lyon, S., Reardon, R. (Eds.), Biological Control of Invasive Plants in the Eastern United States. Forest Health Technology Enterprise Team, Morgantown, West Virginia, pp. 117–130.
Rayamajhi, M.B., Van, T.K., Pratt, P.D., 2007. *Melaleuca quinquenervia* dominated forests in Florida: analyses of natural-enemy impacts on stand dynamics. Plant Ecology 192, 119–132.
Rayamajhi, M.B., Pratt, P.D., Van, T.K., Center, T.D., 2008. Aboveground biomass of an invasive tree melaleuca (*Melaleuca quinquenervia*), before and after herbivory by adventive and introduced natural enemies: a temporal case study in Florida. Weed Science 56, 451–456.
Rayamajhi, M.B., Pratt, P.D., Van, T.K., Center, T.D., 2009. Decline in exotic tree density facilitates increased plant diversity: the experience from *Melaleuca quinquenervia* invaded wetlands. Wetlands Ecology and Management 17, 455–467.
Reckendorf, F., Leach, D., Baum, R., Carbon, J., 1985. Stabilization of sand dunes in Oregon. Agricultural History 59, 260–268.
Reyes, O., Casal, M., Rego, F.C., 2009. Resprouting ability of six Atlantic shrub species. Folia Geobot 44, 19–29.
Richard, A., Lankau1, R.A., Rogers, W.E., Siemann, E., 2004. Constraints on the utilisation of the invasive Chinese tallow tree *Sapium sebiferum* by generalist native herbivores in coastal prairies. Ecological Entomology 29, 66–75.
Richardson, D.M., van Wilgen, B.W., Higgins, S.I., Trinder-Smith, T.H., Cowling, R.M., McKelly, D.H., 1996. Current and future threats to biodiversity on the Cape Peninsula. Biodiversity and Conservation 5, 607–647.
Richardson, D.M., Macdonald, I.A.W., Hoffmann, J.H., Henderson, L., 1997. Alien plant invasion. In: Cowling, R.M., Richardson, D.M., Pierce, S.M. (Eds.), Vegetation of Southern Africa. Cambridge University Press, Cambridge, UK, pp. 535–570.
Roberts, P.D., Pullin, A.S., 2008. The effectiveness of management interventions for the control of *Spartina* species: a systematic review and meta-analysis. Aquatic Conservation: Marine and Freshwater Ecosystems 18, 592–618.
Robles, M., Wang, N., Kim, R., Choi, B.H., 1997. Cytotoxic effects of repin, a principal sesquiterpene lactone of Russian knapweed. Journal of Neuroscience Research 47, 90–97.
Roché, C.T., Roché Jr., B.F., 1988. Distribution and amount of four knapweed (*Centaurea* L.) species in eastern Washington. Northwest Science 62, 242–253.
Room, P.M., Thomas, P.A., 1985. Nitrogen and establishment of a beetle for biological control of the floating weed salvinia in Papua New Guinea. Journal of Applied Ecology 22, 139–156.
Room, P.M., Harley, K.L.S., Forno, I.W., Sands, D.P.A., 1981. Successful biological control of the floating weed salvinia. Nature 294, 78–80.
Roque-Albelo, L., 2003. Population decline of Galapagos endemic Lepidoptera on Volcan Alcedo (Isabela island, Galápagos Islands, Ecuador): an effect of the introduction of the cottony cushion scale? Bulletin de l'Institut Royal des Sciences Naturelles de Belgique, Entomologie 73, 1–4.
Rørslett, B., 2006. Aquatic weed problems in a hydroelectric river: the R. Otra, Norway. Regulated Rivers: Research and Development 2, 25–37.
Rose, K.E., Louda, S.M., Rees, M., 2005. Demographic and evolutionary impacts of native and invasive herbivores on *Cirsium canescens*. Ecology 86, 453–465.
Ross, R.M., Bennett, R.M., Snyder, C.D., Young, J.A., Smith, D.R., Lemarie, D.P., 2003. Influence of eastern hemlock (*Tsuga canadensis* L.) on fish community structure and function in headwater streams of the Delaware River basin. Ecology of Freshwater Fish 11, 1–6.
Royle, D.D., Lathrop, R.G., 1997. Monitoring hemlock health in New Jersey using Landsat TM data and change detection techniques. Forest Science 43 (3), 327–335.
Ryan, R.B., 1990. Evaluation of biological control: introduced parasites of larch casebearer (Lepidoptera: Coleophoridae) in Oregon. Environmental Entomology 19, 1873–1881.
Sainty, G., McCorkelle, G., Julien, M., 1998. Control and spread of alligator weed (*Alternanthera philoxeroides* (Mart.) Griseb.), in Australia: lesson for other regions. Wetlands Ecological Management 5, 195–201.
Samuel, L.W., Kirby, D.R., Norland, J.E., Anderson, G.L., 2008. Leafy spurge suppression by flea beetles in the Little Missouri drainage basin, USA. Rangeland Ecology and Management 61, 437–443.
Sands, D.P.A., Lukins, R.G., Snowball, G.J., 1986. Agents introduced into Australia for biological control of *Gascardia destructor* (Newstead) (Hemiptera: Coccidae). Journal of the Australian Entomological Society 25, 51–59.
Sands, D.P.A., Vickers, R.A., Brancatini, V. and Fahey, O., 1999. Control of breadfruit mealybug in the Pacific. P. 73 in Report of Research, July 1997–July 1999 (Malcolm Robertson ed), CSIRO Division of Entomology, Canberra.
Schmidt, W.C., Shearer, R.C., Roe, A.L., 1976. Ecology and silviculture of western larch forests. Technical Bulletin No. 1520, USDA Forest Service, 97 pp.
Schooler, S.S. 1998. Biological Control of Purple Loosestrife *Lythrum salicaria* By Two chrysomelid beetles *Galerucella pusilla* and *G. calmariensis*. Masters Thesis, Oregon State University, Corvallis, Oregon, USA.
Schooler, S.S., McEvoy, P.B., Coombs, E.M., 2006. Negative per capita impacts of purple loosestrife and reed canary grass on plant diversity of wetland communities. Diversity and Distributions 12, 351–363.
Schooler, S.S., McEvoy, P.B., Hammond, P., Coombs, E.M., 2009. Negative *per capita* effects of two invasive plants, *Lythrum salicaria* and *Phalaris arundinaceae*, on the moth diversity of wetland communities. Bulletin of Entomological Research 99, 229–243.
Schroer, S., Pemberton, R.W., 2007. Host acceptance tests of parasitoids of the Indian *Paratachardina lobata* on the invasive lobate lac scale in Florida. Florida Entomologist 90, 545–552.
Schroer, S., Pemberton, R.W., Cook, L.G., Kondo, T., Gullan, P.J., 2008. The genetic diversity, relationships, and potential for biological control of the lobate lac scale, *Paratachardina pseudolobata* Kondo and Gullan (Hemiptera: Coccideae: Kerridae), a pest in Florida, the Bahamas and Christmas Island. Biological Control 46, 256–266.
Schweitzer, D.F., Minno, M.C., Wagner, D.L., 2010. Rare, declining, or poorly known butterflies and moths (Lepidoptera) of forests and woodlands in the eastern United States. USFS Technology Transfer Bulletin FHTET-2010-xx, in press.
Seastedt, T.R., Knochel, D.G., Garmoe, M., Shosky, S.A., 2007. Interactions and effects of multiple biological control insects on diffuse and spotted knapweed in the Front Range of Colorado. Biological Control 42, 345–354.
Seawright, E.K., Rister, M.E., Lacewell, R.D., McCorkle, D.A., Sturdivant, A.W., Yang, C., Goolsby, J.A., 2009. Economic implications for the biological control of *Arundo donax* in the Rio Grande Basin. Southwestern Entomologist 34, 377–394.
Seixas, C.D.S., Barreto, R.W., Freitas, L.G., Maffia, L.A., Monteiro, F.T., 2004. *Ditylenchus drepanocercus* (Nematoda), a potential biological control agent for *Miconia calvescens* (Melastomataceae): host-specificity and epidemiology. Biological Control 31, 29–37.
Serbesoff-King, K., 2003. Melaleuca in Florida: a literature review on the taxonomy, distribution, biology, ecology, economic importance, and control measures. Journal of Aquatic Plant Management 41, 98–112.
Shafroth, P.B., Cleverly, J.R., Dudley, T.L., Taylor, J.P., Van Riper, C., Weeks, E.P., Stuart, J.N., 2005. Control of *Tamarix* in the western United States: implications for water salvage, wildlife use, and riparian restoration. Environmental Management 35, 231–246.

Sharratt, B.S., Lauer, D., 2006. Particulate matter concentration and air quality affected by windblown dust in the Columbia Plateau. Journal of Environmental Quality 35, 2011–2016.
Sharratt, B., Feng, G., Wendling, L., 2007. Loss of soil and PM10 from agricultural fields associated with high winds on the Columbia Plateau. Earth Surface Processes and Landforms 32, 621–630.
Shaw, R.H., Bryner, S., Tanner, R., 2009. The life history and host range of the Japanese knotweed psyllid, *Aphalara itadori* Shinji: potentially the first classical biological weed control agent for the European Union. Biological Control 49, 105–113.
Sheley, R.L., Larson, L.L., Jacobs, J.J., 1999. Yellow starthistle. In: Sheley, R.L., Petroff, J.K. (Eds.), Biology and Management of Noxious Rangeland Weeds. Oregon State University Press, Corvallis, pp. 408–416.
Sher, A.A., Marshall, D.L., Taylor, J.P., 2002. Establishment patterns of native *Populus* and *Salix* in the presence of invasive nonnative *Tamarix*. Ecological Applications 12, 760–772.
Simberloff, D., Schmitz, D.C., Brown, T.C., 1997. Strangers in Paradise, Impact and Management of Non-indigenous Species in Florida. Island Press, Washington, DC.
Simberloff, D., Stiling, P., 1996. Risks of species introduced for biological control. Biological Conservation 78, 185–192.
Skinner, K.M., Smith, L., Rice, P., 2000. Using noxious weed lists to prioritize targets for developing weed management strategies, including biological control programs. Weed Science 48, 640–644.
Smith, D., Beattie, G.A.C., Broadley, R. (Eds.), 1997. Citrus Pests and their Natural Enemies. Integrated Pest Management in Australia. Queensland Department of Primary Industries, Information Series Q 197030, 272 pp.
Smith, L., 2004. Impact of biological control agents on diffuse knapweed in central Montana. In: Cullen, J.M., Briese, D.T., Kriticos, D.J., Lonsdale, W.M., Morin, L., Scott, J.K. (Eds.), Proceedings of the XI International Symposium on Biological Control of Weeds. CSIRO Entomology, Canberra, Australia, pp. 589–593.
Smith, L., 2005. Host plant specificity and potential impact of *Aceria salsolae* (Acari: Eriophyidae), an agent proposed for biological control of Russian thistle (*Salsola tragus*). Biological Control 34, 83–92.
Smith, L., 2007. Physiological host range of *Ceratapion basicorne*, a prospective biological control agent of *Centaurea solstitialis* (Asteraceae). Biological Control 41, 120–133.
Smith, L., Cristofaro, M., de Lillo, E., Monfreda, R., Paolini, A., 2009. Field assessment of host plant specificity and potential effectiveness of a prospective biological control agent, *Aceria salsolae*, of Russian thistle, *Salsola tragus*. Biological Control 48, 237–243.
Smith, N.J., Smith, D., 2000. Studies on the flatid *Jamella australiae* Kirkaldy causing dieback in *Pandanus tectorius* var. *pedunculatus* (A.Br.) Domin on the Sunshine and Gold Coasts in Southeast Queensland. General and Applied Entomology 29, 11–20.
Snowball, G.J., 1969. Prospects for biological control of white wax scale. Journal of the Entomological Society of Australia (N.S.W.) 5, 23–33.
Snyder, C.D., Young, J.A., Lemarié, D.P., Smith, D.R., 2002. Influence of eastern hemlock (*Tsuga canadensis*) forests on aquatic invertebrate assemblages in headwater streams. Canadian Journal of Fisheries and Aquatic Science 59, 262–275.
Sorensen, B., Jusaitis, M., 1995. The impact of bridal creeper on an endangered orchid. In: Cooke, D., Choate, J. (Eds.), Weeds of Conservation Concern: Seminar and Workshop Papers. Department of Environmental and Natural Resources and Animal and Plant Control Commission, Adelaide, Australia, pp. 27–31.
Spoon, C.W., Bowles, H.R., Kulla, A., 1983. Noxious weeds on the Lolo National Forest. A situation analysis staff paper. U.S. Department of Agriculture Forest Service, Northern Region, Missoula, MT.
St. Helena National Trust 2009. Available from: <http://www.nationaltrust.org.sh/millennium_forest.html/> (accessed 23.06.09).
Stalling, D. 1998. Weeds: an exotic invasion of elk country. Bugle – Journal of Elk and the Hunt (July/Aug 1998), 16–27.
Stock, W.D., Wienand, K.T., Baker, A.C., 1995. Impacts of invading N_2-fixing *Acacia* species on patterns of nutrient cycling in two Cape ecosystems: evidence from soil incubation studies and ^{15}N natural abundance values. Oecologia 101, 375–382.
Story, J.M., Good, W.R., White, L.J., Smith, L., 2000. Effects of the interaction of the biocontrol agent, *Agapeta zoegana* L. (Lepidoptera: Cochylidae), and grass competition on spotted knapweed. Biological Control 17, 182–190.
Story, J.M., Callan, N.W., Corn, J.G., White, L.J., 2006. Decline of spotted knapweed density at two sites in western Montana with large populations of the introduced root weevil, *Cyphocleonus achates* (Fahraeus). Biological Control 38, 227–232.
Story, J.M., Smith, L., Corn, J.G., White, L.J., 2008. Influence of seed head – attacking biological control agents on spotted knapweed reproductive potential in western Montana over a 30-year period. Environmental Entomology 37, 510–519.
Strang, R.M., Lindsay, K.M., Price, R.S., 1979. Knapweeds: British Columbia's undesirable aliens. Rangelands 1 (4), 141–143.
Stromberg, J.C., Fry, J., Patten, D.T., 1997. Marsh development after large floods in an alluvial, arid-land river. Wetlands 17, 292–300.
Suttle, K.B., Hoddle, M.S., 2006. Engineering enemy free space: an invasive pest that kills its predators. Biological Invasions 8, 639–649.
Swarbrick, J.T., Willson, B.W., Hannan-Jones, M.A., 1995. The biology of Australian weeds 25. *Lantana camara* L.. Plant Protection Quarterly 10, 82–95.
Tang, W., Yang, S.-L., Vatcharakorn, P., 1997. Cycads of Thailand. Nong Nooch Tropical Garden and the Cycad Conservation Company, Bangkok, Thailand.
Thomas, J., Leys, A., 2002. Strategic management of bitou bush (*Chrysanthemoides monilifera* ssp. *rotundata* (L.) T. Norl.). In: Spafford Jacob, H., Dodd, J., Moore, J.H. (Eds.), Proceedings of 13th Australian Weeds. Plant Protection Society of Western Australia, Perth, Australia, pp. 586–590.
Thomas, J.R., Packham, D.J.L., Hilton, G.M., 1992. Ecology of Woodlands and Forests. Kluwer Academic Publishers, Dordrecht, NL.
Thomas, P.A., Room, P.M., 1986a. Successful control of the floating weed *Salvinia molesta* in Papua New Guinea: a useful biological invasion neutralizes a disastrous one. Environmental Conservation 13, 242–248.
Thomas, P.A., Room, P.M., 1986b. Taxonomy and control of *Salvinia molesta*. Nature 320, 581–584.
Tipping, P.W., Martin, M.R., Pratt, P.D., Center, T.D., Rayamajhi, M.B., 2008. Suppression of growth and reproduction of an exotic invasive tree by two introduced insects. Biological Control 44, 235–241.
Tipping, P.W., Martin, M.R., Nimmo, K.R., Pierce, R.M., Smart, M.D., White, E., Madeira, P.T., Center, T.D., 2009. Invasion of a West Everglades wetland by *Melaleuca quinquenervia* countered by classical biological control. Biological Control 48, 73–78.
Toft, J.D., Simenstad, C.A., Cordell, J.R., Grimaldo, L.F., 2003. The effects of introduced waterhyacinth on habitat structure, invertebrate assemblages, and fish diets. Estuaries and Coasts 26, 746–758.
Tomley, A.J., 1995. The biology of Australian weeds 26. *Cryptostegia grandiflora* R. Br.. Plant Protection Quarterly 10 (4), 122–130.
Towers, G.H.N., Subba Rao, P.V., 1992. Impact of the pan-tropical weed, *Parthenium hysterophorus* L. on human affairs. In: Richardson, R.G. (Ed.), Proceedings of the First International Weed Control Congress, vol. 2. Weed Science Society of Victoria, Melbourne, pp. 134–138.
Tracy, J.L., Robbins, T.O., 2009. Taxonomic revision and biogeography of the *Tamarix*-feeding *Diorhabda elongata* (Brullé, 1832) species group (Coleoptera: Chrysomelidae: Galerucinae: Galerucini) and analysis of their potential in biological control of Tamarisk. Zootaxa 2101, 1–152.
Trammell, M.A., Butler, J.L., 1995. Effects of exotic plants on native ungulate use of habitat. Journal of Wildlife Management 59, 808–816.
Trujillo, E.E., 2005. History and success of plant pathogens for biological control of introduced weeds in Hawaii. Biological Control 33, 113–122.
Turner, C.E., McEvoy, P.B., 1995. Tansy ragwort. In: Nechols, J.R., Andres, L.A., Beardsley, J.W., Goeden, R.D., Jackson, C.G. (Eds.), Biological Control in the Western United States: Accomplishments and Benefits of Regional Research Project W-84, 1964–1989. University of California, Division of Agriculture and Natural Resources, Oakland. Publication No. 3361, pp. 264–269.
Turner, P.J., Scott, J.K., Spafford Jacob, H., 2006. Barrier to restoration: the decomposition rate of bridal creeper's root system. In: Preston, C., Watts, J.H., Crossman, N.D. (Eds.), Proceedings of the 15th Australian Weeds Conference. Weed Management Society of South Australia, Adelaide, Australia, pp. 827–830.
Turner, P.J., Scott, J.K., Spafford, H., 2008a. The ecological barriers to the recovery of bridal creeper (*Asparagus asparagoides* (L.) Druce) infested sites: impacts on vegetation and the potential increase in other exotic species. Austral Ecology 33, 713–722.
Turner, P.J., Scott, J.K., Spafford, H., 2008b. Implications of successful biological control of bridal creeper *Asparagus asparagoides* (L.) Druce in south–west Australia. In: van Klinken, R.D., Osten, V.A., Panetta, F.D., Scanlan, J.C. (Eds.), Proceedings of the 16th Australian Weeds Conference. Queensland Weed Society, Brisbane, Australia, pp. 390–392.
Ultsch, G., 1973. The effects of waterhyacinth (*Eichhornia crassipes*) on the microenvironment of aquatic communities. Archives of Hydrobiology 72, 460–473.
USDA APHIS, 2007. The proposed release of three parasitoids for the biological control of the emerald ash borer (*Agrilus planipennis*) in the continental United States: environmental assessment. Federal Register 72, 28947-28948. Docket No. APHIS-2007-0060.
USDA Forest Service website. Available from: <http://na.fs.fed.us/fhp/gm/defoliation/index.shtm/>, statistics on acres of defoliation by gypsy moth.
Valentine, L.E., Roberts, B., Schwarzkopf, L., 2007. Mechanisms driving avoidance of non-native plants by lizards. Journal of Applied Ecology 44, 228–237.
van der Westhuizen, L., 2006. The evaluation of *Phenrica* sp. 2 (Coleoptera: Chrysomelidae: Alticinae), as a possible biological control agent for Madeira vine, *Andredera cordifolia* (Ten.) Steenis in South Africa. M.S. Department Zoology and Entomology, Rhodes University, Grahamstown, South Africa.
Van Driesche, R.G., 1994. Classical biological control of environmental pests. Florida Entomologist 77, 20–33.
Van Driesche, R.G., Bellows Jr., T.S., 1996. Biological Control. Chapman and Hall, New York. 539 pp.
Van Driesche, R.G., Healy, S., Reardon, R., 1996. Biological control of arthropod pests of the northeastern and north central forests in the United States: a review and recommendations. FHTET-96-19, US Department of Agriculture, Forest Service, Morgantown, West Virginia.
Van Driesche, R.G., Blossey, B., Hoddle, M., Lyon, S., Reardon, R., 2002. Biological control of invasive plants in the eastern United State. FHTET-2002-04, USDA Forest Service, Morgantown, West Virginia.
Van Driesche, R., Hoddle, M., Center, T., 2008. Control of Pests and Weeds by Natural Enemies: An Introduction to Biological Control. Blackwell, Malden, MA, USA. 473 pp.
van Klinken, R.D., Graham, J., Flack, L., 2006. The demography of exotic, invasive fire-tolerant mesquite (*Prosopis*) in Australia and the implications for ecosystem impacts and management. Biological Invasions 8, 727–741.

van Klinken, R.D., Campbell, S., 2009. Australian weeds series: *Prosopis* species. In: Panetta, F.D. (Ed.), Australian Weeds Series, vol. 3, pp. 238–273.
van Lenteren, J.C., Bale, J.S., Bigler, F., Hokkanen, H.M.T., Loomans, A.J.M., 2006. Assessing risks of releasing exotic biological control agents of arthropod pests. Annual Review of Entomology 51, 609–634.
van Wilgen, B.W., Bond, W.J., Richardson, D.M., 1992. Ecosystem management. In: Cowling, R.M. (Ed.), The Ecology of Fynbos. Nutrients, Fire and Diversity. Oxford University Press, Cape Town, South Africa, pp. 345–371.
van Wilgen, B.W., Reyers, B., Le Maitre, D.C., Richardson, D.M., Schonegevel, L., 2008. A biome-scale assessment of the impact of invasive alien plants on ecosystems services in South Africa. Journal of Environmental Management 89, 336–349.
Versfeld, D.B., van Wilgen, B.W., 1986. Impacts of woody aliens on ecosystem properties. In: Macdonald, I.A.W., Kruger, F.J., Ferrar, A.A. (Eds.), The Ecology and Control of Biological Invasions in South Africa. Oxford University Press, Cape Town, South Africa, pp. 239–246.
Vivian-Smith, G., Lawson, B.E., Turnbull, I., Downey, P.O., 2007. The biology of Australian weeds. 46. *Anredera cordifolia* (Ten.) Steenis. Plant Protection Quarterly 22, 2–10.
Vogler, W., Lindsay, A., 2002. The impact of the rust fungus *Maravalia crytostegiae* on three rubber vine (*Cryptostegia grandiflora*) populations in tropical Queensland. In: Jacob, H.S., Dodd, J., Moore, J.H. (Eds.), 13th Australian Weeds Conference "Threats Now and Forever?", Perth, Western Australia, 8–13 September, 2002. Plant Protection Society of Western Australia, Victoria Park, pp. 180–182.
Voigt, G.K., Mergen, F., 1962. Seasonal variation in the toxicity of *Ailanthus* leaves to pine seedlings. Botanical Gazette 123, 262–265.
Volin, J.C., Lott, M.S., Muss, J.D., Owen, D., 2004. Predicting rapid invasion of the Florida Everglades by Old World Climbing Fern (*Lygodium microphyllum*). Diversity and Distributions 10, 439–446.
Wade, D.D., 1981. Some *Melaleuca*-fire relationships, including recommendations for home-site protections. In: Geiger, R.K. (Ed.), Proceedings of the *Melaleuca* Symposium. Florida Department of Agriculture and Consumer Services, Division of Forestry, Tallahassee, Florida.
Wagner, D.L., 2007. Emerald ash borer threatens ash-feeding Lepidoptera. Newsletter of the Lepidopterists Society 49, 10–11.
Walden, D., van Dam, R., Finlayson, M., Storrs, M., Lowry, J., Kriticos, D., 2004. A risk assessment of the tropical wetland weed *Mimosa pigra* in Northern Australia. In: Julien, M., Flanagan, G., Heard, T., Hennecke, B., Paynter, Q., Wilson, C. (Eds.), Research and Management of *Mimosa pigra*. CSIRO Entomology, Canberra, Australia, pp. 11–21.
Walton, C., 2005. Reclaiming Lost Provinces: A Century of Weed Biological Control in Queensland. Queensland Department of Natural Resources and Mines, Brisbane, Australia. 104 pp.
Wang, Y., Ding, J., Wheeler, G., Purcell, M., Zhang, G., 2009. *Heterapoderopsis bicallosicollis* (Coleoptera: Attelabidae), a potential biological control agent for Chinese tallow (*Triadica sebifera*). Environmental Entomology 38, 1135–1144.
Waterhouse, D.F., 1993. Biological Control Pacific Prospects – Supplement 2. Australian Centre for International Agricultural Research, Canberra.
Waterhouse, D.F., Sands, D.P.A., 2001. Classical Biological Control of Arthropods in Australia. Australian Centre for International Agricultural Research, Canberra, Australia.
Watson, A.K., Renney, A.J., 1974. The biology of Canadian weeds, 6. *Centaurea diffusa* and *C. maculosa*. Canadian Journal of Plant Science 54, 687–701.
Watson, G.W., Voegtlin, D.J., Murphy, S.T., Foottit, R.G., 1999. Biogeography of the *Cinara cupressi* complex (Hemiptera: Aphididae) on Cupressaceae, with description of a pest species introduced into Africa. Bulletin of Entomological Research 89, 271–283.
Webb, F.E., Quednau, F.W., 1971. *Coleophora laricella* (Hübner), larch casebearer (Lepidoptera: Coleophoridae). In: Kelleher, J.S., Hulme, M.A. (Eds.), Biological Control Programmes Against Insects and Weeds in Canada 1959–1968. Commonwealth Institute of Biological Control, Technical Communication No. 4, Commonwealth Agricultural Bureaux, Farnham Royal, UK, pp. 131–136.
Webb, R.E., White, G.B., Thorpe, K.W., Talley, S.E., 1999. Quantitative analysis of a pathogen-induced premature collapse of a "leading edge" gypsy moth (Lepidoptera: Lymantriidae) population in Virginia. Journal of Entomological Science 34, 84–100.
Weise, C., Amalin, D., Coe, R., Mannion, C., 2005. Effects of the parasitic wasp *Coccobius fulvus* on cycad aulacaspis scale, *Aulacaspis yasumatsui*, at Montgomery Botanical Center, Miami, Florida. Proceedings of the Florida State Horticultural Society 118, 319–321.
Wheeler, G.S., Pemberton, R.W., Raz, L., 2007. A biological control feasibility study of the invasive weed – air potato, *Dioscorea bulbifera* L. (Dioscoreaceae); an effort to increase biological control transparency and safety. Natural Areas Journal 27, 269–279.
Wilcox, D.D., Call, C.A., Ramsey, D., Bagley, C., 1996. Ecological amplitude and invasion of diffuse knapweed (*Centaurea diffusa*) at Yakima Training Center, Washington. In: Proceedings of the Society for Range Management Meeting, February 10–15, 1996. Wichita, Kansas, p. 84 (Abstract only).
Williams, J., West, C., 2000. Environmental weeds in Australia and New Zealand: issues and approaches to management. Austral Ecology 25, 425–444.
Willis, A.J., McKay, R., Vranjic, J.A., Kilby, M.J., Groves, R.H., 2003. Comparative seed ecology of the endangered shrub, *Pimelea spicata* and a threatening weed, bridal creeper: smoke, heat and other fire-related germination cues. Ecological Management and Restoration 4, 55–65.
Wilson, J.R.U., Ajuonu, O., Center, T.D., Hill, M.P., Julien, M.H., Katagira, F.F., Neuenschwander, P., Njoka, S.W., Ogwang, J., Reeder, R.H., Van, T., 2007. The decline of waterhyacinth on Lake Victoria was due to biological control by *Neochetina* spp. Aquatic Botany 87, 90–93.
Winn, M.F., Araman, P.A., 2005. Study of the Utilization Options for Dead and Dying Eastern Hemlock in the Southern Appalachians. In: Proceedings, Third Symposium on Hemlock Woolly Adelgid in the Eastern United States, pp. 360–363.
Wood, A.R., Morris, M.J., 2007. Impact of the gall-forming rust fungus *Uromycladium tepperianum* on the invasive tree *Acacia saligna* in South Africa: 15 years of monitoring. Biological Control 41, 68–77.
Woods, D.M., Bruckart III., W.L., Pitcairn, M., Popescu, V., O'Brien, J., 2009. Susceptibility of yellow starthistle to *Puccinia jaceae* var. *solstitialis* and greenhouse production of inoculum for classical biological control programs. Biological Control 50, 275–280.
Wu, Y., Reardon, R.C., Ding, J., 2002. Mile-a-minute weed. In: Van Driesche, R., Lyon, S., Blossey, B., Hoddle, M., Reardon, R. (Eds.), Biological Control of Invasive Plants in the Eastern United States. USDA Forest Service Publication FHTET-2002-04, pp. 331–341.
Yang, M.M., Tung, G.S., LaSalle, J., Wu, M.L., 2004. Outbreak of Erythrina gall wasp (Hymenoptera: Eulophidae) on *Erythrina* spp. (Fabaceae) in Taiwan. Plant Protection Bulletin 46, 391–396.
Yelenik, S.G., Stock, W.D., Richardson, D.M., 2004. Ecosystem level impacts of invasive *Acacia saligna* in the South African fynbos. Restoration Ecology 12, 44–51.
Young, F.L., 2006. Russian thistle (*Salsola* spp.) biology and management. In: Preston, C., Watts, J.H., Crossman, N.D. (Eds.), 15th Australian Weeds Conference, Papers and Proceedings, Adelaide, South Australia, 24–28 September, 2006: Managing Weeds in a Changing Climate. Weed Management Society of South Australia, Victoria, Australia, pp. 145–147.
Zachariades, C., Day, M., Muniappan, R., Reddy, G.V.P., 2009. *Chromolaena odorata* (L.). King and Robinson (Asteraceae). In: Muniappan, R., Reddy, G.V.P., Raman, A. (Eds.), Biological Control of Tropical Weeds Using Arthropods. Cambridge University Press, Cambridge, UK, pp. 130–162.
Zavaleta, E., 2000. The economic value of controlling an invasive shrub. Ambio 29, 462–467.
Zeck, E.H., 1932. Investigations on two white wax scales (*Ceroplastes*) as pests in Australia. Agricultural Gazette, New South Wales 43, 611–616.
Zeiger, C.F., 1962. Hyacinth – obstruction to navigation. Hyacinth Control Journal 1, 16–17.
Zilahi-Balogh, G.M.G., Kok, L.T., Salom, S.M., 2002. Host specificity of *Laricobius nigrinus* (Coleoptera: Derodontidae), a potential biological control agent of the hemlock woolly adelgid, *Adelges tsugae* Annand (Homoptera: Adelgidae). Biological Control 24, 192–198.
Zilahi-Balogh, G.M.G., Humble, L.M., Lamb, A.B., Salom, S.M., Kok, L.T., 2003. Seasonal abundance and synchrony between *Laricobius nigrinus* (Coleoptera: Derodontidae) and its prey, the hemlock woolly adelgid (Hemiptera: Adelgidae). The Canadian Entomologist 135, 103–115.
Zimmermann, H.G., Moran, V.C., Hoffmann, J.H., 2009. Invasive cactus species (Cactaceae). In: Muniappan, R., Reddy, G.V., Raman, A.A. (Eds.), Biological Control of Tropical Weeds Using Arthropods. Cambridge University Press, Cambridge, UK, pp. 108–129.

FINAL
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ORDINANCE NO. 93-16

AN ORDINANCE AMENDING HILLSBOROUGH COUNTY ORDINANCE NO. 90-19, AS AMENDED BY ORDINANCES 90-31E AND 90-33, WHICH PROVIDED FOR THE ISSUANCE OF GENERAL OBLIGATION BONDS, IN AN AGGREGATE PRINCIPAL AMOUNT NOT TO EXCEED $100 MILLION DOLLARS, FOR THE PURPOSE OF ACQUIRING, PRESERVING, PROTECTING, MANAGING AND RESTORING ENVIRONMENTALLY SENSITIVE LANDS, BEACHES AND BEACH ACCESS, PARKS AND RECREATIONAL LANDS, SUBJECT TO APPROVAL AT A REFERENDUM THEREIN AUTHORIZED; PROVIDING FOR THE ABILITY OF THE COUNTY TO SELL PROPERTY IDENTIFIED AS AN ACQUISITION OF CONVENIENCE, THE ABILITY TO CONVEY PROPERTY RIGETS THAT WILL NOT IMPACT THE PRESERVATION OF THE PROPERTY, THE ABILITY TO CONVEY PROPERTY ASSOCIATED WITH SETTLEMENT OF ACTUAL OR POTENTIAL EMINENT DOMAIN PROCEEDINGS, AFFIRMING THE PUBLIC PURPOSE OF THE PROPERTIES ACQUIRED THROUGH FUNDING FROM THIS ORDINANCE; PROVIDING FOR SEVERABILITY; PROVIDING AN EFFECTIVE DATE.

WHEREAS, the Board of County Commissioners of Hillsborough County, Florida duly enacted Hillsborough County Ordinance 90-19 on June 20, 1990 (the "Ordinance"); and,

WHEREAS, the Ordinance, as amended, provided for a referendum on the question of whether Hillsborough County should issue general obligation bonds not to exceed $100 million for the purpose of acquiring, preserving, protecting, managing and restoring environmentally sensitive lands, beaches and beach access, and parks and recreational lands (the "Property"); and,

WHEREAS, the Ordinance was overwhelmingly approved by the voters on October 2, 1990; and,

WHEREAS, the Ordinance requires that all Property acquired under the Ordinance remain in County ownership, for the purposes identified in the Ordinance, unless conveyed to another

governmental entity for preservation purposes; and,

WHEREAS, the number of Properties identified in the Environmental Lands Acquisition and Protection Program ("ELAPP") exceeds current funding; and,

WHEREAS, ELAPP has identified Properties in which the acquisition of only a portion of the Property under one ownership was essential to the preservation effort; and,

WHEREAS, if the County is restricted from the sale of properties not essential to the preservation effort, which are acquired in conjunction with an acquisition of those areas which are necessary to accomplish preservation, ELAPP will not be able to perform as effectively; and,

WHEREAS, there are property rights associated with the acquisition of certain Property which do not need to be retained by the County to accomplish the preservation of the Property; and,

WHEREAS, the future sale of these property rights could provide additional funding for ELAPP's acquisition and management; and,

WHEREAS, portions of the Properties acquired through the Ordinance may be needed by other public or quasi-public entities, including utility companies, which have the power of eminent domain to accomplish their service to the public ("Public Entity"); and,

WHEREAS, in order to more effectively serve the needs of the public, the County needs to have the ability to negotiate and accept a settlement of actual or potential eminent domain litigation from a Public Entity provided that the intent of the Ordinance is preserved; and,

WHEREAS, funds are expended in accordance with the Ordinance

in order to preserve Property for the benefit of the general public and the protection of these lands is in the best interest of the citizens of Hillsborough County; and,

WHEREAS, in order to help assure that these Properties are preserved, the Board of County Commissioners wishes to affirm, through this Ordinance, that these Properties have a highest public purpose; and,

WHEREAS, the Board of County Commissioners of Hillsborough County, Florida finds that it is in the best interest of the citizens of Hillsborough County to amend the Ordinance to permit the sale of certain properties specifically identified for future sale that are not essential to accomplishing preservation objectives, permit the sale of property rights not essential to the preservation of the Property acquired through ELAPP, have the ability to settle actual or potential eminent domain litigation with a Public Entity having the power of eminent domain provided that the intent of the Ordinance is preserved, and affirm that the preservation of these Properties is a highest public purpose.

NOW THEREFORE, BE IT ORDAINED BY THE BOARD OF COUNTY COMMISSIONERS OF HILLSBOROUGH COUNTY, FLORIDA THIS 14TH DAY OF JULY, 1993:

SECTION 1: Section 4 of Hillsborough County Ordinance 90-19 is amended to read:

SECTION 4. Convevances of Lands Acquired to other Public Agencies and the Sale of Properties Not Essential to the Preservation Effort.

a. Any Property acquired pursuant to this ordinance may be conveyed, in whole or in part, to other public agencies for preservation or recreational purposes, provided that:

(1) Such conveyance is done pursuant to a written agreement between the County and the public agency which will provide that any use of the Property by such agency or any other subsequent public agency owner must be consistent with preserving, protecting, managing or restoring the Property, subject to the County having the right of first refusal if such other public agencies propose to dispose of such Property.

(2) Any proceeds received by the County from such conveyance shall only be used for the purposes specified in Section 3. of this Ordinance, or to retire any bonds issued pursuant to this Ordinance.

b. Portions of Properties acquired pursuant to this Ordinance may be sold to a private party or a public agency (including Hillsborough County or associated agency) for purposes other than preservation provided that:

(1) A portion of Property held under one ownership has been identified for preservation in accordance with the purposes of this Ordinance.

(2) It is not possible to acquire only that portion of the Property identified for preservation due to at least one of the following:

(a) The owner(s) have indicated that they are not willing or able to sell only the portion of the Property targeted for preservation.

(b) Staff has advised that it is not practical or possible to acquire only a portion of the Property due to the Property's configuration, nature of the ownership, size or access of the Property not necessary for preservation, or other real estate related factors.

(c) Staff recommends that it is not in the best interest of the County to separate the portion of the Property not essential for preservation at the time of acquisition.

(3) Prior to the County acquiring title to the Property, the area that is to be considered for future sale to a private party or public agency for purposes other than preservation is specifically identified in materials presented to the Board of County Commissioners as an "Acquisition of Convenience", and that this designation requires the express approval of the Board of County Commissioners as part of the approval of the purchase of the Property. The County, with the review and comment of the ELAPP General Committee, or other appropriate Committee as determined by the Board of County Commissioners, may reserve or restrict the use of the property being sold and may convey fee simple or any other interest in said

property as it deems appropriate.

(4) Any proceeds received from the conveyance of the fee simple or other property interest in an "Acquisition of Convenience" shall only be used for the purposes specified in Section 3 of this Ordinance, or to retire bonds issued pursuant to this Ordinance as directed by the Board at the time the sale is approved.

Any Property acquired pursuant to this Ordinance which is not conveyed to another public agency for preservation in accordance with Subsection a. or has not been designated as an "Acquisition of Convenience" in accordance with Subsection b. of this Ordinance, shall be held by Hillsborough County for the purposes specified in Section 3 of this Ordinance.

SECTION 2: The following sections are hereby added to Hillsborough County Ordinance 90-19:

SECTION 8. SALE OF PROPERTY RIGHTS

Any Property Rights, as defined herein, that are associated with land acquired for preservation through this Ordinance that are not necessary for the preservation of the Property may be sold provided that:

a. Staff has advised that it is not necessary for the County to retain the Property Rights in order to preserve the Property.

b. A legally permissible procedure to transfer the Property Rights from the Property acquired for preservation is followed.

c. The Board of County Commissioners authorizes the sale,

transfer, or exchange of the Property Rights by one of the following methods:

(1) If the Property Rights are identified prior to the County acquiring title to the Property, and are specifically identified in materials presented to the Board of County Commissioners, said Property Rights may be sold, exchanged, or transferred to a private party or public agency at the time the Property is acquired, provided that this designation is approved by the Board of County Commissioners as part of the approval of the purchase of the Property. The County may reserve, restrict and/or condition the use of the Property Rights.

(2) If the Property Rights are identified after the Property is acquired by the County or if the Property Rights become legally transferable after the Property has been acquired, the Board of County Commissioners shall hold a public hearing to identify and consider the transfer, sale, or exchange of the Property Rights to a private party or public agency. The County may reserve, restrict and/or condition the use of the Property Rights.

d. Any proceeds received from the transfer, sale, or exchange of Property Rights shall only be used for the purposes specified in Section 3 of this Ordinance, or to retire bonds issued pursuant to this Ordinance as directed by the Board at the time the transfer, sale, or

exchange is approved.

For the purposes of this section the term "Property Rights" shall include, but is not limited to, density credits, water use permits, or similar water related permits or approvals, and capacity fees associated with water, wastewater, or other utility service prepaid fees.

SECTION 9. SETTLEMENT OF ACTUAL OR POTENTIAL EMINENT DOMAIN LITIGATION WITH A PUBLIC AGENCY OR QUASI-PUBLIC ENTITY

The Board of County Commissioners is authorized to negotiate and accept the settlement of actual or potential eminent domain litigation from the Public Entity that has been granted the power of eminent domain to accomplish a project or service for the public and transfer the requested property interest provided that:

(1) The Public Entity provides evidence that the use of the requested property interest is essential to the project or service and the Public Entity can show that there is no feasible alternative to utilize other property.

(2) The Public Entity will sufficiently address concerns of the Board of County Commissioners and incorporate, to the Board of County Commissioners' satisfaction, into the design, engineering, and construction for its project or service, the preservation and management of natural habitats in a manner that minimizes the impact that the project or service may have on the Property and will address any other environmental issues as required

by the County.

(3) Any proceeds received from the conveyance of the fee simple or other interest in the Property as part of the settlement of actual or potential eminent domain litigation shall only be used for the purposes specified in Section 3 of this Ordinance, or to retire bonds issued pursuant to this Ordinance as directed by the Board of County Commissioners at the time the conveyance is approved.

(4) Any interest in Property conveyed in conjunction with this Section will not be required to be designated an as "Acquisition of Convenience" as described in Section 4 of this Ordinance.

SECTION 10. AFFIRMATION OF PUBLIC PURPOSE

The voters of Hillsborough County have approved by referendum the assessment described in this Ordinance to provide funding for the acquisition and management of environmentally sensitive lands. The expenditure of these funds is for the purpose of achieving preservation of lands for the benefit of the public. In recognition of the benefits to the public of preserving these lands, the Board of County Commissioners of Hillsborough County hereby affirms that the acquisition of Property for preservation through ELAPP as funded by this Ordinance is a highest public purpose for those Properties and that the Board of County Commissioners is responsible for assuring that the Properties acquired for preservation will be protected.

SECTION 3: This amendment shall apply retroactively to all Property acquired to date and to all property to be acquired by funding provided by Ordinance 90-19, as amended.

SECTION 4: If any section, sentence, clause, part or provision of this ordinance amendment is held to be invalid by a court of competent jurisdiction, the remainder of this ordinance amendment shall not be affected thereby, but shall remain in full force and effect.

SECTION 5: This Ordinance shall become effective upon receipt of official acknowledgement from the Department of State that said Ordinance has been filed.

STATE OF FLORIDA)
COUNTY OF HILLSBOROUGH)

I, RICHARD AKE, Clerk of the Circuit Court and Ex-Officio Clerk of the Board of County Commissioners of Hillsborough County, Florida, do hereby certify that the above and foregoing is a true copy of an Ordinance adopted by the Board in its regular meeting of July 14, 1993 as the same appears of record in Minute Book 206 of the Public Records of Hillsborough County, Florida.

Witness my hand and official seal this 16th day of July, 1993.

APPROVED BY COUNTY ATTORNEY
BY _____
Approved As To Form And
Legal Sufficiency.

RICHARD AKE
CLERK OF CIRCUIT COURT

By: Judith M. Nichols
Deputy Clerk

FINAL
11/5/97
SJV

ORDINANCE NO. 97-14

AN ORDINANCE RELATED TO HILLSBOROUGH COUNTY PARKS; PROVIDING DEFINITIONS; REPEALING HILLSBOROUGH COUNTY ORDINANCE 78-8; PROVIDING FOR REGULATION OF VEHICLES WITHIN PARKS; PROVIDING FOR PRESERVATION OF PARK PROPERTY; PROVIDING FOR PROTECTION AND PRESERVATION OF PLANT AND WILDLIFE; PROVIDING FOR REGULATION OF RECREATIONAL ACTIVITIES; PROVIDING FOR REGULATION OF BOATING, FISHING, FIREARMS, PICNIC AREAS, HORSEBACK RIDING, AND ANIMALS; PROHIBITING TOY FIREARMS, FIREWORKS, AND EXPLOSIVES, AND POLLUTION OF WATERS; PROVIDING REGULATION OF REFUSE AND TRASH; PROVIDING OPERATING HOURS AND EXCEPTIONS; PROVIDING REGULATIONS OF MERCHANDISING, VENDING, PEDDLING, ADVERTISING, PUBLIC DEMONSTRATIONS, PUBLIC PERFORMANCES, CAMPING, AND SHOOTING AND ARCHERY RANGES; PROVIDING AUTHORITY OF SHERIFF DEPUTIES AND PARK OFFICIALS; PROVIDING PENALTIES; PROVIDING FOR LIBERAL CONSTRUCTION, SEVERABILITY AND EFFECTIVE DATE.

WHEREAS, the Board of County Commissioners, pursuant to Section 125.01, Florida Statutes, is authorized to provide parks, preserves, playgrounds and recreation areas and other recreational facilities for the welfare of its citizens; and

WHEREAS, the Board of County Commissioners adopted Ordinance 78-8 which governs the operation of Hillsborough County parks; and

WHEREAS, it is necessary to repeal Ordinance 78-8 to conform with federal and state law and to provide for more efficient and effective operations of Hillsborough County parks and recreation areas.

NOW, THEREFORE, BE IT ORDAINED BY THE BOARD OF COUNTY COMMISSIONERS OF HILLSBOROUGH COUNTY, FLORIDA:

SECTION 1. DEFINITIONS.

The following terms when used in this Ordinance shall have the meanings ascribed to them in this section.

(a) "Park" shall include "parkways", "recreational areas", "preserves", "natural areas", "marinas", and "other areas operated and maintained by the Hillsborough County Parks and Recreation Department" and shall mean parks, wayside parks, parkways, playgrounds, recreation fields, open green spaces, community centers, museums, auditoriums, ranges and buildings, lakes, streams, canals, lagoons, waterways, pools, water areas and beaches therein, and all public service facilities conducted on the grounds, water areas, buildings and structures in Hillsborough County which are under the control of or assigned for upkeep, maintenance or operation by the Parks and Recreation Department of Hillsborough County.

(b) "Park property" shall mean all areas, grounds, buildings, locations and facilities described in paragraph (a), above.

(c) "County" shall mean Hillsborough County, a political subdivision of the State of Florida.

(d) "Department" shall mean the Hillsborough County Parks and Recreation Department.

(e) "Director" shall mean the Director of the Hillsborough County Parks and Recreation Department.

(f) "Park official" shall mean the Department managers, their assistants, and any and all individuals employed by the Department.

(g) "Parking area" shall mean any part of any park road, drive, or area that is designated for the standing or stationing of any vehicles.

(h) "Permit" shall mean a document or certificate provided by the Department granting permission for use of reserved park/facility areas and/or to conduct and/or take part in a specific activity at a specific location and which sets forth terms and conditions applicable thereto.

(i) "Person" shall mean any natural person, firm, association, joint venture, partnership, estate, trust, business trust, fiduciary, corporation, and all other groups and combinations.

(j) "Vehicle" shall mean any wheeled conveyance (except a baby carriage or wheelchair) for transportation of persons or materials whether: (1) powered or drawn by motor such as an automobile, truck, motorcycle, scooter, minibike, or recreational vehicle; (2) animal-drawn such as carriage, wagon, or cart; (3) any self-propelled vehicle such as a bicycle, tricycle, or skateboard; or (4) any trailer in tow of any size, kind or description. The term "vehicle" does not include any recreational or park transportation service operated or authorized by the Department.

(k) "Vessel" is synonymous with boat as referenced in s.1(b), Art VII of the State Constitution and includes every description of watercraft, barge, and air boat, other than a seaplane on the water, used or capable of being used as a means of transportation on water.

SECTION 2. REPEAL.

Hillsborough County Ordinance 78-8 is hereby repealed in its entirety.

SECTION 3. REGULATION OF VEHICLES WITHIN PARKS.

All persons in or on parks or park property shall follow all applicable vehicle laws. All

applicable vehicle laws are enforceable within park property. The following additional regulations shall also apply:

(a) The speed limit in parks and park property is 15 m.p.h. or as otherwise posted.

(b) All law enforcement officers and such park personnel as are authorized and designated by the Director shall direct traffic whenever needed within park property in accordance with rules and regulations as may be set forth by the Department.

(c) The Director shall determine and all persons shall carefully observe and obey all traffic signs indicating speed, direction, caution, stopping or parking and all other signs posted for proper control and the safeguarding of life and property.

(d) Any person driving, operating, controlling or propelling any vehicle shall operate such vehicle only on designated paved or improved park roads or driveways, except when otherwise directed by any law enforcement officer or park official.

(e) No driver or operator of any vehicle shall obstruct traffic or park or stop on any road or driveway except at places designated for parking or stopping or in the event of any emergency beyond the control of the driver or operator. At designated places a vehicle may be stopped for no more than 15 minutes in order for the occupants to view scenic features.

(f) No person shall operate any truck, commercial vehicle or bus of any type on any restricted park road or property without prior authorization from the Department for the purpose of performing park maintenance or engaging in other authorized activities. Trucks and buses used solely to transport persons to any park or park property for recreational purposes shall be allowed to use park roads and parking areas for ingress and egress in the same manner as provided for conventional passenger vehicles.

(g) Any person who rides, drives, or propels any bicycle, tricycle, motorcycle, scooter or similar vehicle, whether motor propelled or self-propelled, shall do so only on roads designated

for vehicular traffic and/or other areas designated for the specific class of vehicle.

(h) Any person who parks a vehicle shall do so only in areas or facilities designated for that particular type of vehicle unless otherwise directed by any law enforcement officer, or park official, to park in other areas designated for parking. Any vehicle parked in an unauthorized area may be towed away at the owner's expense.

(i) The designated bicycle trails shall be used only by pedestrians and bicycles and other vehicles propelled by human power unless otherwise authorized by the Director. No person shall deviate from compliance with all applicable vehicle laws and regulations governing the operations of the above vehicles while on park property.

(j) No person shall tow another vehicle or wheeled device on park roads except when the towed vehicle is used in transporting authorized recreational vehicles, horse trailers, or small boats into designated areas, or when necessary to remove a disabled vehicle.

(k) No person shall operate any vehicles for hire in any parks, except those authorized by the Department and those legally authorized to carry passengers for hire or for fare.

(l) No person shall change any parts, repair, or grease any vehicle on any park roadway, parkway, driveway, parking lot or other park property unless authorized to do so by a park official.

(m) No driver of a vehicle using gasoline or any other explosive mixture as a source of power shall at any time fail to use a muffler or other sound deadening device.

SECTION 4. PRESERVATION OF PARK PROPERTY.

(a) No person shall willfully mark, deface, injure in any way, displace, remove or tamper with, any park buildings, bridges, tables, benches, fireplaces, railings, paving, water lines,

or other public utilities or parts or appurtenances thereof, park signs, notices, or placards, whether temporary or permanent, monuments, stakes, posts or other boundary markers or other structures or equipment, facilities or park property or appurtenances whatsoever, whether real or personal.

(b) No person shall damage or remove plants or plant materials, trees or parts thereof or any flowers or nuts or seeds whatsoever from any park property. Park officials may make such removals and the Director may issue specimen collecting permits to scientists, students of botany and other similarly situated individuals authorizing such removals.

(c) No person shall make any excavation by tool, equipment, blasting or other means.

(d) No person shall construct or erect any building or structure of whatever kind, whether permanent or temporary or run or string any public utility into, upon, across or over any park or recreation lands or affix any materials to any park property except with the prior written approval of the Director.

(e) No person shall build or attempt to build any fire or fires against or adjacent to any park building, structure, tree or plant, or any park property whatsoever, or against or on any property of others or in any area of any park except in areas specifically designated for fire building and in accordance with such regulations as are or may be specifically set forth by the Director. No person shall drop, throw, or otherwise deposit by any means, lighted matches, burning tobacco products or any other flammable material within any park area or any highway, road or street abutting or contiguous thereto.

(f) No person shall damage or remove any cultural, historical or archaeological artifacts from any park property.

SECTION 5. PROTECTION AND PRESERVATION OF PLANT AND WILDLIFE.

(a) Within any park, no person shall cut, carve, or injure the bark or break off limbs or branches, or pick the flowers or seeds of any tree, plant, or shrub, nor shall any person dig in or otherwise disturb grass areas or install any vegetation or in any other way injure or impair the natural beauty or usefulness of any area, nor shall any person pile debris or material of any kind on or about any tree or plant, or attach any rope, wire, or other contrivance thereto, whether temporary or permanent in character or use, without prior approval of the Director. No person shall tie or hitch any animal to any tree or plant within any park property.

(b) No person shall molest, harm, frighten, kill, net, trap, snare, hunt, chase, shoot, throw or propel any missiles by any means at any wildlife creature be it mammal, bird, amphibian, or reptile roaming free about a park or in captivity in any zoo cage. No person shall remove or possess the young of any wild animal or the nest or eggs of any reptile or bird.

(c) No person shall feed any zoo animals, birds or reptiles which are on restricted diets when posted signs or other notice prohibits such feeding.

(d) No person shall place, dump, abandon or leave any mammal, reptile, amphibian, fish or bird, either wild or domestic on the grounds of any zoo or park.

SECTION 6. RECREATIONAL ACTIVITIES IN PARK AREAS.

(a) No person, regardless of age, sex, or manner of dress, shall swim, or wade in any beach, water area or pool within any park except at places designated for such activities. Any person engaging in such activities shall comply with the rules established for these areas, including, but not limited to, hours of use and safety limitations for such uses.

(b) No person shall engage in recreational or other activities other than in areas designated for those activities. Swimming is prohibited in all park areas designated for boating. Boating is prohibited in all park areas designated for swimming.

(c) In areas designated for swimming and wading, all persons shall be so covered with clothing or a bathing suit so as to prevent any indecent exposure of the person. No person shall dress or undress on any park property except in bathing houses, or other structures as may be provided and maintained by the Department for that purpose. No person shall dress or undress in any vehicle, toilet, rest room, beach, or other park area, except as provided above.

(d) No person shall erect or cause to be erected any tent, shelter or structure on or in any beach, or water area in such a manner that requires guy wire, rope, extension, brace or support connected or fastened from any such tent, shelter or structure to any other structure, stake, rock or other object.

(e) No person shall enter or be in the water at any bathing or swimming area wearing, carrying, pushing, or towing any inflated inner tube, raft, rubber boat, or other similar device. Use of such devices shall be limited to certain areas which may, from time to time, be specifically designated for use of such devices by posted signs.

(f) Park officials shall regulate activities in picnic areas to prevent congestion and to secure the maximum use of park facilities for all. If any such facilities are crowded, persons holding picnics in such areas shall not occupy such facilities to the exclusion of others for an unreasonable time. The determination of unreasonable time shall be in the sole discretion of a park official. Use of individual fireplaces or other cooking areas together with adjacent tables and benches shall be on a first come, first served basis.

(g) No person shall conduct raffles, bingo games, card games for money, or hold drawings for prizes, or participate in any other forms of gambling on any park property. However, upon approval by the Director, charitable organizations may conduct raffles provided that participants are members and/or guests of the charitable organization and the raffle is otherwise conducted in compliance with all federal, state and local laws.

(h) No person shall conduct any activity or utilize any park or park area in a manner which will result in financial gain without prior approval of the Director.

(i) No person shall engage in any activity in any park or park area which is or may be dangerous to the health, safety and welfare of himself and/or others. No person shall engage in any activity in any park or park area which interferes with the use and enjoyment of the parks by others.

SECTION 7. BOATING.

In addition to the provisions set forth in Chapter 327, Florida Statutes, the following regulations shall apply to recreational water areas within parks:

(a) No person shall bring in to, launch or operate any vessel on any park property, watercourses, bays, lagoons, lakes, canals, rivers, ponds, or sloughs except at such places as are or may be designated by the Department for such use or purpose. Any person operating such vessels shall comply with Department boating regulations and all other federal, state and local laws related to boating.

SECTION 8. FISHING.

No person shall fish in park waters, either fresh or salt, by use of hook and line, seine, net, trap, spear, gig, or other device except at such places and in such areas as have been designated by the Department for such use.

SECTION 9. FIREARMS.

(a) No person, except law enforcement officers, shall carry, possess, or use firearms of any type, air rifles, pistols, spring guns, or any other form of weapon or trapping device which

is or may be on or in any park property except in areas designated for such uses or for events approved by the Department. Bows and arrows may be used at designated areas provided that such use is in compliance with rules and regulations established by the department and all applicable federal, state and local laws.

(b) No person shall hunt, trap or pursue any wildlife by any means or method except with prior written approval of the Director and in areas designated for such activities. Any such activities shall be in compliance with rules and regulations established by the Department and all applicable federal, state and local laws.

SECTION 10. PICNIC AREAS.

(a) No person shall picnic or cook in any park area not specifically designated for and regulated by the Department for such activities.

(b) No person shall build, light or cause to be lighted any fire upon the ground or other object in any park area except in an approved grill, stove, fireplace or other similar container. Any person who builds lights or causes to be lighted any fire as provided above, shall extinguish the fire before leaving the immediate area.

(c) No person shall use a grill, stove, fireplace or other similar device in such a manner as to burn, char, mar, blemish or otherwise damage any bench, table or other object of park property.

SECTION 11. HORSEBACK RIDING.

No person shall engage in horseback riding within any park property except in areas designated for such activities by clearly marked bridle paths, trails, and other necessary features. In areas designated for horseback riding, horses must be thoroughly broken, properly restrained

and prevented from grazing and straying unattended. All riders must carry proof of their horse's negative Coggins test.

SECTION 12. ANIMALS.

(a) Except in specified areas, domesticated animals are permitted within park property. All such animals must be restrained at all times at a distance not greater than six (6) feet in length from their handler. No such animals, except seeing eye dogs, shall be allowed on boardwalks or narrow passageways. All such animals shall wear up-to-date tags indicating that they have had rabies vaccinations.

(b) No person shall bring into any park property any non-domesticated animals including but not limited to, cattle, mules, swine, sheep, goats, fowl, or reptiles, except where in conjunction with projects sponsored by County Departments or upon permit from the Director.

(c) Dangerous dogs as defined in Chapter 767, Florida Statutes are prohibited from park property.

(d) In conjunction with projects sponsored by County Departments or upon permit from Director, animals may be allowed in designated areas of the parks at specified times without restraint.

SECTION 13. TOY FIREARMS, FIREWORKS, AND EXPLOSIVES.

(a) No person shall bring into, or have in his possession, or set off or otherwise cause to explode or discharge or burn, in any park area any firecrackers, torpedoes, rockets, toy firearms, cannons, or other fireworks or explosives of or containing flammable material or any substance, compound, mixture, or article which in conjunction with any other substance or compound, may explode, discharge or burn, unless he first obtains a written permit from the

director.

(b) Parents and/or guardians shall be held responsible and accountable for the actions of minors in regards to the prohibitions in the foregoing paragraph as provided by law.

SECTION 14. POLLUTION OF WATERS.

No person shall throw, discharge, or otherwise place or cause to be placed in the waters of any fountain, pond, lake, stream, bay or any other body of water within park property, any substance, matter, or thing, liquid or solid, which would or may result in the pollution of said waters.

SECTION 15. REFUSE AND TRASH.

No person shall take into, dump, deposit, drop, or place any bottles, broken glass, ashes, paper, boxes, cans, dirt, rubbish, waste, garbage, tobacco products, containers or foil, refuse or other trash upon any park property except in the receptacles provided for trash disposal; where receptacles are not provided, same shall be carried away from park property by the person or persons responsible for its presence and properly disposed of elsewhere. Park refuse and trash receptacles shall only be used by those persons using the park area for recreational and park activity.

SECTION 16. OPERATING HOURS, EXCEPTIONS, ACTIVITY.

(a) No person shall be or remain in any part of any park which is fenced in or provided with gates between the closing of the gates at night and their re-opening on the following day. No person shall be or remain in any park not fenced in or provided with gates, between sunset and sunrise of the following day, except in areas designated as twenty-four (24)

hour launching areas, or unless lighting is provided for a specific activity after sunset whereby such persons and vehicles may pass through such parks, without stopping, on the most direct walk or driveway leading from their point of entrance to the exit nearest to their point of destination. The provisions of this Section shall not apply to law enforcement officers or employees of the Department while in the discharge of their duties nor to persons having a written permit issued by the Department allowing them to be or remain in any part of any park between such times. The Director may establish exceptions to the operating hours as set forth above for certain uses and when it is otherwise in the interest of the public health, safety or welfare. Any such exceptions shall be posted at the park entrance and obeyed accordingly.

(b) No person shall park or permit to remain parked any vehicle on any driveway, parkway, parking area or other park property between sunset and sunrise on the following day or as otherwise posted, except for areas designated as twenty-four (24) hour launching areas.

SECTION 17. UNFINISHED OR WITHHELD PARKS.

No person, except as authorized by the Department, shall enter upon any part of any park which is in an unfinished condition or under construction or withheld from general public usage in the interest of public safety, health and/or welfare.

SECTION 18. MERCHANDISING, VENDING, PEDDLING, ETC.

No person, other than the Department or regularly licensed concessionaires acting by and under the authority of the County, shall expose or offer for sale, rent or trade, any article or thing, or station, or place any stand, cart, or vehicle, for the transportation, sale or display of any article or merchandise within the limits of any park or recreation area.

SECTION 19. ADVERTISING, PUBLICITY AND SIGNS.

(a) No person shall advertise or obtain publicity through any means whatsoever within or upon any park property.

(b) No person shall park or station on any park property any vehicle displaying a sign or notice with the intent of offering said vehicle for sale or exchange.

(c) No person shall distribute, display, or affix any printed materials or advertisements to or within any park property. Exceptions to this provision are printed materials or advertisements permanently affixed on vehicles or on clothing; distribution of printed handbills or leaflets, the purpose of which is not solely commercial; announcements of park sponsored or sanctioned events; authorized signs located entirely within concession structures, and signs and distribution of printed materials in conjunction with a permitted use of reserved park/facility area.

SECTION 20. PUBLIC DEMONSTRATIONS, GATHERINGS, PERFORMANCES, SPEECHES, ETC.

(a) Any band, procession, military company, or any company or group with flags, banners, or transparencies, may be allowed upon any park or parkway or within any park, subject to reasonable regulations of time, place and manner of such activities as established by the Director.

(b) No entertainment or exhibition shall be given in any park or recreation area except entertainment given under the direction and authority of the Department.

(c) Any public meeting of any kind or any public speeches by any person, representatives of any political party, social club or society, political aspirant, religious sect, theatrical or circus group, act, rite or ceremony, or other public exhibition may be held in any

park, parkway, playground or other recreational area, subject to reasonable regulations of time, place and manner of such gatherings as established by the Director.

SECTION 21. ALCOHOLIC BEVERAGES

(a) The sale, consumption, and possession of alcoholic beverages as defined in Section 561.01(4), Florida Statutes, is hereby prohibited.

SECTION 22. PROPER USE OF FACILITIES.

No person shall loiter in or around any park department rest room, dressing room, or bath house nor shall any person engage in any lewd and lascivious behavior as defined in Chapters 798 and 800, Florida Statutes (1995) or any amended or successor Statute.

SECTION 23. AUTHORITY OF SHERIFF DEPUTIES AND PARK OFFICIALS.

(a) It shall be the duty and responsibility of Sheriff Officers, Special Deputies, and Park Officials to enforce all provisions of permits issued by the Department.

(b) It shall be unlawful for any person to do any act forbidden or fail to perform any act required by any permit issued by the Department in furtherance of the mandates and provisions of this Ordinance.

(c) Besides the rules and regulations as set out in this Ordinance, park officials shall have the authority to establish further rules and regulations for regulation of park use pursuant to the preservation of health, safety, and/or welfare of the public in furtherance of the mandates and provisions of this Ordinance.

(d) Any violation of the provisions of this Ordinance, or any violation of any rules and regulations set forth by the Department pursuant to this Ordinance, shall authorize any park

official to remove the violator from the park area; said removal shall be effectuated by the park official requesting the violator to remove himself from the park area. Failure of any person violating the provisions of this Ordinance and/or the rules of the Department, to remove himself from the park area after direction and request has been made by a park official, shall constitute a trespass.

SECTION 24. CAMPING.

No person shall camp within any park property except in areas designated by the Department for such purpose. The Department may establish rules and regulations for designated camping areas within park property.

Camping in permanent cabins constructed by the Department or in privately owned trailer units or tents erected under Department permit and use by groups of persons under adequate supervision are the only types of overnight camping that shall be allowed in the parks; the bringing into a park and using for overnight occupancy any house trailer, camp trailer, camp wagon, or any other form of movable structure or special vehicle, except in areas designated for that purpose by the Department, is prohibited.

SECTION 25. SHOOTING AND ARCHERY RANGES.

All persons using any park range facilities including shooting and archery ranges shall abide by the Department's regulations governing range activities; copies of which regulations shall be furnished at each such range.

SECTION 26. PENALTIES.

Any person who violates this Ordinance shall be prosecuted in the name of the State in

the same manner as misdemeanors are prosecuted and, upon conviction, shall be subject to a fine not to exceed $500 or by imprisonment in the County Jail not to exceed 60 days or by both such fine and imprisonment.

SECTION 27. LIBERAL CONSTRUCTION.

This Ordinance shall be liberally construed in order to effectively carry out the purposes hereof which are deemed to be in the best interest of the public health, safety, and welfare of the citizens and residents of Hillsborough County, Florida. The provisions of this Ordinance shall supersede any existing provisions of the Code of Laws and Ordinances of Hillsborough County, Florida, which conflict with any provisions as set forth herein.

SECTION 28. SEVERABILITY.

If any section, subsection, sentence, clause, phrase, or provision of this Ordinance is held invalid or unconstitutional by any Count of competent jurisdiction, such invalidity or unconstitutionality shall not be so construed as to render invalid or unconstitutional the remaining provisions of this Ordinance.

SECTION 29. EFFECTIVE DATE.

This Ordinance shall take effect upon filing of this Ordinance with the Secretary of State, State of Florida.

STATE OF FLORIDA)
)
COUNTY OF HILLSBOROUGH)

I, RICHARD AKE, Clerk of the Circuit Court and Ex Officio Clerk of the Board of County Commissioners of Hillsborough County, Florida, do hereby certify that the above and foregoing is a true and correct copy of an Ordinance adopted by the Board at its meeting of November 5, 1997, as the same appears of record in Minute Book 258, of the Public Records of Hillsborough County, Florida.

WITNESS my hand and official seal this 12th day of November, 1997.

RICHARD AKE, CLERK OF CIRCUIT COURT

FLORIDA SEAL

BY: Gary J. Klunk
Deputy Clerk/ Gary J. Klunk

APPROVED BY COUNTY ATTORNEY

By: Approved as to form and legal sufficiency

Appendix H
National Resource Conservation Service Soil Information for the Gopher Tortoise

GOPHER TORTOISE SOIL SUITABILITY

The soil is interpreted as a habitat component according to its potential to be used by gopher tortoise (*Gopherus polyphemus*) in excavating burrows. Burrows are considered a necessary part of specific local habitat. The guide to interpretive criteria is intended to provide guidelines in the identification and selection of sites that have the most potential for preserving, maintaining, or increasing local populations of gopher tortoise.

This interpretation guide is of a more general nature. It is designed to be used in the planning process to identify areas of concern prior to the application of conservation practices. Based upon the wildlife objectives, these areas can be avoided or practices can be adjusted to minimize damage to the burrow habitat. The guide does not take into account climate or soil temperature that may influence the presence or distribution patterns of a species. The presence or absence of a species is determined at the local level.

The interpretations provide suitability ratings and identify the dominant soil characteristics that influence the suitability of the site for burrowing by gopher tortoise. This information allows the user to plan and develop alternatives in site selection by identifying the site that best meets the wildlife habitat requirements.

Soils that are rated HIGHLY SUITABLE have no restrictions to use and are favorable for burrowing by gopher tortoise. Colonization and population densities may be above average if other habitat factors are not limiting. A MODERATELY SUITABLE rating implies that the site is suitable and is somewhat favorable for habitat to burrowing by gopher tortoise and that few restrictive features may limit the use of the site somewhat. Colonization and population densities may be average to above for the area if the other habitat requirements are met. A LESS SUITABLE rating indicates that the soil characteristics are such that they may limit establishment, maintenance, or use of the site by gopher tortoise. Colonization and population densities may be below average or restricted in the area due to the limiting factors even though all of the other species habitat requirements are met. A MARGINAL rating indicates that the soil characteristics are such that they may limit establishment, maintenance, or use of the site by gopher tortoise. Colonization and population densities will be limited due to restricted features of soil. An UNSUITABLE rating indicates that the soil characteristics are such that they may limit establishment, maintenance, or use of the site by gopher tortoise. The final identification and selection of a site suitable for burrowing by gopher tortoise is determined by the limitation of the soil as it influences excavation, maintenance, and preservation of the burrows. The guide identifies the soil restricting features that will have the most effect on habitat.

The criteria used for rating the soils for gopher tortoise habitat are as follows:

Depth of Excavatable Material

Depth of A and E horizons-- (surface and subsurface layers) that have less than 15 percent clay and are greater than 20 inches thick (Grossarenic and Arenic)help burrowing species with the establishment of burrows.

Highly Suitable: >= 40"; Moderately Suitable: >=20 – 40"; Less Suitable: <20"
Marginally Suitable: 15-35% clay; Unsuitable: >=35% clay

Depth to Restrictive Layer

Restrictive layers such as plinthic zones, fragipan, or spodic horizons are thought to adversely affect the potential depth of excavation by burrowing species. The layers may be too dense for the species to excavate or it may be the perched water over this layer. Shallow depth to a restrictive layer limits the depth of habitat.

Well Suited: >=200 cm; Somewhat Suited: >=50 – 200 cm; Not Suited: < 50 cm

Fragments > 5mm

Gravel adversely affects the potential depth of excavation by burrowing species. High concentrations of gravel and rock fragments adversely affect the excavation of soil by burrowing species. The horizons with gravel and or rock fragments that is greater than 5 mm in size and contains 15 percent by volume or more limits the species ability to excavate a burrow if it is within 80 inches of surface. The physical effort to dislodge or transport the rock fragments from the burrow may be beyond the abilities of the species.

Well Suited: >85% passing #4 sieve; Somewhat Suited: 65-85% passing; Less Suited: <65% passing

Ponding

Ponding or standing water adversely affects gopher tortoise habitat.

Well Suited: None; Somewhat Suited: Rare; Not Suited: Occasional, Common, Frequent

Flooding

Flooding from stream over flow can adversely affect habitat and burrowing suitability. In areas subject to flooding, the gopher tortoise are evicted, species are drowned both young hatchling and adults, eggs destroyed, and the walls of the burrows may collapse or become filled with debris and water. Any effort of the animals to return to the site is delayed until the floodwater has receded and the soils have dried sufficiently to allow renewed activity. Also, gopher tortoises may have a higher impact from predation during flooding events while evicted from burrows.

Well Suited: None, Very Rare; Somewhat Suited: Rare;
Not Suited: Occasional, Common, Frequent, Very Frequent

Water Table

A seasonal high water table can affect burrowing species by restricting burrowing, and possibly cause drowning when the water table returns. Caving or tunnel collapse may be a problem, especially during the rising and falling of the water table depths between seasons of year. Perched or apparent water tables can increase drowning of species during wet periods especially during inactive times.

Well Suited: >=200 cm; Somewhat Suited: >=50 – 200 cm; Not Suited: <= 50 cm

Slope

Soils that have a surface slope that is steeper than 15 percent fall per 100 feet horizontal distance tend to adversely affect habitat suitability.

Well Suited: <15%; Somewhat Suited: >=15 to 35%; Not Suited: >=35%

Gopher Tortoise Soil Suitability Classes

Suitability Class	Suitability Index
Highly Suitable	1.00
Moderately Suitable	0.99
Less Suitable	0.84 to 0.98
Marginal	0.45 to 0.83
Unsuitable	0.04 to 0.44

APPENDIX I

CELM POLICIES

GOPHER TORTOISE RELOCATION POLICY

Hillsborough County Parks and Recreation Department/Resource Management Team

Purpose: To determine whether or not to allow gopher tortoises to be relocated onto preserve lands from unprotected sites, or to be moved from one location to another on preserve lands.

Background: Resource Management staff receive requests from individuals seeking gopher tortoise relocation sites on a regular basis. In most cases, the donor site has been approved for development, and the developer or his representative is attempting to avoid the destruction of the tortoises, as authorized under a "taking permit" issued by the Florida Game and Fresh Water Fish Commission (G&F). Although tortoises are a protected species, and are considered to be both desirable and important elements of the natural environment, the careless relocation of tortoises onto preserve sites may be of little benefit and may actually be harmful to both the animals being moved and any existing population. Potential problems can result in the injury or death of the relocated or resident tortoises due to:

*improper handling during relocation, causing direct injury or stress induced disease
*failure to adapt and survive due to seasonal factors (cold temperatures, high water tables, etc.)
*introduction of Upper Respiratory Tract Disease (URTD)
*exceeding the carrying capacity of the relocation site
*decline of habitat quality at the relocation site due to a lack of site management

In spite of these concerns, the relocation of tortoises onto protected areas can be beneficial to those areas, if the process is properly managed. Known benefits of relocation include:

*increasing the size of a remnant population to a level which is self sustaining
*reestablishing tortoises in suitable habitat where they have been extirpated by poaching or disease
*reintroduction of tortoises to habitat restoration sites, once the new vegetative communities have become established and provide suitable habitat
*relocation of tortoise "associates," if possible, especially protected species which depend on tortoise burrows for habitat
*increasing the amount of burrow habitat available on site for existing associate species
*tortoises appear to play an important role in recycling of nutrients and seed dissemination/germination

The above list reflects an underlying assumption that upland habitats in Hillsborough County which are capable of supporting gopher tortoises cannot be considered to be fully functional or high quality in the absence of gopher tortoises and the burrows which they maintain. Lastly, one of the most compelling reasons may simply be a desire to avoid the unnecessary destruction of this unique and popular native animal.

There are also rare occasions when it may be necessary to relocate tortoises from one on site location to another, or from one preserve site to another. Examples include habitat restoration projects which target the removal of fill material or spoil areas which often harbor tortoise burrows, due to the improved drainage provided by the artificially elevated sites, or restoration of natural hydrology, which could flood burrows in areas where past drainage "improvements" have

lowered the water table. If there is suitable habitat elsewhere on site, and the viability of the tortoise population is not in question, then relocation could be acceptable. On site relocation to accommodate site improvements may also be considered, however, every effort should be made to avoid the necessity by planning and designing facilities properly.

Relocation Criteria: Relocation will not be approved unless all of the following conditions are met.

1) The proposed relocation site must contain permanently protected habitat suitable for gopher tortoises, large enough in extent to support a viable population indefinitely. Determination of these conditions will be based on guidelines provided by the Florida Game and Fresh Water Fish Commission, Nongame Wildlife Program Technical Report No. 4: Ecology and Habitat Protection Needs of Gopher Tortoise (*Gopherus polyphemus*) Populations Found on Lands Slated for Large-Scale Development in Florida.

2) Adequate management capabilities must exist in the foreseeable future, with no serious constraints anticipated, including the ability to conduct prescribed burns, control nuisance exotic species, and provide site security.

3) The proposed site must not contain an existing population of tortoises which is considered viable, or which could recover to viable status with proper site management.

4) All relocated tortoises must be in good health, and must be tested for URTD. If one or more tortoises from a given donor site test positive for URTD, none of the tortoises from the site will be accepted.

5) At any given time, no more than one site will be made available for relocations.

6) The relocation site shall be effectively isolated from other existing tortoise populations, with natural or man-made barriers in place to deter off-site migration of relocated animals.

7) Every effort should be made to relocate native associate species found in the burrows on the donor site.

8) All relocation activities, including site surveys and monitoring of populations, must be conducted in full compliance with both the Florida Game and Fresh Water Fish Commission and the Hillsborough County Planning and Growth Management Department, Natural Resources Section.

9) Post relocation population surveys will be conducted to document the degree of success.

10) In order to be consistent with the policies of the Southwest Florida Water Management District, relocations will not be permitted unless existing, pre-relocation population densities are 0.4 tortoises per acre or less. Post-relocation densities must not exceed 1.0 tortoises per acre.

11) Relocations will not be authorized solely for humanitarian reasons.

12) The Parks and Recreation Department Resource Management Office reserves the right to refuse any gopher tortoise relocation proposal for lands managed by this office.

13) This policy will be continually updated as new information becomes available.

Updated 11/30/98

HABITAT MONITORING POLICY

Hillsborough County Parks and Recreation Department/Resource Management Team

Purpose: To establish a set of monitoring guidelines to determine the success of site management efforts in protecting and enhancing the natural resources of preserve lands.

Background: In order to insure that the objectives of the ELAP Program in acquiring natural preserve areas are met, the Resource Management Office conducts management activities on the preserve lands, including site security, prescribed burning, exotic control, listed species management, restoration, and monitoring of recreational uses. In an effort to determine whether or not the various site management techniques are accomplishing the desired objectives of maintaining or increasing habitat quality and wildlife diversity, a monitoring program has been developed to document existing site conditions and demonstrate changes over time. Due to the high number of preserve sites (over 30), and the extensive acreage (over 30,000 acres), a relatively simple and easily repeatable monitoring method is required as a " base level". This method consists of establishing permanent photographic monitoring stations on every site, with the number and location for each site determined on a site specific basis, but as needed to provide a profile of the site's natural environment, or to highlight areas which are expected to change due to restoration or enhancement efforts.

Each photo station is marked with a steel fence post which is capped with a short section of white PVC pipe identified by a sticker as a permanent marker not to be disturbed. The markers indicate the point at which monitoring photographs are taken at least once a year, in each of the four cardinal directions (NSEW). More frequent photographs are taken as needed to document events such as replanting, burns, or exotic removal. All photographs are labeled with site, date, direction and station number, and stored in site management files. Each set of monitoring photos will be accompanied by a brief narrative of site conditions observed during the monitoring event.

In situations that require more than base level monitoring, such as grant funded restoration projects, impacts of recreational facilities, or listed species recovery efforts, specific monitoring methodologies are developed to meet the unique needs of each project. Examples include standard wetland mitigation monitoring for permitted facilities; pre- and post-treatment photographs and mortality estimates for exotic plant control; qualitative vegetative assessments for burn units; habitat quality assessments and population surveys for gopher tortoise relocations; nest box surveys for SE American Kestrel recovery efforts; and water quality sampling for wetland restoration projects or monitoring of cattle grazing impacts. All data collected is compiled and reported to other agencies as needed, and stored in site management files at the Resource Management Office.

INVASIVE EXOTIC PLANT POLICY

Hillsborough County Parks and Recreation Department/Resource Management Team

Purpose: To provide a set of guidelines to define the objectives, techniques, and procedures to be followed in the control and removal of invasive exotic plant species on preserve lands.

Background:
The Hillsborough County Parks and Recreation Department (HCPRD) is charged with management of invasive exotic plants on county-owned preserve lands as required by the Hillsborough County comprehensive plan, as well as through interlocal agreements with state agencies such as the Southwest Florida Water Management District (SWFWMD), the Conservation and Recreational Lands Program (CARL) and the Florida Communities Trust (FCT). While many of these preserve lands are in a predominantly natural condition when purchased, a few have been disturbed by past phosphate mining, agricultural activities, adjacent development and other human activities. Almost all county-owned preserves have problems with exotic plant invasion, the degree of which depends on site location, past disturbance, past management, and many other factors.

The problem with invasive exotic plants
Invasive exotic plants differ from our native plants in that they have few natural enemies (i.e., insects and diseases) in this country, allowing them to out compete native species. In addition, they have various mechanisms for spreading rapidly in undisturbed natural areas as well as altered lands. Invasive exotic plants are capable of producing large amounts of seed and/or spreading vegetatively within a short time frame. The seeds and fruit are spread by air, water, animals and humans. Vegetative parts are often spread by vehicles and land management machinery. Some invasive plants release chemicals that suppress the growth of surrounding vegetation (allelopathy). Others produce extensive root growth that crowds out native species. Invasive exotic vines blanket native trees and plants, eventually shading out or breaking them.

The damage to native ecosystems is extensive, resulting in lowered biodiversity. Invasive exotic plants often form monocultural stands that greatly diminish availability of food sources and habitat for native wildlife. They alter natural fire patterns and interfere with aquatic system functions. Access to natural areas by staff and the public is inhibited by rampant invasive plant growth. Aesthetic beauty of native ecosystems is ruined.

Identification and prioritization for control
Invasive exotic plant species are recognized and recorded by staff and other experts during preliminary site assessment activities, including new and previously unnoticed infestations. When past site activities are conducive to invasion by particular exotic species (i.e., cattle grazing and tropical soda apple) an informal exotic plant survey of the property may be conducted by staff.

Invasive exotic plants are prioritized for control according to their potential for invasion, the control options available, access to the infestation, and the existing quality of the habitat. Timing for plant susceptibility to control methods due to stage of growth and time of year is a primary consideration. Future plans for the infested area, including restoration, are also considered.

Control methods

Invasive exotic plants are controlled using methods that are the least disruptive to the infested ecosystem. For example, while large, isolated stands of cogongrass can be mowed or burned prior to aerial herbicide treatment, small infestations intermingled with native species must be carefully treated by hand to avoid damage of non-target plants.

Manual/mechanical, physical, and chemical methods of controlling invasive exotic plants are commonly used by the HCPRD. Few biological control agents are currently available for species encountered in Hillsborough County, however, development and testing of biological controls on county-owned lands is welcomed by HCPRD.

Manual/mechanical control methods include hand-pulling of small plants, collection of fruits, tree girdling, and mowing to prevent flowering and fruiting. These methods are often used in conjunction with physical and chemical controls for greater effectiveness. For example, skunkvine is sometimes hand-pulled, allowed to resprout, then sprayed with herbicide. Prescribed fire is used as an indirect physical control. Staff can more easily access burned areas to locate and treat invasive exotics such as Brazilian pepper. Burning also consumes dead vegetation that impedes chemical treatment of invasive exotics such as cogongrass.

Chemical controls used by HCPRD include basal bark, foliar, cut stump, and girdle and spray treatments. Methods of application range from hand held quart spray bottles and backpack sprayers to larger sprayers mounted on all terrain vehicles and pick up trucks. Experiments with basal soil treatments of monocultural stands on preserve lands have also been conducted by chemical industry representatives. The Hillsborough County Roadway Maintenance Mosquito Unit uses boats to access aquatic invasive species in waterways, and helicopters to aerially spray large infestations of aquatic and terrestrial invasive plants on county lands.

Herbicides

Chemical herbicides regularly employed by HCPRD include glyphosate and triclopyr. Triclopyr is used in basal bark, cut stump, girdling, and occasional foliar treatments in upland areas. It is most commonly used for basal bark treatments of Brazilian pepper, Australian pine and other invasive exotic trees. Glyphosate is used in basal bark, cut stump, and girdling treatments in wetlands (i.e., Chinese tallow and Brazilian pepper treatments), but is normally used for foliar treatments in both wetlands and uplands.

Chemical company representatives have been given permission to set up temporary herbicide test plots on several county-owned preserves. If test results conclude that certain herbicide practices are more effective than the ones currently in use, this may justify changes in HCPRD's use of herbicides in the future.

Disposal of invasive exotic plant material

When invasive exotic vegetation is cut or pulled the resulting brush is removed so that the area is not reinfested by remaining seeds, roots, or stems. The Florida Department of Environmental Protection (FDEP) regulates the movement of prohibited plants and plant parts. HCPRD uses prescribed fire to dispose of large quantities of cut brush such as Brazilian pepper and Australian

pine. In addition, the wood of Australian pine is acceptable for home fireplaces and has been offered to the public for free pick up. Fruits of tropical soda apple and air potato are collected, bagged, and incinerated. Small seedlings of many species of invasive exotic plants are composted without any threat of reinfestation.

Monitoring and follow-up

Monitoring of invasive exotic plant infestations before and after treatment is an integral part of the management program. Once HCPRD staff is aware of an infestation and it is prioritized for treatment, staff will include visits to the infested area in their routine management activities. Any changes in the population are noted in site activity reports. Monitoring is more formal after treatment, taking place biweekly or monthly when the particular invasive exotic is expected to require further treatment. Invasive exotic plants which spread primarily by sexual reproduction, such as tropical soda apple, may require monitoring for a year or more until staff is satisfied that seed banks are depleted.

Most invasive exotic plants require more than one treatment for eradication, while others can never be totally eradicated. Some species, such as skunkvine, require periodic ongoing treatment for management at acceptable levels. HCPRD has an established herbicide spray crew whose primary responsibility is eradication and management of invasive exotic plants on county preserves. Other HCPRD staff work with the spray crew as needed.

Partnerships

Invasive exotic plants know no boundaries and infestations often cross fence lines into areas beyond HCPRD control. When infestations are treated on one side of the boundary and not the other, reinfestation usually occurs. HCPRD and the Florida Department of Transportation recently formed a partnership for treatment of Brazilian pepper on two preserves and adjacent highway right-of-way.

Volunteer organizations such as the Pepper Patrol work with HCPRD, FDEP and others on an informal partnership basis. These groups work together to eradicate invasive exotic plants on public and private land. They also sponsor seminars and produce pamphlets to educate the public about invasive exotic plants.

Training and education

HCPRD personnel involved in invasive exotic plant management are required to obtain a Restricted Pesticide Applicator license from the Florida Department of Agriculture and Consumer Services (FDACS). Study materials and testing is provided by the Cooperative Extension Service (CES). Periodic updates and advanced training for Continuing Education Units (CEUs) are required by DACS to renew the licenses. Free classes for CEUs are normally provided on a yearly basis by the CES and the chemical industry.

HCPRD is a member of the Exotic Pest Plant Council (EPPC), which provides a yearly conference and periodic newsletters. The EPPC also maintains and distributes a list of Florida's most invasive species. HCPRD has contributed information on numerous invasive exotic plant invasions to EPPC via field reporting forms. Copies of these forms and other educational materials are maintained on file in the HCPRD/Resource Management office. A list of plant species which are targeted for eradication or control on County-owned preserve lands will be

maintained and periodically updated by the Resource Management Office.

References:

Various authors, *Exotic Plant Invasion on Florida's Water Management District Lands: A Cooperative Inter- District Report*, 1997

Revised 7/30/97

MANAGEMENT FUNDING ASSISTANCE POLICY
Hillsborough County Parks and Recreation Department/Resource Management Team

Purpose: To establish a review and approval process for requests for management funds from non-County agencies which manage lands acquired through the ELAP Program.

Background: A number of sites acquired through the ELAP Program are currently being managed by non-County organizations, through either lease agreements or conveyance of ownership. Other managing agencies include Hillsborough River State Park, Hillsborough Community College, the City of Tampa, and the City of Temple Terrace. Since the ordinances which establish and govern the program have designated a portion of the funds collected as available for management and restoration of lands once they are purchased, the lands which are managed by other agencies are also considered eligible for a portion of those funds.

Restoration Funding: The funds available for site restoration through the ordinances are defined as an amount up to 3% of a specific site's acquisition cost to the County. For example, a site which cost the County $1,000,000.00 to acquire would be eligible for up to $30,000.00, which would be obtained from the ELAP Program's acquisition reserve fund. This money could be used for habitat restoration projects such as exotic plant removal, native plantings, etc., but not for recreational facilities or capital improvements such as fencing.

Site Management Funding: Under the ordinances, a total of 2% of all revenues collected through the ELAP Program Ad Valorem tax, including Bond proceeds, is set aside for site management. This is a much more general category of expenditures which can include fencing, capital equipment, and recreational facility development. Unlike the restoration fund, there is no correlation between a site's acquisition cost and the allocation of management funds to specific sites.

Over the life of the program, the management revenue has been used, along with other funds such as grants, leases, Phosphate Severance Tax revenues, and restoration accounts, to support the County's primary preserve management operation, the Parks and Recreation Department's Resource Management Team. Since the efforts of the Resource Management Team are directed by the overall site protection and management objectives of the ELAP Program, the site management resources, and hence the revenues used to support those resources, are allocated on an ever changing basis which is more related to the needs of specific sites than to site cost or acreage.

In spite of this, it may be useful to provide a calculation of how the site management revenues would be allocated annually based on total acreage. Based on an average annual allocation of $100,000.00, and the current inventory of approximately 32,000 acres of land, there is an average of $3.12-1/2 per acre available for site management. The total amount of land currently managed by non-County agencies = 2,874 acres, which would receive a total of $8,983.00/year. The breakdown for each agency is shown below:

Tampa	140 acres=437.50/year
Temple Terrace	69 acres=217.35/year
HCC	256 acres=800.00/year

HRSP	364 acres=1137.00/year
SWFWMD	926 acres=2894.00/year
LMRSP	754 acres=2356.00/year
Plant City	365 acres=1141/year

In general, the amount of money available using this method of allocation would not be significant in terms of the overall annual management costs for these agencies.

County Management of Lands Acquired through Joint Funding: The ELAP Program has been very successful in sharing the cost of land acquisition with other land buying programs, including Florida Communities Trust, the CARL Program, and SWFWMD/Save Our Rivers. The majority of those jointly acquired lands, a total of approximately 17,945 acres, are managed by the County. Since ELAPP funds did not cover the total amount to purchase those lands, the site management revenues provided by ELAPP do not amount to 2% of the cost to acquire those lands. In essence, and additional 8,973 acres of land are being managed by the County without additional funding support. None of the agencies which shared acquisition costs are currently providing management funding to the County (with the exception of grant funding).

In-Kind Services: When considering the subject of providing ELAPP site management support to other agencies, it is much more practical to develop partnerships which take advantage of the different strengths and weaknesses of the managers. In fact, there have been many instances of the County providing In-Kind Services to the various other agencies listed above. For example, Resource Management staff have conducted plant species inventories for the City of Temple Terrace in support of the development of management plans for the two sites which they manage, and prescribed burning and exotic plant control assistance has been provided to HCC at English Creek. The County has been awarded funding by the SWFWMD Alafia River Basin Board to conduct exotic plant control, and has applied for SWFWMD Basin Board Grant Funding in the Hillsborough River and Northwest Hillsborough basins, and has included the ELAPP properties managed by other agencies in the funding request. If approved, this will enable the grant funded County spray crew to include those sites. The County is very receptive to pursuing other partnerships of this type.

Conclusion: Although nothing precludes the County from providing funding support for site management, the following factors should be considered when reviewing requests for restoration and management funding support from other agencies which manage ELAPP lands.

1) Legitimate restoration projects may be funded for an amount not to exceed 3% of a site's County acquisition costs.

2) Restoration funding requests will be reviewed by the Hillsborough County Parks and Recreation Department, and if found to be compatible with the objectives of the ELAP Program, will be presented to the ELAPP General Committee, the Park Board, and HCBOCC for approval.

3) Unless part of a pre-existing agreement entered into by the County, management funding requests will be considered on a case by case basis, and will not be calculated or limited by acquisition costs or site acreage. Any decision to transfer funds to a non-County agency for site

management will be based on the demonstration of a critical need which cannot be met by the managing agency, when failure to meet that need will result in negative impacts to a site's natural resources.

4) The County supports the concept of In-Kind Services partnerships to improve the protection and management of lands acquired through the ELAP Program.

Revised 3/15/99

MITIGATION POLICY

Hillsborough County Parks and Recreation Department/Resource Management Team

Purpose: To establish a review and approval process for requests to conduct habitat creation, restoration, and/or enhancement on preserve sites in order to mitigate for off-site impacts.

Background: Off-site mitigation offers the potential to provide habitat restoration on preserve lands at little or no cost to the County. Those seeking mitigation opportunities would benefit financially by avoiding land acquisition costs, and the mitigation projects are more likely to provide significant and functional benefits to the environment when incorporated into larger preserve lands.

Since off-site mitigation is not always the most desirable option from an environmental standpoint, and mitigation projects are not always entirely successful, proposals must be evaluated on a case by case basis. Preference should be given to proposals from the public sector in order to maximize cost savings to the taxpayer, and it should be demonstrated that the impacts requiring mitigation are unavoidable (as per State Statutes and/or regulatory policies) rather than motivated by economics or other factors. It would be inappropriate for a development proposal involving impacts to protected resources to gain an advantage in the regulatory approval process simply because the mitigation will benefit public lands. The project must be capable of regulatory approval with or without the use of public preserve lands for mitigation.

Examples of previously approved mitigation requests include a wetland restoration/creation project by the West Coast Regional Water Supply Authority at the Dairy Farm ELAPP site to mitigate for water supply pipeline impacts; and the filling in and replanting of a rim ditch adjacent to Brooker Creek at the Clearwater Restoration site by Tampa Electric to mitigate for impacts from the relocation of a transmission tower at the Citrus Mall construction site.

Approval Process:

1) The mitigation candidate contacts Resource Management Staff to request the use of a preserve site for mitigation.

2) Resource Management staff conducts a review of the mitigation requirements, and determines whether or not any existing preserve sites have restoration requirements which would be met by the mitigation proposal. Under no circumstances shall mitigation result in the destruction of natural upland habitat, or other preserve features which are considered to be desirable or beneficial to the overall objectives of the ELAP Program.

3) If Resource Management staff agrees that a mitigation project will meet the restoration objectives of an existing site, the candidate is invited to prepare a conceptual mitigation proposal for further staff review and preliminary approval.

4) The conceptual mitigation proposal is presented to the ELAPP General Committee for approval.

5) If the mitigation proposal is approved by the General Committee, a license agreement is developed by Resource Management staff, to be submitted to the Board of County Commissioners for approval. The license agreement outlines the responsibilities and obligations of the candidate, which usually require the candidate to be responsible for monitoring and maintenance of the mitigation project until all permit conditions are met. The agreement may require the candidate to provide services to the County that exceed permit requirements, such as additional habitat restoration or other site improvements.

Revised 11/30/98

PRESCRIBED BURNING POLICY

Hillsborough County Parks and Recreation Department/Resource Management Team

Purpose: To provide a set of guidelines to define the objectives and procedures which determine when and how to utilize prescribed fire as a resource management technique on preserve lands.

Background: The Hillsborough County Parks and Recreation Department (HCPRD) routinely uses prescribed fire to manage county-owned natural preserve lands. Prescribed fire is beneficial for purposes of wildlife management, disease control, hazardous fuel reduction, habitat restoration, access improvement, aesthetics, and site preparation. Management of natural preserves is required by the Hillsborough County comprehensive plan, as well as through interlocal agreements with state agencies such as the Southwest Florida Water Management District (SWFWMD), the Conservation and Recreational Lands Program (CARL) and the Florida Communities Trust (FCT). The Environmental Protection Commission of Hillsborough County (EPCHC) endorsed the use of prescribed fire as a critical resource management tool in August of 1994.

Burn plans

In accordance with Florida Statute 590.026, a prescribed burn plan must be written prior to every burn that is conducted on county-owned land. This plan includes ecological objectives for the burn, specific weather conditions which are necessary to conduct the burn safely, as well as a plan to protect surrounding sensitive areas such as residences and roads which may be impacted by smoke.

Burn Unit Identification

Each nature preserve has a master burn map in which each burn unit is numbered.

Consequences of not burning

When fire is excluded from natural areas, they become overgrown with vegetation. Gopher tortoises, which are a key component of upland habitats in Florida, leave the site to forage for food and are often killed by vehicles when they cross roads. Other animals which depend on the use of gopher tortoise burrows also leave the site and are killed in the same manner. Many species of native wildlife will be negatively impacted if periodic burning does not take place. The sites become susceptible to intense wildfires, which can cause damage to facilities on the site as well as to private property. Air quality concerns such as smoke impacts on roadways are more serious when wildfires occur than with periodic prescribed burning. The chances of wildlife being killed in a wildfire are much greater than during a prescribed burn.

Without periodic fires regeneration of trees such as longleaf pine, whose seeds require bare mineral soil to germinate, decreases. Grasses and wildflowers stop blooming and producing seeds, then disappear. Shrubs such as saw palmetto stop blooming and bearing fruit. Insect and disease damage to plants increases. Diverse ecosystems such as pine flatwoods succeed into hardwood hammocks, which replace grasses and herbaceous plants with hardwood trees and woody shrubs. Low intensity, rejuvenating fires can no longer occur without ground covers such as grasses and wildflowers. The resulting habitat does not support as large a number of wildlife species as a mosaic of habitat types would.

Frequency of Burning

Different habitat types require different intervals between burns, ranging from every 1 to 3 years for grasslands, prairie, and sandhills, from every 3 to 5 years for pine flatwoods, and 10 to 50 years for sand pine scrub and oak scrub. The varying intervals are needed to provide optimum conditions for the plants and animals that are adapted to each habitat type, based on their requirements for feeding, breeding, etc. The burn intervals also reflect the different rates at which fuels accumulate to the point at which burning is feasible, while enabling the fire to be relatively low in intensity.

Debriefing

The prescribed burn manager has the option of conducting a post burn debriefing with staff who worked on the burn. The debriefing must be done at the conclusion of the burn, preferably at the site with all individuals who participated in the burn. If it cannot be done at that time, it is done at the first opportunity after completion of the burn.

Public Education

Staff is available on a request basis to give programs to educate the public about the need for prescribed fire. Neighborhood meetings are conducted well in advance of planned burning in areas surrounded by development. In addition, literature is distributed before and during prescribed burns which take place in residential areas, and during events such as Earth Day.

HCPRD personnel are active members of the Central Florida Prescribed Fire Council (CFPFC). A primary objective of this council is to increase the public's understanding of the role of fire management.

News media are encouraged to observe prescribed burns in order to keep the public informed of the importance of fire management. Media access to burns must be guided by staff to ensure personnel safety.

Equipment

Equipment to be used on a prescribed burn is inventoried the day before the burn to ensure that it is in working condition. This includes brush trucks, hand tools, and Indian pumps. All fuel canisters are filled and ready for service.

Firelanes

Firelanes are constructed only when natural or manmade barriers are not present. Their construction is done with the objective of minimizing disturbance to the soil and natural plant community, and to prevent the fire from escaping. A preconstruction inspection is always done to ensure that the proposed construction areas do not contain wildlife habitat such as gopher tortoise burrows, or plants such as the endangered Florida golden aster. In addition, firelanes are never constructed through wetlands, and large trees are preserved. HCPRD staff uses a tractor, disk, and rotovator to construct firelanes, and employs the use of firefoam in environmentally sensitive areas to minimize firelane construction. Firelanes constructed with a tractor plow by the Florida Division of Forestry (FDOF) during a burn may need to be recontoured at a later date. Any areas with constructed firelanes which have the potential to impact wetlands with erosion will be

separated from the wetlands by the use of haybales, siltscreens, or other approved erosion control devises.

Firing Techniques

Firing techniques are selected which generate the least amount of smoke when smoke sensitive areas are nearby and which give wildlife the maximum potential to escape from the fire. Ring fires, which could trap an animal inside a circle of fire, are never used. Only portions of preserves are burned in a single season using a mosaic pattern, leaving an abundance of wildlife habitat with food and cover.

Mop up

Areas which are still burning at the end of a prescribed burn are evaluated for potential smoke impacts to the surrounding community. Staff employs the use of hand tools and water to extinguish open flames and smoldering fuels. Tree snags are left for wildlife habitat unless they pose a hazard to human safety, in which case they will be removed. Staff is required to check the prescribed burn site after noon the following day to verify that the fire has not rekindled and that residual smoke is not creating a problem. If problems are identified, mop up continues until staff is satisfied that all problems are resolved.

Notification

Staff contacts the FDOF to request a prescribed burn authorization on the morning of the burn, prior to leaving for the site. This is followed by calls to the EPCHC and the Hillsborough County Fire Department. Next, E-mail notification is sent to the Deputy County Administrator, the Parks Department director, the Resource Development section manager and the media contacts for both the HCPRD and Hillsborough County. The E-mail notification is then printed and faxed to the Resource Development section manager.

Neighbors or groups adjacent to a prescribed burn unit are notified via pamphlets, meetings, telephone calls, or press releases prior to the burn. Neighbors and those who could be affected by the burn may contact the Parks and Recreation Department to be placed on an advanced notification list. Signs are placed on a site during the burn to notify motorists or pedestrians of the burn. Staff inspects the area to be burned prior to igniting the fire to ensure that no one is within the area to be burned.

Post-burn monitoring and evaluation

Staff conducts post-burn monitoring of prescribed burn sites for up to a year after the burn for the purpose of determining the success of the burn's objectives. Documentation is through the use of photography and written notes, which are filed along with the burn plan.

Radio protocol

The main means of communication during prescribed burns is through conversation over the radio. All staff members carry a radio. Staff follows established procedures for radio use (Resource Management Radio Procedures).

Safety

Staff members must wear a nomex fire suit over all cotton clothing, a helmet, leather gloves, and

leather shoes in order to work on a prescribed burn. These items can only be removed during breaks, and at the end of the burn as determined by the person in charge of the burn. After attendance at basic prescribed fire training, each staff member is issued a fire shelter and required to wear it at all times during the burn.

Staff members are encouraged to drink adequate amounts of water. They are also required to take frequent breaks, work in pairs whenever possible and watch for signs of heat stress or fatigue.

Statistics

Staff keeps documentation concerning the acreage burned by year, dates of the burns, and where the burns were conducted. These statistics are submitted annually to the CFPFC and kept on file.

Technical Assistance

Staff coordinates with the FDOF, SWFWMD, The Nature Conservancy (TNC), the Florida Game and Freshwater Fish Commission (FGFWFC), the National Audubon Society (NAS), and others to gain technical knowledge and advice about prescribed burns. FDOF conducted its Basic Prescribed Fire training course at Upper Tampa Bay Park for several years with assistance from the HCPRD.

Time of year when burns occur

Factors which influence selection of the time of year to burn include weather conditions, wildlife benefits, fuel conditions, preservation of large trees, and time of the last fire. Some flora and fauna responses to dormant season burns may justify a variable season strategy. For example, winter burns may kill reptiles and amphibians, which are less active during cold weather (Robbins and Myers, 1989). Also, eggs or hatchling birds could be killed during the nesting season, which varies widely depending on the species. Many species of birds, such as quail and mourning doves, have the ability to renest if the eggs or nestlings are lost. Winter burns may encourage growth of woody plants, while some grasses only produce seeds when burned during the growing season. Areas of heavy fuel buildup should be burned in the dormant season or as soon as appropriate weather conditions occur.

There is a growing body of scientific literature which documents the benefits of burns done during the growing season, i.e., when natural wildfires most frequently occur. This position is heavily advocated by TNC, SWFWMD and FDOF. HCPRD policy is to conduct prescribed burns throughout the entire year, with an emphasis on the growing season.

Training

As soon as feasible, all permanent staff members who work on prescribed burns must at a minimum attend the training course on Basic Prescribed fire (organized through Hillsborough Community College and FDOF) and obtain a prescribed burn certification. Additional training may be required by the supervisor. Staff attends the meetings of the CFPRC to get the latest information and support, as well as annual conferences given by organizations such as the Florida Native Plant Society and the Society for Ecological Restoration, which cover issues concerning prescribed fire. Staff also maintains a literature file of scientific articles about fire and other management issues.

Visitors/outside observers

Visitors may be permitted to watch prescribed burns from a safe distance. Entry into the burn unit while or immediately after a prescribed burn is in progress is discouraged. However, should there be a need for visitation, such as for the benefit of the media, visitors can be allowed entry with the accompaniment of a staff member. Visitors are required to wear protective burn equipment at the discretion of the burn boss.

Volunteers

Requests from the public to volunteer during prescribed burns are common. Due to the specialized knowledge needed for prescribed burning, as well as safety of the volunteer, the Resource Management team requires that any prospective volunteers be approved by the environmental supervisor. For training purposes, volunteers must attend the FDOF Basic Prescribed Fire training course prior to volunteering on a burn. As with all county volunteer positions, Volunteer in Public Service (VIPS) forms must be completed prior to participation.

Wildfires

Wildfires on preserve lands are normally extinguished as soon as possible after discovery. Any reported wildfires which are determined to be burning according to an existing set of prescribed burn objectives may, with appropriate permission from regulatory agencies, be allowed to continue burning. This is a special situation which requires on-site monitoring by staff, with assistance from FDOF as needed.

Incendiary or arson fires are reported to the FDOF immediately and an investigation may be requested. Staff and public visitation to the arson site is temporarily suspended until the investigation is completed in order to preserve evidence. The Resource Management supervisor can be contacted by telephone or pager 24 hours a day.

Wildlife Management objectives

HCPRD policy for natural preserve lands is to increase native wildlife populations wherever feasible, with emphasis on the recovery of listed species (endangered, threatened, and species of special concern). Much of this is accomplished through the use of prescribed fire. Listed species which are managed for include gopher tortoise, Sherman's fox squirrel, the Florida golden aster, and Florida scrub-jay. All of these species are declining in number because of loss of habitat and because the remaining habitat has not been managed through the use of prescribed fire. Many other associated plant and animal species that depend on these keystone species also benefit from fire management.

References:

Myers, Ronald L. and John J. Ewel. 1990. *Ecosystems of Florida*. University of Central Florida Press, Orlando.

Robbins, Louise E. and Ronald L. Myers. 1989. *Seasonal Effects of Prescribed Burning in Florida: A Review.* The Nature Conservancy Fire Management and Research Program, Tallahassee

Revised 11/30/98

RECREATIONAL USE POLICY

Hillsborough County Parks and Recreation Department/Resource Management team

Purpose: To determine whether a proposed recreational activity is compatible with a specific preserve site, and if so, under what conditions and to what extent it can be allowed to occur.

Background: Resource Management staff receive requests from individuals seeking recreational access to preserve sites on a regular basis. According to the various ordinances establishing the ELAP Program, and the Administrative Guidelines which have been adopted for the program, all lands acquired through the program shall be made available for compatible, resource-based recreational purposes, provided that such uses will not disturb or degrade the environmental quality of the site. In other words, the primary objective of the land acquisition program, as reflected in the management of all lands acquired through the program, is to preserve the native plants and animals and their habitat, and where possible, enhance the natural resources of the preserve areas, and increase populations of wildlife and listed species. A secondary objective is to allow compatible recreational activities, but only to an extent which does not undermine the primary objective. In determining compatibility, it is necessary to consider not only which recreational activities are compatible with environmental protection objectives, but also whether or not two different recreational activities are compatible with each other. One way to avoid user group conflicts is to designate trail systems for "single-use" rather than "multi-use" whenever possible.

Criteria for permitting recreational uses:

1) Is the Activity Appropriate for a Natural Area?

In order to be considered under any circumstances, the recreational activity must be "resource-based", in other words, the activity requires a natural resource in order to occur, rather than a man-made facility. Examples include fishing, hunting, canoeing/kayaking, hiking, mountain biking, horseback riding, bird watching, camping, etc. Recreational activities which are not resource-based, and which require other facilities, include baseball, basketball, tennis, horse racing, drag racing, remote control aircraft, etc.

2) Compatibility

The activity must be compatible with the natural setting, meaning that it does not cause a harmful impact or degrade the natural quality of the site. Negative impacts include not only habitat damage and destruction, but disturbance of wildlife, noise and light pollution, etc. Incompatibility may also result from interference with essential site management activities, such as prescribed burning. In some cases, an activity may be compatible if restricted in location or level of use, but may become incompatible if allowed to occur in certain areas, or if the number of participants or frequency of use is too high. Another consideration is whether or not a site is "ready" for recreational access. In many cases, habitat restoration or enhancement is required, and it may be necessary to withhold access until these efforts have been completed, otherwise, the recreational activity may interfere with management efforts, or even make an existing problem, such as exotic nuisance vegetation, worse.

3) Demand vs. Availability

Since it is possible for virtually any recreational use to create problems if not properly managed, consideration should be given to the need for a proposed use on a specific site. In other words, just because the use is compatible and resource based, it may not be justified if the demand is already being met on other sites in the same area. This concern has been created by two recreational uses in particular.

Mountain bikers are constantly exploring biking opportunities on new sites, due to their high mobility and need for large areas with extensive trail networks. Since there is a tendency for unauthorized trails to proliferate, as well as concerns over safety for participants in this highly active sport, the activity needs to be restricted to certain sites which can accommodate the impacts and where management efforts can be focused.

Horseback riding results in similar concerns over control of the activity, but for a different reason. Since transporting horses to sites which offer trail systems involves considerable effort, horse owners are eager to gain access to any site which happens to be located near their residence. Since most of the larger preserve areas are located in rural neighborhoods where people are more likely to own horses, there has been at least some degree of interest in allowing riding on every site over 100 acres. Unfortunately, opening a site to horseback riding involves a considerable increase in the level of management required, making it impractical to make every potential site available for this use. Even if the management resources were available, other user groups may find that their enjoyment of a site is reduced by horseback riding. If an activity is offered to only those members of the public who happen to live adjacent to a publicly owned preserve, with direct access, it is not ethical and may be illegal to deny access to other members of the public who live elsewhere as well. In addition, not all sites are suitable for the activity due to habitat sensitivity and security concerns. In terms of existing horseback riding areas, there are more sites with trails available for this activity in Hillsborough and surrounding counties, than any other trail based sport.

4) Management Capability

Regardless of whether or not a proposed recreational use meets the above conditions, if management capabilities are not sufficient to guarantee that the use is properly developed and monitored, it should not be allowed. This includes both the funding and manpower to install and maintain required facilities, such as parking, signage, trail layout and construction, as well as to monitor the use to assure that unsafe conditions and negative environmental impacts are avoided. In several cases, a proposed recreational use has been authorized based on the availability of volunteers to provide the labor needed to install the trails, under County supervision and guidance. The mountain biking trail at Balm-Boyette Scrub, and horseback riding trails at Rhodine, Alderman's Ford Addition, and Alafia River Corridor, were all developed with volunteer participation.

Resource Management staff is responsible for monitoring recreational uses to determine if impact problems exist. If serious degradation does occur, the County must have the ability to modify, suspend, or terminate the recreational use so that recovery can occur.

5) Use Agreements

In situations when a proposed use has the potential to become a problem if not properly

managed, the County will require a formal agreement to be developed with an organization representing the user group, outlining the responsibilities of the organization, which are intended to prevent or address any problems which arise, as well as to acknowledge the circumstances under which the use may be suspended or canceled, if necessary.

Summary:

In order for a recreational use to be permitted on a specific preserve site, the following conditions must be met:

* The use must be a compatible, resource-based recreational activity
* It must be possible for the use to occur without degradation of the natural environment
* The use must not interfere with essential site management activities
* There must be a demand for the activity which is not being adequately met in the region
* Management capabilities must be adequate to develop, maintain, and monitor the use
* It must be possible to terminate the use if unavoidable negative impacts occur

updated 11/30/98

SITE SECURITY POLICY

Hillsborough County Parks and Recreation Department/Resource Management Team

Purpose: To establish a set of guidelines to protect natural preserve lands from damages resulting from unauthorized access.

Background: In order to accomplish the objective of preserving the natural resources of lands acquired through the County's ELAP Program, it is necessary to protect the lands from unauthorized human activities which would result in harmful impacts. Potential damages include illegal dumping, destruction of habitat and erosion from off- road vehicles or unregulated trail development, loss of protected plants and wildlife due to poaching, disturbance of nesting habitat, etc. Measures required to prevent such impacts may include: posting of regulatory signage; installation of fences or other physical barriers; routine patrolling; and establishing live-on site security. It is necessary to implement such measures on a site specific basis due to budgetary constraints and individual site characteristics, as well as a desire to promote public access for compatible, resource-based recreational uses.

General Guidelines:

1) All sites will be posted according to State Statutory requirements immediately after acquisition.

2) Sites with a past history of illegal dumping or off-road vehicle use will be a priority for implementation of security measures.

3) Remote areas which are easily accessible by vehicle must be protected by adequate fences, gates, and other barriers as needed.

4) Sites with existing residences in a usable condition will be occupied by qualified security residents as soon as possible.

5) Sites without existing residences, which have severe security concerns, will be provided with the necessary utilities for a mobile home, to be provided by a qualified security resident, as selected by the Resource Management Section.

6) Security residents must be selected from qualified individuals who either serve as law enforcement officers, or are employed by the Parks and Recreation Department. Exceptions will be granted for qualified individuals who were serving in a similar capacity for the previous landowner, as determined by Resource Management. Security residents are required to sign and comply with a Site Security Agreement, specifying the terms and conditions of the live-on position.

7) All provisions of the County "Park Ordinance" #97-14 will be enforced.

HABITAT RESTORATION POLICY

Hillsborough County Parks and Recreation Department/Resource Management Section

Purpose: To establish guidelines to define the objectives, techniques and procedures to be followed in the restoration of natural plant communities in disturbed or degraded areas of preserve lands.

Background: In the process of acquiring large tracts of land for natural resource preservation, Hillsborough County occasionally purchases, either unavoidably or by deliberate design, areas which have been altered by past land uses or exotic plant invasion. It is the policy of the Resource Management Section to restore environmentally damaged ecosystems to a more "natural" condition, to the greatest extent possible and practical. The reason for doing so is to maximize the benefits derived from a naturally functioning ecosystem, which include, but are not limited to, the following: wildlife diversity; wildlife carrying capacity; recovery and support of listed plant and animal species; restoration and enhancement of habitat connectivity; improvement of water quality; reduction of storm-water runoff; and enhancement of aesthetic values. Habitat restoration may involve the reintroduction of fire through prescribed burning, removal of invasive exotic vegetation, replanting of areas cleared of native plants, hydrologic restoration, or all of the above. Whatever the techniques employed, the underlying objective of habitat restoration is to direct and facilitate the process of natural succession.

Determination of Target Restoration Habitat: In most cases, restoration attempts to re-create the natural plant community that originally occurred on the site prior to the impacts. Determining that condition involves an analysis of a combination of factors, including soil types, topography, and existing conditions on similar, nearby undisturbed sites, if available.

In some cases, site alterations are too extreme to enable the re-creation of original conditions. Examples include areas which have undergone mining, dredging, landfill, and some forms of agricultural development. In such areas, the objective may be simply to replace exotic species with native, rather than to restore a fully "authentic" natural plant community. Occasionally, highly disturbed areas which are not considered to be priority sites for restoration, may be designated for other uses such as facilities development, agricultural use, storm-water management, etc. However, unless there is a specific reason to do otherwise, or an area of a site has been designated as an "acquisition of convenience" (surplus), the County will attempt to restore such areas to a more natural condition.

Methodology: Since habitat restoration techniques are constantly evolving, no attempt to describe specific methods will be presented as part of this policy. In general, the best available methods, within financial constraints, will be employed. Resource Management staff will keep abreast of new developments by participating in area workshops and regional conferences, maintaining memberships in organizations and societies dedicated to restoration and management, and sharing information with other land management agencies and organizations.

Partnerships: Whenever possible, Resource Management will seek to partner with other agencies and organizations to pursue habitat restoration objectives. To date, restoration partnerships have been formed with the West Coast Regional Water Supply Authority (NKA Tampa Bay Water),

Southwest Florida Water Management District/SWIM Program, Hillsborough County Environmental Protection Commission, Sierra Club, Audubon and others. Partnerships may simply provide a source of additional funds, consist of volunteer participation, or provide actual large scale re-creation of habitat.

Site Evaluation and Prioritization: The first option for restoration of disturbed areas will always be to let natural succession occur on its own. In situations where this is not possible, priority will be given to projects which accomplish the following objectives:

- support the survival or expansion of populations of listed species
- re-create or enhance habitat connections between core parcels
- control infestations of exotic nuisance plants which threaten natural areas
- provide water quality enhancement or reduce storm-water runoff
- replace extremely rare natural plant communities

Other factors affecting site priority include availability of grant funding or the ability to form partnerships. Due to limited resources available for site management in general, restoration of some areas may be delayed indefinitely if it is determined that doing so will not cause continued degradation of other natural resources.

Development of a Restoration Plan: Regardless of a restoration project's priority rating, no site restoration activity should occur until, at the least, a conceptual site restoration plan has been developed and incorporated into the overall management plan for the site. It is essential that habitat restoration activities be fully integrated into other site management activities, in order to avoid conflicting with those activities. For example, an area which is a high priority for prescribed burning, in order to reduce fuels, etc., should nor be re-planted until such burns have been conducted. Also, premature planting in areas previously used for agricultural purposes, such as row crops, may result in native plants becoming overgrown by nuisance exotics or weedy native species.

Summary: Restoration of natural habitat in disturbed or degraded areas of preservation lands is always one of the primary objectives of site management, unless there is a specific reason not to do so. Prior to initiating habitat restoration activity on any site, a conceptual site restoration plan must be developed. The plan will identify restoration objectives and best available methods to be employed, as well as opportunities for partnerships or outside funding. Restoration activities will be integrated into other site management initiatives to avoid conflicting objectives.

Revised 5/26/00







Status Survey for Florida Goldenaster, *Chrysopsis floridana*

Final Report for the Division of Forestry, Florida Department of Agriculture and Consumer Services Contract # 008472

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FLORIDA
Natural Areas
INVENTORY

Cover Photographs

top: flower heads of *C. floridana*, Bill Boothe

middle: flower stem of *C. floridana*, Bill Boothe

bottom: habit of *C. floridana*, FNAI

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ABSTRACT

In 2004, field surveys were conducted and information solicited to update 20 occurrence records in the database of the Florida Natural Areas Inventory for the federally endangered Florida goldenaster (*Chrysopsis floridana*). Eleven of these sites were field surveyed and new information was obtained on one additional site. These, plus one site with data from 2000, gave recent information on the status of a total of 13 of the 20 sites (65%). Plants were confirmed at 7 of the 13 sites; not confirmed at 1 site where the habitat was intact, and not found at 5 sites where the habitat had been destroyed (25% of all sites). Six of the remaining seven sites were visited but were not surveyed due to lack of access; all had intact habitat. Plants were documented at three new sites, all of them on publicly managed lands. This survey documented that sites on private land are being rapidly lost and there is good potential for finding further sites on public lands. Another field season would be needed to determine the status of *C. floridana* at five previously known sites on public land, plus conduct more thorough surveys at two of the new sites on public lands, and thereby gain a complete picture of the status of the species.

INTRODUCTION

Florida Goldenaster (*Chrysopsis floridana*) is currently listed as endangered by both the U.S. Fish and Wildlife Service (USFWS 1999) and by the Florida Department of Agriculture and Consumer Services (Florida Administrative Code Chapter 5B-40). FNAI (2002) ranks *Chrysopsis floridana* as G1/S1, indicating that it is critically imperiled globally and in Florida because of extreme rarity (< 5 occurrences and < 100 individuals). Florida goldenaster is endemic to Florida, and limited in distribution, occurring in native scrub communities in four west-central peninsular counties: Hillsborough, Manatee, Sarasota, and Hardee. Although J. K. Small collected specimens from dunes in St. Petersburg Beach in 1921, populations are considered extirpated from Pinellas County (USFWS 1999).

Florida goldenaster (*Chrysopsis floridana)* is a fall-flowering perennial herb with yellow disk and ray flowers in the Asteraceae (Chafin 2000). It is distinguished from the sympatric coastalplain golden aster, *C. scabrella*, by its felty stem leaves with rounded tips (vs. glandular, non-wooly stem leaves with pointed tips in *C. scabrella*) and perennial habit (vs. biennial in *C. scabrella*).

Turnover in *C. floridana* population is fairly rapid (Lambert and Menges 1996). In the first growing season after germination a basal rosette is formed which produces a single flowering shoot in the second (or third or fourth?) growing season and then either dies or gives rise to secondary basal rosettes at the end of short rhizomes (Semple 1981).

Within the currently documented range, populations are clustered in southern Hillsborough County, with outlying populations in Hardee, Manatee, and Sarasota counties. Populations are found on Archbold, St. Lucie, Lakewood, Duette, and Pomello fine sands (USFWS 1999). The plants grow well in low nutrient conditions associated with the xeric scrub habitats. The well-drained, white sands of sand pine scrub and oak scrub communities frequently have large patches of bare sand, an ideal microhabitat for the Florida goldenaster.

METHODS

Field Surveys

The Florida Natural Areas Inventory (FNAI) database of 20 Element Occurrence Records (EOR's) for *Chrysopsis floridana* had not been updated since 1990, with the exception of one site added in 2000. Public and private landowners were contacted for information about habitat condition and status of *Chrysopsis floridana* on the sites of record, as well as for new sites.

Field surveys were conducted in late August and early September 2004, targeting primarily private sites, since the species' natural habitat is being rapidly developed. Arrangements were made with Hillsborough County Parks, Recreation and Conservation Department to visit known sites for *C. floridana* in the Environmental Lands Acquisition Protection Program (ELAPP).

U.S. Geological Survey quadrangles and FNAI-generated Digital Ortho Quarter Quad aerials showing point locations for the 20 EOR's were used to locate sites in the field. An FNAI spreadsheet with directions and other information contained in the 20 EOR's was also used in locating sites. Since the standard minimum separation distance for occurrences in the FNAI database is 0.5 mi, a minimum of a 1-mile radius around each mapped point was searched at each site. Any plants found within a 0.5 mi radius of the original point were considered part of the same occurrence even if the precise location was slightly different from that originally mapped. New and updated information on each individual site that resulted from the survey is provided in six new columns added to the existing EOR spreadsheet (Appendix A). A shapefile of updated locations is provided in Appendix B.

RESULTS

Habitat Conditions

Chrysopsis floridana prefers open ground in sandy areas, generally in full sun, and is usually found growing in the ecotone between scrub and other communities. The plants do not compete well with other plants, particularly saw palmettos, scrub oaks, and invasive exotic grasses, such as *Rhynchelytrum repens* and *Paspalum notatum*. Seeds of the species have been found to germinate well after light soil disturbance (Lambert and Menges 1996). Several populations currently exist on roadsides and interstate ramps, but these are vulnerable to frequent mowing or other disturbances associated with periodic roadside maintenance.

Typical natural habitat for the species consists of open, white-sand scrub dominated by sand pines (*Pinus clausa*), scrub oaks (*Quercus myrtifolia, Q. chapmanii, Q. geminata, Q. inopina*), and rusty lyonia (*Lyonia ferruginea*). Small, widely scattered herbaceous species such as jointweed (*Polygonella polygama*), wireweed (*Stipulicida setacea*) and other small native herbs may occur in the openings or on the sandy perimeters with *C. floridana*.

Element Occurrence Record Survey Data

A total of 11 of the 20 known EOR sites in the FNAI database were visited and surveyed; current information was obtained from managers on one additional site; these plus one site that had 2000 FNAI data gives current survey information (2000 or later) for 13 (65%) of the 20 EOR sites (Table 1). Of the remaining seven sites, six were visited and determined to be in natural condition, but were not surveyed due to lack of access, and one was not visited. Three new sites, all on managed lands, were added as a result of the survey (Fig. 1). Existing and updated EOR information on individual sites is provided in a spreadsheet (Appendix A). A shapefile of current EOR locations is provided on compact disk (Appendix B).

Of the 13 sites with 2000 or more recent data, plants were found at seven sites, not found at one site with intact habitat, and not found at five sites where the habitat was destroyed (Table 1). Four of the latter were on private land and one (EO# 6) was a city park. The private sites, observed from roadsides, were improved pasture (with bahiagrass, *Paspalum notatum*), unimproved pasture in native vegetation, or, in one case, housing development (EO#4). The Sun City Park site (EO#6) has picnic facilities, is frequented by off-road vehicles, and is maintained my mowing. *Chrysopsis floridana* does not appear to persist on sites that are frequently mowed

or that have been planted to bahiagrass. It was not present in a mowed powerline corridor (EO#14) where it had been formerly reported, but was found nearby in a narrow strip of native vegetation along a road right-of-way.

The five sites on public land that were visited but not surveyed are Hillsborough County Parks (Balm-Boyette and Goldenaster Scrubs) that were recently purchased by ELAPP and are being prepared for public access. Population data for *C. floridana* at existing EOR sites and new sites on ELAPP lands will be sent to FNAI when these sites are monitored. There is good potential to find additional populations on these properties. There are also reported to be additional sites in Hardee County (DeLaney, 2004) but hurricane-related delays did not permit these to be checked.

Table 1. Summary data obtained at sites of FNAI Element Occurrence Records (EOR's) for *Chrysopsis floridana* – 2004 survey

EOR sites visited	**Managed**	**Private**	**Total**
Total FNAI EOR's before survey	11	9	20*
EOR sites visited and surveyed	4	7	11
EOR sites for which 2000 or later data obtained	1	0	1
EOR sites with 2000 or later data already in database (not visited)	0	1	1
Total EOR sites with 2000 or more recent survey data	5	8	13
EOR sites visited and intact (not surveyed due to lack of access)	5	1	6
EOR sites not visited	1	0	1
Total	11	9	20

Results for sites visited	**Managed**	**Private**	**Total**
EOR sites surveyed and plants found	3	4	7
EOR sites surveyed and plants not found - site intact	1	0	1
EOR sites destroyed	1	4	5
Percentage recently surveyed EOR sites where plants found	3/5 = 60%	4/8 = 50%	7/13 = 54%
New EOR sites reported in this survey	3	0	3
Post-survey total FNAI EOR sites (plus new sites, minus destroyed sites)	13	5	18
Percentage of post-survey total FNAI EOR sites with recent survey data	7/13 = 54%	4/5 = 80%	11/18 = 61%
Percentage of post-survey total FNAI EOR sites known to be intact	12/13 = 92%	5/5 = 100%	17/18 = 94%

*minus one site (EO#8) for which directions were determined to be too vague to allow re-location; this record was deleted from the database.

Number of Individuals

All seven of the sites where plants were found had between 25 and 150 individuals, with a total of about 850 individuals; however, more extensive data is needed to estimate total numbers of individuals and average population size, since *C. floridana* is a short-lived forb that occurs in two forms, as a rosette and as a flowering plant and may respond to yearly weather fluctuations.

DISCUSSION

Population Size and Status

Most populations are described as reproductive with seedlings, juveniles and flowering adults in the populations. It also appears, though not verified, that sites with light soil disturbance have larger populations. Even in mature intact scrub, soil disturbance occurs regularly. Gopher tortoises, lizards, and small mammals continuously move the sand around providing ideal conditions for seed germination. As monitoring programs are initiated in the managed sites, better estimates of population size and population status will be available.

Environmental Lands and Acquisition Programs

In the 14 years since the last update in 1990, the percent of FNAI EOR sites for *C. floridana* on managed lands has increased from 62% to 80%, most of these being in Hillsborough County. The Hillsborough County Environmental Lands Acquisition and Protection Program purchased the sites and is managing these lands in native habitat to maintain the listed species populations. The 16 managed sites in Hillsborough and Manatee Counties are listed in Table 2. No managed sites for *C. floridana* are known for Hardee or Sarasota counties.

Table 2. *Chrysopsis floridana* EOR sites in public ownership.

EO #	County	Quad Name	Organization	Management Agency
PREVIOUSLY RECORDED ELEMENT OCCURRENCES				
3	Hillsborough	Lithia	ELAPP	Balm-Boyette Scrub
19	Hillsborough	Lithia	ELAPP	Balm-Boyette Scrub
20	Hillsborough	Lithia	ELAPP	Balm-Boyette Scrub
18	Hillsborough	Riverview	ELAPP	Balm-Boyette Scrub
2	Hillsborough	Riverview	ELAPP	Rhodine Scrub: ELAPP (formerly Shadow Run)
9	Hillsborough	Riverview	ELAPP	Golden Aster Scrub Nature Preserve
14	Hillsborough	Riverview	ELAPP	**Fishawk road site near powerline – managed by** Hillsborough Parks, Recreation and Conservation.
24	Hillsborough	Riverview	FDOT	Florida Department of Transportation
25	Hillsborough	Riverview	FDOT	Florida Department of Transportation
16	Manatee	Verna	FDEP	Lake Manatee State Park
NEW ELEMENT OCCURRENCES				
26	Hillsborough	Riverview	ELAPP	Bell Creek Scrub Nature Preserve: ELAPP
27	Manatee	Ft. Lonesome	FWC	Moody Branch Mitigation Park
28	Hillsborough	Wimauma	FWC	Little Bullfrog Creek Scrub

Threats

The major threat to *Chrysopsis floridana* is conversion of native scrub habitat in private ownership to commercial or residential development or to agriculture. Four of the 20 known EOR sites have been lost to conversion. A second threat is invasion of open sites by exotic grasses, perhaps combined with frequent mowing; these have resulted in the loss of the population at one site (EO#6) and a reduction of the population at another (EO# 14).

Management Needs

Hillsborough County continues to purchase lands for conservation. The County also provides management plans for their Natural Areas and Parks. These management plans should contain objective driven protocols for Monitoring and Maintenance of scrub habitat that includes prescribed fire, eradication of invasive nonnative vegetation and provisions for open ground or gaps for "gap specialists". County management plans that accurately address the requirements of the scrub habitat using prescribed fire in the appropriate season, frequency and intensity, will also meet the specific requirements for *Chrysopsis floridana.*

Monitoring. Consistent monitoring protocols are needed to assess population status on all sites. Archbold Biological Station biologist, Eric Menges, has developed a protocol to track the demographics and reproduction of the recently described *Chrysopsis highlandsensis* (Menges 2001;Menges and Weekley 2004). Adapting his protocol for *C. floridana* will assist in monitoring these populations.

Prescribed fire. Maintaining scrub habitat through the use of fire is a challenge to many counties in Florida, especially coastal counties where the scrub habitat is fragmented and surrounded by development. Management using a combination of fire and mechanical techniques is being explored throughout the state. Data on the response of scrub communities to different treatments are not conclusive, as the many of the studies (Roberts and Cox 2000, Weekley and Menges, unpublished data on the Lake Wales Ridge State Forest) will require long-term monitoring before firm conclusions can be reached.

Invasive species. Invasive plant management is an ongoing concern. Removal of undesired species may present challenges in the ecotones that are prone to invasion by plant species that populate disturbed soils. Some forms of maintenance may invite invasive species, especially grasses that rapidly colonize bare ground. Populations of *Chrysopsis floridana* on maintained roadsides are affected by mowing activities of road crews. One of three plant clusters on I-75 cloverleaf (EOR #24) and another on an off-ramp (EOR #25) maintained by the Department of Transportation (DOT) no longer contain *C. floridana* apparently because adjacent bahiagrass grew into the open sandy areas.

RECOMMENDATIONS

Many of the known sites for *Chrysopsis floridana* populations are now protected through the Hillsborough County ELAPP program. Five of these sites were visited and determined to be intact, but another field season is needed to survey these populations. Additional surveys are also needed on two of the new sites for the species on Florida Fish and Wildlife Conservation Commission lands and on possible new sites reported for Hardee County. In light of the loss of known populations on sites not managed for natural habitat, more information is also needed about the response of *Chrysopsis floridana* to mowing and invasive exotics.

REFERENCES CITED

Chafin, L.G. 2000. Field guide to the rare plants of Florida. Florida Natural Areas Inventory, Florida State University, Tallahassee.

Christman, S. P. 1988. Endemism and Florida interior sandpine scrub. Unpublished Report to Florida Game and Fresh Water Fish Commission, (GFC-84-010). Tallahassee. 247 Pp.

Coile, N. C. and M. A. Garland. 2003. Notes on Florida's endangered and threatened plants. Department of Agriculture and Consumer Service, Division of Plant Industry, Gainesville. 122 pp.

DeLaney, K. 2004. Personal communication. Hardee County *Chrysopsis floridana* locations. Director of Planning & Development, Hardee County, 110 S. 9th Ave., Wauchula, FL 33873, (863) 767-9655

Florida Natural Areas Inventory. 2002. Tracking List of Rare, Threatened, and Endangered Plants Animals and Natural Communities of Florida. Florida State University, Tallahassee, FL.

Lambert, B.B. and E.S. Menges. 1996. The effects of light, soil disturbance, and presence of organic litter on the field germination ands survival of the Florida golden aster *Chrysopsis floridana.* Florida Scientist 59(2): 121-137.

Menges, E. S. 2001a. Mowing, logging, and sawing: fire surrogates or mere smoke screen. Powerpoint presentation to the Lake Wales Ridge Ecosystem Working Group, Fall 2001. Archbold Biological Station, Lake Placid, FL.

Menges, E.S. 2001b. *Chrysopsis* sp. nov.: monitoring overview, field protocol, and data documentation. Unpublished report, Archbold Biological Station, Lake Placid, FL.

Menges, E.S. and C. Weekley. 2004. Further demographic research on four state-listed Lake Wales Ridge endemic plants. Final report to Endangered and Threatened Plant Conservation Program, Division of Plant Industry, Florida Department of Agriculture and Consumer Services, Gainesville.

Roberts, D.R. and A.C. Cox. 2000. Sand pine scrub vegetation response to two burning and two non-burning treatments. Pages 114-124. *In:* Keith Moser and Cynthia F. Moser (eds.), Fire and forest Ecology: innovative silviculture and vegetation management. Tall Timbers Fire Ecology Conference Proceedings, No 21. Tall Timbers Research Station, Tallahassee.

Semple, J.C. 1981. A revision of the goldenaster genus *Chrysopsis* (Nutt.) Ell. nom. cons.(Compositae-Asteraceae). Rhodora 83: 323-384.

U.S. Fish and Wildlife Service. 1999. *Chrysopsis floridana.* pp. 4-1173 to 4-1184. *In:* South Florida multi-species recovery plan. U.S. Fish and Wildlife Service, Atlanta, GA. 2172. pp.

APPENDIX A

Spreadsheet of updated FNAI element occurrence records for 20 existing and 3 new sites for *Chrysopsis floridana*.

APPENDIX B

Compact disk with shape file of updated locations of 23 EOR sites for *Chrysopsis floridana*.

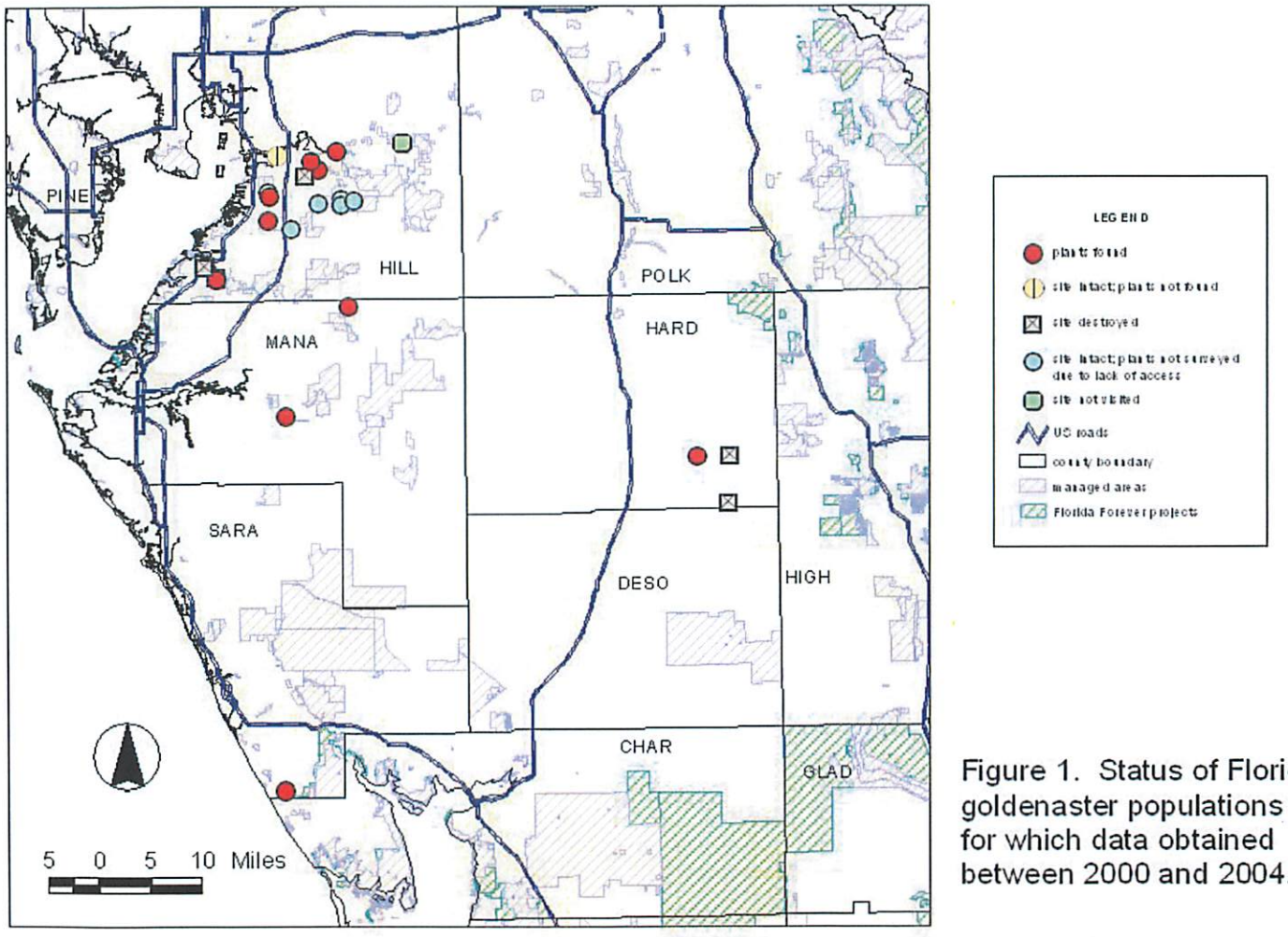


Figure 1. Status of Florida goldenaster populations for which data obtained between 2000 and 2004.

Chrysopsis floridana - updated element occurrence records - 2004

EO #	Status	Scientific name	county	quad name	Managed area	first observe	last observed
1	site intact; plants not surveyed due to lack of access	Chrysopsis floridana	Hillsborough	Wimauma	Private pasture site west of road; private sod farm to east	1980	10/17/1980
2	plants present 2000- 2004	Chrysopsis floridana	Hillsborough	Riverview	Rhodine Scrub: ELAPP, formerly known as Shadow Run development	1976 09-30	12/4/1989
3	site intact; plants not surveyed due to lack of access	Chrysopsis floridana	Hillsborough	Lithia	Balm-Boyette Scrub: ELAPP	1979 10-26	9/5/1990
4	site cleared-plants not found	Chrysopsis floridana	Hillsborough	Ruskin			10/31/1980
5	plants presen t 2000- 2004	Chrysopsis floridana	Hillsborough	Ruskin			10/31/1980
6	site cleared-plants not found	Chrysopsis floridana	Hillsborough	Ruskin	Sun City Park	1976	10/5/1989
9	site intact; plants not surveyed due to lack of access	Chrysopsis floridana	Hillsborough	Riverview	Golden Aster Scrub Nature Preserve: ELAPP		6/19/1905
10	site cleared-plants not found	Chrysopsis floridana	Hillsborough	Riverview	Private	1988	1988-10
11	site cleared-plants not found	Chrysopsis floridana	Hardee	Sweetwater	Private		11/8/1987
12	site cleared-plants not found	Chrysopsis floridana	Hardee	Crewsville SW	Private		11/22/1987
13	plants present 2000- 2004	Chrysopsis floridana	Hardee	Sweetwater	Private		11/22/1987

Chrysopsis floridana - updated element occurrence records - 2004

EO #	Status	Scientific name	county	quad name	Managed area	first observe	last observed
14	plants present 2000- 2004	Chrysopsis floridana	Hillsborough	Riverview	Hillsborough Parks, Recreation and Conservation managing site.	1/12/1989	1/12/1989
16	plants present 2000- 2004	Chrysopsis floridana	Manatee	Verna	Lake Manatee Lower Watershed, Lake Manatee State Park	1988	1989
17	site not visited 2000 - 2004	Chrysopsis floridana	Hillsborough	Lithia	Alderman's Ford Preserve, Alafia River Corridor: ELAPP		1982
18	site intact; plants not surveyed due to lack of access	Chrysopsis floridana	Hillsborough	Riverview	Balm-Boyette Scrub: ELAPP	1990	
19	site intact; plants not surveyed due to lack of access	Chrysopsis floridana	Hillsborough	Lithia	Balm-Boyette Scrub: ELAPP	8/8/1990	
20	site intact; plants not surveyed due to lack of access	Chrysopsis floridana	Hillsborough	Lithia	Balm-Boyette Scrub: ELAPP	8/8/1990	
22	plants present 2000- 2004	Chrysopsis floridana	Sarasota	Englewood	Englewood Reverse Osmosis Plant	2000-05	2000-05
24	plants present 2000- 2004	Chrysopsis floridana	Hillsborough	Riverview	Department of Transportation	1/3/1997	
25	site intact; plants not found	Chrysopsis floridana	Hillsborough	Riverview	Department of Transportation	3/3/1994	3/9/2000
NEW SITES		New sites to Purchase					
26	plants present 2000- 2004	Chrysopsis floridana	Hillsborough	Riverview	Bell Creek Scrub Nature Preserve: ELAPP	new 2004	
27	plants present 2000- 2004	Chrysopsis floridana	Manatee	Ft. Lonesome	Moody Branch Mitigation Park- FWC	new 2004	
28	plants present 2000- 2004	Chrysopsis floridana	Hillsborough	Wimauma	Bulfrog Creek Scrub, ELAPP/FWC	new 2004	

Chrysopsis floridana - updated element occurrence records - 2004

EO #	2004 Observ	# plants	NOTES Populations	Notes on site	Other plants on site
1	8/29/2004	0	No plants seen	Improved pasture on west side of road; native oak scrub on east which was observed from dirt road on south side	
2	00/00/2004	35	35 + plants, reproductive seen in 2004; Sheryl Bowm	Sheryl Bowman, Hillsborough Parks reports 1000+ plants on the all of Balm-Boyette Scrub.	Mature sand pine scrub, Pinus clausa, Pityopsis graminifolia, Ceratiola ericoides
3	8/29/2004		One of four populations known to be intact on ELAPP- Balm-Boyettee Scrub	Surveys scheduled for near future	White sand scrub; community intact.
4	8/28/2004		Private site, gate locked - no access	Appears from 1999 aerial that there is no natural community remaining on site	
5	8/28/2004	0	15 + plants, reproductive	plants gone at original point-mowed, but found in remaining scrub to north. Site recently burned; flags on site may indicate iminent development.	Cladonia leporina, Lechea minor, Coreposis leavenworthii
6	8/28/2004	0	Plants gone, mowed		
9	8/28/2004			Surveys scheduled for Dec 2004, GPS Populations. Per Sheryl Bowman	
10	8/28/2004	0	No plants. Pasture, bahiagrass, no open sandy areas, and mowed.		pasture grasses
11	8/30/2004	0	No plants, Private site		cultivated in annual herbs- "coleas"
12	8/30/2004	0	No plants, Private site		citrus grove
13	8/30/2004	100	Intact site, 25+ plants reproducing; 50-100 plants south side Sweetwater Rd	where not mowing, grasses competing with plants	Old oak scrub, but open sun and bare ground along edge of road,on both sides of the road, scrub oaks, Cladonia leporina, C. evansii,

Chrysopsis floridana - updated element occurrence records - 2004

EO #	2004 Observ	# plants	NOTES Populations	Notes on site	Other plants on site
14	12/1/2004	100	50-100 plants on south side of road; fewer than 50 plants on north side	in narrow strip of intact vegetation north of road	grasses, herbs, forbs on powerline; native oak, palmetto on roadside; not mowing; grasses encroaching
16	8/30/2004	100	100+ plants along sand road to Lake, in open areas of mature sand pine scrub		Scrub oaks, Saw palmetto, Pityopsis graminifolia, C.leporina, C evansii
17	8/30/2004		uncertain whether plants remain. Spoke with Sheryl Bowman. Plants transplanted or seeded into an area by the shop. They were being mowed and may no longer exist.	Alderman's Ford Park belongs to Hillsborough County	
18	9/1/2004		One of four populations known to be intact on ELAPP- Balm-Boyettee Scrub	Surveys scheduled for near future	Mature scrub -overgrown
19	9/1/2004		One of four populations known to be intact on ELAPP- Balm-Boyettee Scrub	Surveys scheduled for near future	Mature scrub - overgrown
20	9/1/2004		One of four populations known to be intact on ELAPP- Balm-Boyettee Scrub	Surveys scheduled for near future	Mature scrub - overgrown
22			did not survey		
24	8/28/2004	75	50+, 0, 25+ plants on 3 roadsides on cloverleaf		oaks, solidago, galactia volubilis, Pityopsis graminifolia.Site on CR 672 best condition, high, dry, one site gone - mowed, other intact up high on bank.
25	8/28/2004	0	plants gone, overgrown, no bare ground	Gibsonton off Ramp from I-75	Dense saw palmettos, oaks, bahiagrass, no open ground
NEW:					
26	8/28/2004	300	Over 300 plants, reproducing; in two clusters: one of 200+ plants in preserve and one of 100+ plants in vacant lot south of preserve entrance	in preserve: along north and south edges of abandoned road in mature sand pine scrub with abundant lichens	
27	5/27/2004	26	20+ plants	plants encountered in course of other work - need survey specifically for species	
28	8/29/2004	36	many dozens of plants	Scrub	

Chrysopsis floridana - updated element occurrence records - 2004

EO #	Updated Directions	Recommendations	2004 source	latitude	longitude
1	8 mi. south of Riverview on US 301, turn east on Bill Tucker Road, the south on West Lake Drive, turn east on private road- Turfgrass America-sod farm; site is on north side.	Get landowners permission and survey site.	Anne C. Cox, PhD, Ecologist, ecolo-G Inc. 431 Jupiter Lakes Blvd. # 2104A, Jupiter FL. 33458 (561) 744-9531, annecox@bellsouth.net	274440N	0821926W
2		Manage for open space; burn if possible.	Steve Dickman and Sheryl Bowman, Hillsborough County Parks, Recreation and Conservation Department,10940 McMullen Road, Riverview, FL 33569-6225; (813) 672-7876 (dickmans@hillsboroughcounty.org); Daphne Lambright, Biotechnical Support Services, 19204 Autumn Woods Ave.Tampa, FL 33647, (813)972-3531.	274944N	0821652W
3		Manage for open space; burn if possible.	Steve Dickman and Sheryl Bowman, Hillsborough County Parks; Daphne Lambright, Biotechnical Support Services, Tampa, FL	274712N	0821438W
4		delete from database	Anne C. Cox, PhD, Ecologist, ecolo-G Inc. Jupiter FL.	274051N	0822638W
5	From US 41 about 1 mile south of Little Manatee River, turn east onto Stevens Road and continue into Riverbend park development. Natural scrub is on north as enter subdivision.	This would be good purchase. May be owned by WMD or other agency, Orange flagging on site, no signs - to keep off.	Anne C. Cox, PhD, Ecologist, ecolo-G Inc. Jupiter FL.	274029N	0822632W
6		delete from database	Anne C. Cox, PhD, Ecologist, ecolo-G Inc. Jupiter FL.	274140N	0822739W
9		Remain in contact with Hillsborough County and get data after Dec 2004 site review.	Steve Dickman and Sheryl Bowman, Hillsborough County Parks; Daphne Lambright, Biotechnical Support Services, Tampa, FL	274750N	0822137W
10	Plants in pasture adjacent to residential farmhouse	delete from database	Anne C. Cox, PhD, Ecologist, ecolo-G Inc. Jupiter FL.	274914N	0821803W
11		delete from database	Anne C. Cox, PhD, Ecologist, ecolo-G Inc. Jupiter FL.	272456N	0813813W
12		delete from database	Anne C. Cox, PhD, Ecologist, ecolo-G Inc. Jupiter FL.	272054N	0813824W
13	C634 east of Sweetwater, just before Harn Rd	Contact landowner, nice native area in midst of farms, orange groves	Anne C. Cox, PhD, Ecologist, ecolo-G Inc. Jupiter FL.	272451N	0814115W

Chrysopsis floridana - updated element occurrence records - 2004

EO #	Updated Directions	Recommendations	2004 source	latitude	longitude
14	on Fish Hawk Blvd, 0.5 mi east of Bell Shoals, north side road.		Anne C. Cox, PhD, Ecologist, ecolo-G Inc. Jupiter FL.	275117N	0821523W
16		Establish good rapport with Lake Manatee SP.	Anne C. Cox, PhD, Ecologist, ecolo-G Inc. Jupiter FL.	272846N	0822013W
17		Site needs to be resurveyed the length of Fish Hawk Road and Chrysopsis floridana populations GPS'd	Steve Dickman and Sheryl Bowman, Hillsborough County Parks; Daphne Lambright, Biotechnical Support Services, Tampa, FL	275155N	0820845W
18		Site needs fire. Remain in contact with Hillsborough County	Steve Dickman and Sheryl Bowman, Hillsborough County Parks; Daphne Lambright, Biotechnical Support Services, Tampa, FL	274652N	0821649W
19		Site needs fire. Remain in contact with Hillsborough County	Steve Dickman and Sheryl Bowman, Hillsborough County Parks; Daphne Lambright, Biotechnical Support Services, Tampa, FL	274643N	0821441W
20		Site needs fire. Remain in contact with Hillsborough County	Steve Dickman and Sheryl Bowman, Hillsborough County Parks; Daphne Lambright, Biotechnical Support Services, Tampa, FL	274705N	0821329W
22		Englewood Reverse Osmosis Plant		265717N	0822053W
24		Remain in contact with DOT. Suggest not mow higher areas, but keep free of exotic grasses, esp bahiagrass	Anne C. Cox, PhD, Ecologist, ecolo-G Inc. Jupiter FL.	274730N	0822128W
25		Check one more time and if no longer maintained, delete from database	Anne C. Cox, PhD, Ecologist, ecolo-G Inc. Jupiter FL.	275057N	0822047W
NEW:					
26	From I-75 S, take Gibsonton Exit, go East 2.8 miles, turn South onto McMullen Rd, go 1 mile to Hillsborough County Parks and Recreation Department, Resource Management office	Survey site thoroughly and obtain counts of plants	Anne C. Cox, PhD, Ecologist, ecolo-G Inc. Jupiter FL.	27.50169N	0821738.3W
27	park is just south of the Hillsborough county line in Manatee County.	Survey site thoroughly and obtain counts of plants	Mr. Shane Belson, Biological Scientist IV, Florida Fish and Wildlife Conservation Commission, Division of Habitat and Species Conservation,1601 Scotty's Road, Kissimmee, Florida 34744, PH: 407/846-5300 X1003, SC: 327-5300, FX: 407/846-5310;		
28	South Hillsborough Co, between I75 and US Hwy 301	Survey site thoroughly and obtain counts of plants	Mr. Shane Belson, Biological Scientist IV, Florida Fish and Wildlife Conservation Commission		

Chrysopsis floridana - updated element occurrence records - 2004

EO #	TRS	directions
1	031S020E-32	8 mi. south of Riverview on US 301, turn east on Bill Tucker Road.
2	030S020E-35	3.5 mi. southeast of Riverview at Shadow Run development ca. 0.5 mi. south of west end of Lake [lake not apparent on topo map].
3	031S021E-18	From Tampa 301 South to CR 672 East, go west to Balm Boyette Road, north on Balm Boyette, approximately 1.3 mi. along east railroad right-of-way along tracks parallel to Boyette Road where tracks and road separate, 2.4 mi. SSW of Boyette.
4	032S019E-19	Ca. 100 m north of Stephens Road, 3 mi. east of Sun City and US 41; north of Stephens Road ca. 2 mi. east of Sun City; 100 m east ofcorner of Lloyd Drive and Toby Street. South of Little Manatee River. See quad or county map.
5	032S019E-30	West side of Francis Circle, 200 feet south of Stephens Road, 2.4 mi. east of Sun City and US 41. Ca. 1.7 mi. north of Hillsborough-Manatee county line. See quad or county map.
6	032S018E-13	SUN CITY HERITAGE PARK (FORMERLY LITTLE MANATEE RIVER PARK) [CA. 1.0 MI S OF RIVER ON US 41] 1989-10-06. "REST AREA ON U.S. 41, 0.7 MI S OF [LITTLE] MANATEE [RIVER]" (1986-09-30).
9	031S019E-12	From I-75 take Big Bend Road (SR 672, Apollo Beach exit) to west. Site is 0.5 miles north of Big Bend Road and 0.5 miles west of I-75 (see map) near borrow pit; edge of sand pine forest.
10	031S020E-03	From Balm-Riverview Road take Rhodine Road 0.25 miles west, along south side of road, see map indicating site location.
11	035S027E-20	RT 66 TO CREWSVILLE RD, SE TO JOHNSON RD, SE (?) 1.3 MI; T35S R27E SEC 20.
12	036S027E-17	0.5 MI S (OF 665?) ON PRICE RD NEAR SWEETWATER T36S R26E SEC 17.
13	035S026E-23	C-634 NEAR SWEETWATER, 50 YD S OF RD. T35 R26E SEC 23.

Chrysopsis floridana - updated element occurrence records - 2004

EO #	TRS	directions
14	030S020E-02	ON POWERLINE EASEMENT CA. 1000 M E OF BELL SHOALS/BOYETTE RD INTERSECTION.
16	034S020E-31	IN LAKE MANATEE SRA.
17	030S022E-18	ALDERMAN'S FORD CO PARK. SR 39 AT ALAFIA RIVER.
18	031S020E-14	FROM JUNCTION WITH I-75, GO [4.5 MI.] E ON BIG BEND RD. [SR 672], THEN S ON BALM-RIVERVIEW [CA. 1.5 MI.]. SAND PINE FOREST IS W OF ROAD [SEE ATTACHED MAP].
19	031S021E-18	APPROX. 0.3 MI. SE OF BOYETTE ROAD ALONG SAND ROAD (SEE ATTACHED MAP).
20	031S021E-17	APPROX. 0.1 MI. W OF WHERE PRINGLE BRANCH GOES INTO STALLION HAMMOCK. MAP ATTACHED.
22	040S020E-31	ENGLEWOOD REVERSE OSMOSIS PLANT: 201 SELMA AVENUE, ENGLEWOOD, FL 34223.
24	031S019E-01	2000-03-03: I-75 EXIT FOR CR 672 (BIG BEND RD), SE OF TAMPA; PLANTS IN SW CORNER OF THE EXIT, ON THE SOUTH SIDE OF THE SOUTHBOUND ON-RAMP (SITE 1-CF) AND ALSO AT THE POINT WHERE THE CLOVERLEAF MEETS CR 672 FOR EASTBOUND TRAFFIC (SITE 2-CF) (F00MOR03FLUS).
25	030S020E-03	2000-03-09: GIBSONTON DRIVE EXTI (OLD #48) ON I-75, SE OF TAMPA, FIRST EXIT SOUTH OF THE ALAFIA RIVER; PLANTS IN SE CORNER OF EXIT, SOUTH OF THE NORTHBOUND OFF-RAMP AND JUST NORTH OF THE "GIBSONTON DRIVE" SIGN (F00MOR02FLUS).
NEW:		
26		
27	033S021E-06 , SE1/4	
28	033S021E-06 ?	

Chrysopsis floridana - updated element occurrence records - 2004

EO #	element occurrence data	habitat description
1	About 75 plants observed--flowering.	Disturbed scrub.
2	1989-12-04: D. White observed plants in flower and fruit during short visit. 1979-10-26: Flowering; plants evenly distributed throughout 400 X 350 m area, 50-60% in flower, 100% with closed flower buds. 1976-12-11: Abundant; flowering/fruiting(?). 1976-09-30: Flowers buds.	Sand pine scrub, mostly heavily disturbed and persists as remnant areas within development.
3	1979-10-26: Less than 200 individuals in population; 10% had open flowers, 50% seedlings and remaining 40% had flower buds read to open at site. 1988-05-28: 90 plants, no seedlings or reproduction evident. 1990-09-05: 100-200 individuals on less than 0.1 acres.	Disturbed white sand scrub in open sun dominated by oaks and Pinus clausa (sand pine), associated species list included. On old railroad grade.
4	Population extensive with average density of 25 plants/5 sq. m. 80% flowering and apparently extensive over the entire area.	Ecotone between scrub and a Gordonia swamp and in open areas in scrub.
5	31 plants observed, with flower beds.	Young sand pine scrub - Pinus clausa - Quercus geminata association.
6	1989-10-05: SMALL COLONY, 25-30 INDIVIDUAL PLANTS IN AREA 5' X 15'. 75% IN BLOOM, SPIKES 12-18" WITH BUDS IN USUAL STAGES OF DEVELOPMENT. 1976-09-30: FLOWER BUDS; A FEW PLANTS SCATTERED UNDER TREES & IN OPEN SAND. 1961-11-11: COMMON. SOUGHT IN 1987-1988, BUT NOT FOUND.	SAND PINE-OAK/SANDHILL ASSN.
9	Several hundred.	Edge of sand pine forest.
10	Several dozen plants.	Fence line at the edge of sand pine scrub.
11	IN FLOWER WITH POLYGONELLA ROBUSTA AND PITYOPSIS GRAMINIFOLIA.	SCRUB OAK CREST.
12	FLOWERING	
13	USF Herbarium specimen # 238703 dated 11/18/1987	OAK SCRUB WITH CATTLE.

Chrysopsis floridana - updated element occurrence records - 2004

EO #	element occurrence data	habitat description
14	1989: Pinus clausa / Quercus geminata scrub; about 50 plants in population; fruiting (S89HANSFFLUS).	SCRUB
16		
17		
18	100-200 PLANTS OBSERVED GROWING ON N & S EDGES OF SAND PINE FOREST AND ALONG BOUNDARY BETWEEN SCRUBBY FLATWOODS AND FIELD. GROWING IN OPEN AREAS IN WHITE SAND WITH NO COMPETITION.	OPEN AREAS IN SCRUBBY FLATWOODS, SURROUNDED BY MYRTLE OAK, LYONIA FERRUGINEA, SAND PINE AND SERENOA REPENS.
19	DENTON REPORTS 100-200 INDIVIDUALS IN LESS THAN 0.1 ACRE AREA.	SITE IN DISTURBED SAND ADJACENT TO SAND PINE SCRUB. IN OPEN SAND WITH NO COMPETITION. NO PLANTS ARE IN NATURAL SCRUB. EVIDENCE OF DISTURBED SAND; OLD RR GRADE AND SAND ROAD. PLANTS IN LEAF.
20	DENTON REPORTS 50-100 INDIVIDUALS IN PATCHES SCATTERED OVER 1-2 ACRE AREA.	SAND PINE SCRUB: PINUS CLAUSA, QUERCUS MYRTIFOLIA, Q. CHAPMANII, Q. GEMINATA, Q. INOPINA, LYONIA FERRUGINEA, POLYGONELLA POLYGAMA. FAIRLY OPEN. CHRYSOPSIS IS IN OPENINGS.
22	2000-05: ABOUT 200 PLANTS IN FAIR TO POOR CONDITION (PNDCHR01FLUS).	2000-05: MATURE SAND PINE FOREST WITH ROSEMARY UNDERSTORY (PNDCHR01FLUS).
24	2000-03-03: 73 PLANTS AT THE CLOVERLEAF POINT (SITE 2-CF), 142 PLANTS AT THE ON-RAMP POINT (1-CF), WITH A DECLINE IN NUMBERS OF APPROX 400 PLANTS SINCE 1997; DECLINE IS ATTRIBUTED TO DISPLACEMENT BY SERENOA REPENS WHICH INVADED THE AREA AFTER CLEARING FOR A LIGHTING POLE IN 1996; NO MOWING HAS OCCURRED	2000-03-03: DOT RIGHT-OF-WAY WITH SCRUB VEGETATION OF QUERCUS GEMINATA, Q. MYRTIFOLIA, OPUNTIA HUMIFUSA, HYPERICUM SPP., SERENOA REPENS, PITYOPSIS SP. (F00MOR03FLUS).
25	2000-03-09: 2 PLANTS (F00MOR02FLUS). 1997-01-03: PLANTS EXTIRPATED (F00MOR02FLUS). 1995-11-16: PLANTS PRESENT (F00MOR02FLUS). 1994-03-03: PLANTS OBSERVED (F00MOR02FLUS).	2000-03-09: SAND PINE SCRUB WITH QUERCUS MYRTIFOLIA, Q.INOPINA, Q. GEMINATA, XIMENIA AMERICANA, PINUS CLAUSA, PITYOPSIS SP., LECHEA SP., HYPERICUM SP., OPUNTIA HUMIFUSA, ARISTIDA SPP. (F00MOR02FLUS).
NEW:		
26		
27		
28		

Chrysopsis floridana - updated element occurrence records - 2004

EO #	best source
1	Specimen (temporary placeholder citation)
2	U.S. FISH & WILDLIFE SERVICE, 1980. STATUS REPORT ON CANDIDATE SPECIES CHRYSOPSIS FLORIDANA. REGION IV, OFFICE OF ENDANGERED SPECIES, ATLANTA, GA.
3	OSARIO, RUFINO. 1988. FIELD REPORT FORM FOR CHRYSOPSIS FLORIDANA, MAY 29, 1988.
4	Specimen (temporary placeholder citation)
5	Specimen (temporary placeholder citation)
6	HEATH, ROBERT. 1989. LETTER TO FNAI ON OCT 6, 1989.
9	HEATH, ROBERT. 1988. LETTER FROM ROBERT HEATH TO KATY NESMITH ON 10/27/88 ABOUT CHRYSOPSIS FLORIDANA.
10	HEATH, ROBERT. 1988. LETTER FROM ROBERT HEATH TO KATY NESMITH ON 10/27/88 ABOUT CHRYSOPSIS FLORIDANA.
11	Specimen (temporary placeholder citation)
12	Specimen (temporary placeholder citation)
13	Specimen (temporary placeholder citation)

Chrysopsis floridana - updated element occurrence records - 2004

EO #	best source
14	Specimen (temporary placeholder citation)
16	P89DEL01FLUS - Created by EO conversion
17	HEATH, ROB. 1989. LETTER TO FNAI ON NOVEMBER 6, 1989.
18	DENTON, SHIRLEY R. 1990. FIELD REPORT FORM FOR CHRYSOPSIS FLORIDANA FROM HILLSBOROUGH COUNTY, FL, ON 8 & 9 AUGUST AND 5 SEPT. 1990.
19	DENTON, SHIRLEY R. 1990. FNAI FIELD REPORT FORM ON CHRYSOPSIS FLORIDANA IN HILLSBOROUGH COUNTY, FL.
20	DENTON, SHIRLEY R. 1990. FNAI FIELD REPORT FORM ON CHRYSOPSIS FLORIDANA IN HILLSBOROUGH COUNTY, FL.
22	CHRISTMAN, STEVEN P. (STEVE) (DR.). ROUTE 3, BOX 2831, QUINCY, FL 32351. 850/875-2302.
24	MORIATY, WILLIAM. 3 MARCH 2000. FIELD FORMS FOR I-75 CHRYSOPSIS FLORIDANA SITES.
25	MORIATY, WILLIAM. 9 MARCH 2000. FIELD FORMS FOR I-75 GIBSONTON DRIVE EXIT CHRYSOPSIS FLORIDANA SITES.
NEW:	
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Plant Pests To Get A Taste Of Their Own Medicine

PARASITIC FLIES SENT TO DESTROY WEEVILS

By ANDRIY R. PAZUNIAK
The Tampa Tribune

ODESSA — In the moist, quiet air of a Hillsborough County forest Friday, a small army of tiny warriors flew from their base and set out to save some of Florida's most cherished plants.

Their mission: penetrate deep into enemy territory and eat their way out.



UF researchers released flies in Odessa's Lake Rogers Park.

A team of University of Florida researchers unleashed 56 parasitic flies into Lake Rogers Park on Friday to ward off the infestation of the Mexican bromeliad weevil, a type of beetle that has been

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Weevil problem began in May.

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made its debut at Lake Rogers in May. Barely a month later, numerous patches of tree-hanging bromeliads have dried up and died throughout the park as a result of the weevil infestation.

In Myakka River State Park in Sarasota, approximately 80 percent of the bromeliad population has been wiped out since the weevils first appeared, said Teresa Cooper, a UF graduate student working with Cave and Frank on the project.

The team hopes to unleash more flies in other weevil-infested trouble spots in coming weeks, including Broward, Palm Beach and Collier counties. The team must wait for permits to be approved.

The introduction of an insect into the ecological system does not concern researchers, Cave said, because the flies feast solely on the beetle's larvae.

"Our research indicates it will not attack any other insects, any other animals, and will not attack plants," Cave said.

Cave discovered the fly species in the mountain forests of Honduras in 1993 and named it after his colleague, Frank. The official name of the fly is "Lixadmontia Franki."

"He didn't think it'd be a good idea to name it after his wife," Frank said.

Cave and Frank brought the species to Florida and worked to create new generations at the UF Biological Control Research and Containment Laboratory in Fort Pierce.

Progress To Be Checked In 6 Weeks

Friday's release was the first of an organism reared at the facility, which opened in 2004.

Though elimination of the weevil would be ideal, Frank said the team is trying to remain realistic.

"We just hope to reduce the population so it's no longer a significant ecological pest," Frank said.

Cooper will return to the Lake Rogers site in six weeks to check on the flies' progress.

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PARASITIC FLIES

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wreaking havoc on the native bromeliad population of southern Florida since 1989.

Weevil larvae bury themselves in the bromeliads and eat the plants to death before they have a chance to flower and release their seeds, putting future plant generations at risk.

Researchers are hoping the flies will do the same to the weevils.

The plan is for the fly larvae to lodge in the weevil larvae and eat them alive, killing the weevils before they can kill the bromeliads.

"It's like that scene in the first 'Alien' movie," Ronald Cave, a UF entomologist who led the research effort with his colleague Howard Frank, said after releasing the flies into the wild.

Results May Be Seen In Months

Cave said he hopes to see tangible results within a couple of months but conceded his team would be "real lucky" if the flies act that quickly.

"They won't last much longer," said Frank, staring up at a tree with dead bromeliads hanging from it.

First spotted in Fort Lauderdale in 1989, the weevil

FINAL REPORT

for

Pinellas County Environmental Fund Grant No. 2002-0005-011

Florida scrub jay (*Aphelocoma coerulescens*) Habitat Restoration
in
Hillsborough County, Florida

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Introduction

Florida scrub is an ecosystem limited to the well-drained sandy soils formed by ancient dunes in what is now central Florida. One unique variant is oak scrub, a habitat dominated by several species of stunted, low-growing oaks. This extremely rare ecosystem has evolved into one of the most distinctive in North America, supporting numerous plant and animal species found nowhere else (Fitzpatrick, et. al. 1991). The well-drained sandy soils supporting Florida scrub also are highly prized for human needs; as *Homo* sapiens expanded throughout central Florida during the latter half of the Twentieth Century most scrub habitat was cleared to make way for residential and commercial development, recreation, and agriculture. It has been estimated no more than 25% of the original Florida scrub remains, with much of this occurring as small isolated fragments. Because of limited distribution and extent of habitat loss, Florida scrub is considered globally imperiled and vulnerable to extinction (Florida Natural Areas Inventory [FNAI] 1990) and protection and management of remaining scrub has become a high priority for local, state, and federal agencies as well as private organizations dedicated to habitat preservation.

Like most upland habitats in Florida, scrub is dependent on periodic fires to maintain its unique structure and species composition. Without fire, oak scrub changes from the characteristic low growing stunted vegetation to one in which oaks grow to heights in excess of three meters, other tall-growing trees begin to proliferate, and much of the smaller ground-level vegetation that provides fuel for periodic fires dies away for lack of sunlight. This process of habitat deterioration eventually becomes self-perpetuating; the canopy of trees increases in density, resulting in further decreases of the ground level vegetation that promotes fires, the decline continues and ultimately the scrub becomes fire-resistant (Myers 1990). Interruption of this downward spiral requires substantial alteration of the habitat, such as removing canopy-forming trees by mechanical means like roller chopping or use of a hydro-axe. These drastic forms of restoration are time-consuming, extremely expensive, and necessary. Long-term exclusion of fire greatly diminishes the conservation value of scrub on protected lands; as oak scrub habitat becomes overgrown, it is rendered hostile for many of its unique endemic species, further compounding for these organisms the severity of imperilment resulting from extensive habitat loss (FNAI 1990, Fitzpatrick et al. 1991, Myers 1990).

One such imperiled species is the endemic Florida scrub jay (*Aphelocoma coerulescens*) that occurs only in the fire-maintained oak-dominated scrubs of peninsular Florida (Fitzpatrick, et. al. 1991). Loss of habitat from conversion of oak scrub for human use and exclusion of fire from many surviving fragments has resulted in extirpation of this rare, unique bird from large portions of its historic range, and it is now considered vulnerable to extinction (Hipes, et al. 2000). If this species is to persist, long-term survival of Florida scrub jay populations on protected lands is of exceptional importance. Efforts to maintain viable populations include burning suitable habitat at the appropriate intervals of

10 – 20 years (Fitzpatrick, et. al. 1991), and restoration of overgrown, fire-suppressed scrub in the hope that Florida scrub jays will someday return to these areas.

In May 2003, the Pinellas County Environmental Fund (PCEF), with the support of the National Fish and Wildlife Federation (NFWF), awarded Grant No. 2002-0005-011 to the Hillsborough County Parks, Recreation, and Conservation Services Department in order to restore fire-suppressed oak scrub habitat on lands acquired for preservation through the Hillsborough County Environmental Lands Acquisition and Protection Program (ELAPP). The overall goal of the project was restoration of oak scrub to benefit not only Florida scrub jays, but also endangered plants such as the Florida golden aster (*Chrysopsis floridana*). Three preserves at the northern end of the Southern Gulf Coast sub-region Florida scrub jay population (U.S. Fish and Wildlife Service [USFWS] 1999, see Attachment 1) were selected for the project, the 4,933-acre Balm Boyette Scrub Preserve (BBS), the 1,236-acre Golden Aster Scrub Preserve (GAS), and the 7,826-acre Little Manatee River Corridor Preserve. Scrub jays previously were documented on all three (Gordon 2001, Attachment 2) and each preserve is within the 5-mile dispersal range (Fitzpatrick et al. 1991) of numerous scrub jay families (Attachment 2). Within the three preserves, five restoration sites of fire-suppressed scrub were selected and are identified here as Balm Boyette Scrub (BBS) East and West, Golden Aster Scrub (GAS), Little Manatee River (LMR), and Upper Little Manatee River (ULMR). A brief description of the five restoration sites follows.

Balm Boyette Scrub (BBS) East and West

BBS East and West are part of the Balm Boyette Scrub Preserve (Fig. 1a). The preserve is mostly surrounded by agricultural lands, the exception being a low-density residential area to the southeast of BBS East. The BBS East site is 30 acres in Township (T) 31, Range (R) 21, and Section (S) 18. It is surrounded by pine flatwoods except for the southeast corner, which is adjacent to a fallow agricultural field. The BBS West site consists of 118 acres in T31, R20, and S13. It is bordered to the east by Bell Creek and associated wetlands, to the west and north by Boggy Creek and its headwaters, and privately owned agricultural lands to the south. Underlying soils of BBS East and West consist of droughty, well-drained Archbold fine sand at higher elevations surrounded by Pomello fine sand at lower elevations. At BBS East, the most abundant underlying soil in the adjacent pine flatwoods is Myakka fine sand. At BBS West, an intervening narrow strip of poorly drained Immokalee find sand separates the scrub soils from the nearby wetlands (Soil Conservation Service [SCS] 1989, see Figure 2a).

Golden Aster Scrub (GAS)

The GAS restoration site is 77 acres located in T31, R19, and Ss 1 & 12 and is part of the Golden Aster Scrub Preserve (Figure 1b). This preserve is adjacent to high-density residential areas on three sides. In addition, Interstate 75 parallels the eastern border of the site, separating the

preserve from residential areas in that direction. Similar to the BBS sites, underlying soils in the highest portions of GAS consist of Archbold fine sands, Pomello fine sand at lower elevations and Myakka fine sands occur throughout the adjacent mesic pine flatwoods (SCS 1989). At this site the scrub soils are arranged as a long, low-lying ridge with an approximately NNE – SSW orientation (Figure 2b).

Little Manatee River (LMR) and Upper Little Manatee River (ULMR)

The LMR site is part of the Little Manatee River Corridor Preserve (Figure 1c) and consists of 74 acres located in T32, R19, S24 and T32, R20, S19. Adjacent to this portion of the preserve are a high-density residential development to the north, U.S. Highway 301 and low-density residential areas to the east, the Little Manatee River State Recreation Area to the south, and Cypress Creek and a high-density residential development lie to the west. A substantial portion of this site is covered by Myakka fine sand, a soil characteristic of mesic pine flatwoods, and the western area of this site contains Orsino fine sand, which generally supports xeric plant communities such as sandhill or scrubby flatwoods (SCS [1989], Figure 2c).

The ULMR site is one of the highest points along the northern boundary of the Little Manatee River Corridor Preserve and consists of 99 acres located in T32, R20, S14, (Figure 1d). Off-site active agricultural fields surround the preserve, and fallow fields within the preserve are adjacent to the eastern, southern, and western edges of the ULMR study site. On this site, Archbold fine sand and Candler fine sand, a soil generally associated with long leaf pine dominated sandhill communities, occur in roughly equal proportions. Those portions of the fallow fields adjacent to the study site also are covered by these fine sands, and lower elevations of the site are covered with Myakka fine sand (SCS [1989], Figure 2d).

Fire had been excluded from the scrub habitats of each preserve for enough time that all had become fire resistant and unsuitable for Florida scrub jays. The sites had become overgrown with dense stands of mature sand pines (*Pinus clausa*), sand live oaks (*Quercus geminata*) over three meters in height, and ground-level vegetation was too sparse to carry fire (Appendix 1). The specific objectives of this project were to:

1. Remove canopy-forming trees to make the areas suitable for ground level vegetation, including rare plants.
2. Reduce the height of oaks to a level suitable for Florida scrub jays.
3. Establish patches of bare ground throughout each scrub.

These objectives were chosen with the goal of restoring the oak scrubs to conditions considered optimal for scrub jays by Fitzpatrick, et al. (1991). These are, a well-developed shrub layer 1 – 2 meters in height dominated by scrub oaks that cover at least 30% of the substrate; canopy cover of less than 20%; and 25% of the substrate exposed (i.e. bare ground) or partially exposed.

Restoration consisted of mechanically reducing the density of sand pines and lowering the overall height of sand live oaks with a roller chopper and hydro-axe. Most sites were then subdivided with fire lanes into smaller areas (Figs. 3a – 3d) prior to decreasing fuel loads by the application of prescribed burns. Table 1 summarizes the acreage of each site, dates of roller chopping, and linear feet of fire lanes cut. Table 2 summarizes the dates of prescribed burns in the subdivided areas. Not all areas on each preserve were burned. Because scrub jays had been documented on BBS and GAS in the recent past (Attachment 2), several of the roller-chopped areas were left unburned to provide food and shelter for colonizing scrub jays, per Fitzpatrick, et al. (1991).

To assess progress of the restoration, surveys to sample the habitat structure and species composition of the plant communities were done during the spring and summer of 2006. Additionally, surveys for Florida scrub jays that may have colonized the areas subsequent to the vegetation reduction and prescribed burns were attempted. This report summarizes the methods used and results of those surveys.

Methods

Habitat structure

Surveys took place from May - August 2006 and the method at each of the 19 subdivided areas was the same. Starting points for transects were placed at 50-meter intervals along fire lanes that border each area. From these, a subset of transects was chosen to ensure most portions of each area were sampled. With the aid of a compass, transects were walked beginning at the starting points and continuing across the area, ending at the fire lane on the opposite side (Figs. 4a – 4d). One-meter-square plots were placed at 25-meter intervals along each transect walked. Plots were not placed within 5 meters of any edge of an area to avoid possible edge effects. Within each meter-square six components of habitat structure relevant to the quality of Florida scrub jay habitat, or its management, were selected for sampling; the maximum heights of scrub oaks and other vegetation, and relative abundances of bare ground, litter, palmetto, and scrub oaks (all species combined).

The first two specific goals of this project were to make areas more suitable for scrub jays by lowering the height of scrub oaks and more suitable for ground level vegetation by removing canopy-forming trees. To assess whether these goals were achieved the heights of the tallest scrub oak and tallest plant rooted within each meter-square was measured and recorded in 0.25-meter increments. These data were summarized by calculating mean maximum scrub oak height and mean maximum vegetation height ($\pm$ one standard deviation [$\pm$one s.d.]), using the Excel spread sheet program (Microsoft 2002).

The third specific goal of this project was to establish throughout each restoration site patches of bare ground, which are defined as exposed, or partially exposed, sandy areas. Along with bare ground, two other components of habitat structure relate to quality of scrub jay habitat; litter, defined as dead vegetation lying on the ground; and cover of scrub oaks (considered collectively, this includes *Quercus chapmanii, Q. elliottii, Q. geminata, Q. inopina, Q. minima,* and *Q. myrtifolia*). The sixth component of habitat structure, palmetto (*Serenoa repens*), was considered because of its role carrying fire through scrub (Breininger and Schmalzer 1990), an important aspect in the management of this habitat. Percent cover of all structural components was visually estimated by standing over each meter-square plot and looking directly down (i.e. birds-eye view). Estimates were recorded in 5% increments.

Two aspects of relative abundance of bare ground, litter, scrub oaks, and palmetto were considered; how frequently each was encountered; and the estimated percent cover of each in the restoration sites. Frequency was estimated by calculating the percentage of plots in which each of the four components was observed. Percent cover was estimated by calculating the mean percent ($\pm$ one s.d.) cover of each component, across all plots.

Vegetation surveys

The species composition of scrub oaks at each area was investigated by recording the percent cover for each species of oak observed within the plots. Some species of scrub oak were rarely encountered (e.g. *Q. inopina*), however, and cover of all but *Q. geminata* was extremely sparse. Therefore, relative abundance of each species was estimated by only summarizing its frequency of occurrence. The overall species composition of the plant community at each restoration site was estimated by recording all plant species observed within each meter-square-plot, as well as those observed while walking transects.

Florida scrub jay surveys

Scrub jays were previously documented on or near the Balm Boyette Scrub Preserve, the Golden Aster Scrub Preserve, and the western portions (LMR) of the Little Manatee River Corridor (see Attachment 2). To determine if jays were still in the general vicinity surveys were conducted at these documented locations, in general accordance with the methodology recommended in Fitzpatrick, et al. (1991). Surveys took place between 0800 and 1200 hours in mid-March at GAS and BBS, and in mid-April at LMR. The loudspeaker used to broadcast recordings of scrub jay calls was sufficiently powerful for the sound to carry across the scrub and sampling stations were therefore limited to fire lanes bordering each scrub. Because jays seen at GAS and LMR were always observed stopping short of entering the restoration areas, and the only family group previously documented at BBS could not be relocated, it was decided that surveys using broadcast calls within restoration sites would be moot. In addition, because the height of most scrub oaks at the ULMR restoration site were substantially below the recommended minimum of 1 meter (Fitzpatrick et al. 1991), and scrub jays had not been previously documented on this site, surveys using broadcast call were not attempted here. During the course of sampling vegetation, however, field workers wore binoculars each day while walking transects and would periodically scan the restoration areas for scrub jays.

Results

Fieldwork for sampling habitat structure and the species composition of the plant community within each restoration area took place May – August 2006. Combined, 59 transects were walked and 488 meter-square plots sampled during these surveys (Table 3). Considering meter-square plots were 25 meters apart, roughly 12.2 km. (7.58 miles) of transect were walked through scrub.

Habitat structure

Use of the roller chopper and hydro-axe to lower the height of scrub oaks and other vegetation had dramatic results. Prior to treatment, at all sites both exceeded 3 meters in height. Following mechanical reduction, the mean maximum height neither of scrub oaks nor of vegetation exceeded 1.20 m (Figs. 5a – d, and Table 4). With the exception of a few scattered snags and several pine trees along some edges, roller chopping removed canopy-forming vegetation (i.e. over 3 m. in height) from each scrub (see Appendix 1).

All four structural variables occur throughout each of the five restoration sites (BBS East, BBS West, GAS, LMR, and ULMR). At each, litter ranks as both the most frequently encountered form of habitat structure and greatest in percent cover. Palmetto ranks as the least frequently encountered form of habitat structure at all sites except ULMR, and as the least in percent cover throughout (Figs. 6 & 7, Tables 5 & 6). When data for each of the 19 subdivided areas are analyzed separately, the same general pattern emerges. In all but one area litter is both the most frequently encountered and greatest in percent cover. In all but five areas palmetto is the least frequently encountered and least in percent cover (Figs. 8a - d, 9a - d; Tables 7 & 8).

Bare ground varied between sites in both frequency of occurrence and percent cover (Figs. 6 & 7). Analysis of data from all subdivided areas within a restoration site combined indicates that the goal of establishing patches of bare ground throughout each restoration site was achieved; each site contains at least 10 percent bare ground, the minimum amount necessary for scrub jays (Fitzpatrick, et. al. 1991). When subdivided areas within each restoration site are analyzed separately, results are the same for BBS East, GAS, LMR, and ULMR; all subdivided areas have at least 10% bare ground. At BBS West, however, this component of habitat structure is highly variable; four of the subdivided areas lack even the minimum amount of 10% bare ground, and the remaining two have substantially more than 25% bare ground (Figs. 8a - d, 9a - d; Tables 7 & 8).

Analysis of the combined data for all areas within each restoration site indicates that no restoration site has a cover of scrub oaks that meets or exceeds the recommended minimum of 30 percent and for this variable percent cover ranged from 10.94 to 24.41. As with the other components of habitat structure, some variability within each restoration site was evident. When each area is analyzed separately, however, all but one area remains below the minimum 30 percent

cover of scrub oaks, and four areas have less than half the recommended minimum (Figs. 8a - d, 9a - d; Tables 7 & 8).

Vegetation surveys

Species richness of scrub oaks varied by restoration site; the most rich were BBS and GAS, where all six species were found; five species were found in LMR and ULMR, with both lacking *Q. inopina*; and BBS East was the least rich, with only four species of scrub oak, lacking *Q. inopina* and *Q. myrtifolia*. The relative abundance of each scrub oak species varied both between sites (Fig. 10), and within each site (Figs. 11a - d).

During vegetation surveys, 172 plant species were found, including 21 endemic species, six listed as threatened or Endangered by the State of Florida and/or the United States Fish and Wildlife Service, and four that had not yet been documented in Hillsborough County (Tables 9 – 12). A complete list of plants observed at each preserve is presented in Appendix 2. To assist the ongoing Florida Natural Areas Inventory (FNAI) project documenting the statewide distribution of listed plant species, reports of each listed plant encountered during these surveys were forwarded to FNAI (see Appendix 3). For each of the four species not previously documented in Hillsborough County, a voucher specimen was deposited in the University of South Florida Herbarium in Tampa, Florida.

Florida scrub jay surveys

Surveys took place in mid-March at GAS and BBS, and in mid-April at LMR. Only four scrub jays were observed during these surveys, two at GAS, and two at LMR. Of these, three had been previously banded but banding data were available for only two (Table 13).

Discussion

The purpose of the project funded by PCEF Grant No. 2002 – 0005-011 was to begin restoration of fire-suppressed oak scrub habitat on three preserves in south-central Hillsborough County. Three specific goals were established at the outset. These were:

1. Removal of canopy-forming trees to make areas suitable for ground level vegetation including rare plants,
2. Reduction of the heights of oaks to a level suitable for Florida scrub jays,
3. Establish patches of bare ground throughout each scrub.

Trees were removed and the heights of scrub oaks lowered by use of a roller-chopper and hydro-axe. Following this mechanical treatments most areas were subjected to prescribed burns to reduce fuel loads and establish patches of bare ground throughout each scrub. Surveys were conducted on the restoration sites during May-August 2006 to determine whether the three specific goals had been met. During these surveys six components of habitat structure were measured; maximum heights of scrub oaks and of vegetation, and relative abundances of bare ground, litter, scrub oaks, and palmetto.

The two mechanical techniques removed nearly all canopy-forming tress. The mean maximum vegetation height in 14 of the subdivided areas was less than 1 meter, and less than 1.25 meters in the other five (Table 4, Figs. 5a - d). This lack of an extensive tree canopy has provided favorable conditions for ground-level vegetation and numerous herbaceous plant species were found at each restoration site, including several endemic to Florida and listed as either Threatened or Endangered (see Tables 9 - 11 and Appendix 2). By this measure, the first specific goal of the project has been achieved. Based on the plant species observed (Appendix 2) the plant communities on these restoration sites are similar to those reported for other roller chopped upland habitats (Greenberg et al. 1995).

Florida scrub jays prefer scrub oaks between 1 and 2 meters in height and generally avoid areas where the oaks are taller than 3 meters (Fitzpatrick et al. 1991). As can be seen in the photographs (Appendix 1), before mechanical treatment oaks exceeding heights thought to be tolerated by jays occurred throughout each restoration site. The roller-chopper and hydro-axe effectively reduced heights of scrub oaks; as with the height of all vegetation, the mean maximum heights of scrub oaks in 14 subdivided areas was less than 1 meter, and less than 1.25 meters in the other five.

These low heights may explain the observations that scrub jays were not observed to venture into the restoration areas and the overall lack of scrub jays seen during the surveys. Although in most areas scrub oaks presently are below the minimum heights suitable for jays, Schmalzer (2003) reported scrub oaks growing, on average, roughly 0.40 meters between 5 and 10 years post-burn on scrubs at the Merritt Island National Wildlife Refuge.

Based on this, it is anticipated that within three to six years scrub oaks will have grown to heights suitable for jays on each restoration site, meeting the second specific goal.

The prescribed burns set following mechanical treatments contributed to the establishment of patches of bare ground at each restoration site and all had at least 10% bare ground, the minimum considered necessary for scrub jays (Fitzpatrick et al. 1991). This structural component of the oak scrubs was highly variable within each restoration site, especially BBS West where four of the subdivided areas had less than 10% bare ground, and the other two substantially more than 25 percent. Although the specific goal of establishing bare ground throughout each restoration site has been achieved, maintaining this component at a level suitable for scrub jays presents a challenge for the management of these areas. Schmalzer (2003) reports that bare ground had been reduced to near zero 3 – 4 years post-burn on a Merritt Island study site. Burning the Hillsborough County restoration sites within the next three years, however, may result in the oaks being two small to produce a mast of acorns, an essential part of the scrub jay diet (Fitzpatrick et al. 1991).

Because of the importance of these species to Florida scrub jays, the percent cover of scrub oaks (all species combined) also was estimated at each restoration site. Presently, no site has at least 30% cover of scrub oaks. This, however, may be nothing more than a reflection of when the surveys were done relative to when the fuel reduction burns took place. No subdivided areas was burned more than 24 months prior to the vegetation surveys and Schmalzer (2003) reported scrub oaks not substantially increasing in percent cover until 2 to 3 years after a burn, after which several species spread substantially, with one (*Q. myrtifolia*) increasing by nearly 40% in a five-year period.

Regarding species composition of the scrub oaks on the Hillsborough County sites, the surveys documented variation both between sites and within each site (Figs. 10 and 11a-d). The most frequently encountered at BBS East, BBS West, and GAS was *Q. geminata*, at LMR it was *Q. myrtifolia*, and at ULMR *Q. chapmanii. Q. inopina* was the rarest, being observed on only two sites, and the least frequently encountered on both. In the absence of long-term data, however, little of substance can be inferred from the observed patterns. These surveys, however, could serve as the beginning of long-term studies investigating the distribution and relative abundance of scrub oaks on the Hillsborough County preserves. Such work could provide some insight into variations in the species composition of Gulf Coast scrubs and long-term responses of individual species to the mechanical treatments or other management practices.

Results of this study suggest that litter may be the single largest contributor to the disappearance of patches of bare ground on these sites over time. By both measures (frequency of occurrence and mean percent cover), litter was the most abundant form of habitat structure encountered on any restoration

site, except in area 3W at BBS West, where it was only slightly less abundant than bare ground. The accumulation of litter at this early stage of the restoration of these scrubs poses challenges to management similar to those presented by declining amounts of bare ground. As litter accumulates it eliminates sites where jays can cache acorns, but attempting to burn it too soon may set back the scrub oaks to such a degree that mast production of acorns is not possible.

On all restoration sites palmetto had the least amount of cover, and was the least frequently encountered except at ULMR. These findings are consistent with those reported by others that have investigated the effects of mechanically treating upland habitats in Florida. Greenberg et al. (1995) reported substantial reductions in the abundance of palmetto after roller chopping, and Breininger and Schmalzer (1990) report that while scrub oaks did return to an area of scrub on the Kennedy Space Center cleared in the mid 1960's, palmetto remained absent for over two decades.

Palmetto provides a volatile fuel source and is one of the most important components for carrying fire through some types of scrub (Greenberg et al. 1995). Breininger and Schmalzer (1990) report that the regenerating scrub at the Kennedy Space Center which lacked palmetto had become resistant to burning and speculated that these portions of the scrub would eventually succeed into xeric oak hammocks, which are of little value to many species endemic to scrub. As with the other structural components measured in these surveys, palmetto provides a challenge; too much and a site becomes unsuitable for many scrub endemics, too little and the scrub is unlikely to burn.

Restoration of fire-suppressed oak scrub habitat is a complex process continuing well beyond the initial phase of mechanically reducing overgrown vegetation, encompassing both time and proper land management. For example, several years following mechanical treatment are likely needed for oaks to grow tall enough to support scrub jays on the Hillsborough County sites. Results of the surveys conducted May-August 2006 also suggest restoration sites need to be creatively managed so that what appear to be mutually exclusive components of scrub habitat necessary for scrub jays, such as sufficient amounts of both bare ground and scrub oaks suitable in height as well as percent cover, do not disappear over time. Without regularly scheduled, long-term monitoring, however, it is virtually impossible to gain useful information about how a restoration project is progressing, or what corrective measures may need to be taken in order to achieve the desired goals.

The following recommendations for future projects involving restoration of fire-suppressed scrub habitat are offered:

1. Restoration projects that have the goal of increasing available habitat for scrub jays on protected lands should be planned to take into account locations of existing jay populations and the time necessary for a restored scrub to become suitable for jays. Growth management plans that predict long-term patterns of development also may provide useful information as to where and when jay habitat on lands not protected may be lost to development and thereby help prioritize when particular scrubs need to be restored to prevent jays being extirpated from an area.
2. Management decisions regarding scrub habitat being restored for scrub jays need to take into account that several, sometimes contradictory, attributes of the habitat are needed by scrub jays. For example, following mechanical reduction of overgrown vegetation litter may accumulate for several years, resulting in loss of the bare ground necessary for scrub jays to cache acorns. Burning off the litter throughout the site too early, however, may reduce the heights of oaks below which these plants are capable of producing acorns.
3. Regular monitoring is essential if progress of a restoration project is to be understood. The purpose of monitoring programs should be two-fold; determining the number of jays present and their use of restoration areas, and to detect changes over time in those components of habitat structure that are relevant to scrub jays.

Literature Cited

Breininger, D. R. and P. A. Schmalzer. 1990. Effects of fire and disturbance on plants and birds in a Florida oak/palmetto scrub community. American Midland Naturalist **123**: 64-74.

Fitzpatrick, J. W., G. E. Woolfenden, and M. T. Kopeny. 1991. Ecology and development-related habitat requirements of the Florida scrub jay (*Aphelocoma coerulescens coerulescens*). Florida Game and Fresh Water Fish Commission, Nongame Wildlife Program Technical Report No. 8. Tallahassee, FL. 49 pp.

Florida Natural Areas Inventory. 1990. Guide to the natural communities of Florida. Florida Natural Areas Inventory. Tallahassee, Florida.

Gordon, D. 2001. Historical and existing scrub jay populations in Hillsborough County. Quest Ecology, Inc. Wimauma, Florida.

Greenberg, C. H., D. G. Neary, L. D. Harris, and S. P. Linda. 1995. Vegetation recovery following high-intensity wildfire and silvicultural treatments in sand pine scrub. American Midland Naturalist **133**: 149-163.

Hipes, D., D. R. Jackson, K. NeSmith, D. Printiss, and K. Brandt. 2000. Field guide to the rare animals of Florida. Florida Natural Areas Inventory, Tallahassee.

Microsoft. 2002. Microsoft Excel. Copyright Microsoft Corporation 1985-2001.

Myers, R. L. 1990. Scrub and high pine, p. 150-193 *In:* R. L. Myers and J. J. Ewel (eds.). Ecosystems of Florida. University of Central Florida Press, Orlando.

Soil Conservation Service. 1989. Soil Survey of Hillsborough County, Florida. United States Dept. of Agriculture.

Schmalzer, P. A. 2003. Growth and recovery of oak-saw palmetto scrub through ten years after fire. Natural Areas Journal **23**: 5 – 13.

United States Fish and Wildlife Service. 1999. Multi-species recovery plan for the threatened and endangered species of South Florida. Volume I: The species.

Appendix 1:
Photographs of restoration sites on Balm Boyette Scrub, Golden Aster Scrub, and the Little Manatee River Corridor.

Appendix 2:
List of plant species observed on Balm Boyette Scrub, Golden Aster Scrub, and the Little Manatee River Corridor.

Appendix 3:
Florida Natural Areas Inventory field forms for rare plants observed on the Balm Boyette Scrub, Golden Aster Scrub, and the Little Manatee River Corridor.

Attachment 1:
United States Fish and Wildlife Service Florida scrub jay population sub-regions.

Attachment 2:
Locations of preserves, documented scrub jay families, and dispersal range of scrub jays.

Plant Species List, Hillsborough County PCEF Scrub Restoration Grant

: BBS = Balm Boyette Scrub, GAS= Golden Aster Scrub, LMRC - [illegible] Manatee River Corridor

Bullet (•) after species name denotes endemic status. Asterisk (*) after species name denotes non - native status.

(E) = Endangered, (T) = Threatened,

Family	Genus Species	Common Name	BBS	GAS	LMRC
PTERIDOPHYTES					
BLECHNACEAE	***Woodwardia virginica***	VIRGINIA CHAIN FERN	X		
DENNSTAEDTIACEAE	***Pteridium aquilinum* var. *pseudocaudatum***	TAILED BRACKEN	X	X	X
POLYPODIACEAE	***Pleopeltis polypodioides* var. *michauxiana***	RESURRECTION FERN	X		
GYMNOSPERMS					
PINACEAE	***Pinus clausa***	SAND PINE	X	X	X
	Pinus elliottii	SLASH PINE	X		X
	Pinus palustris	LONGLEAF PINE	X	X	X
MONOCOTS					
AGAVACEAE	***Yucca filamentosa***	ADAM'S NEEDLE	X	X	X
ARECACEAE	***Sabal etonia•***	SCRUB PALMETTO			X
	Serenoa repens	SAW PALMETTO	X	X	X
BROMELIACEAE	***Tillandsia recurvata***	BALLMOSS	X	X	X
	Tillandsia usneoides	SPANISH MOSS	X	X	
COMMELINACEAE	***Callisia graminea***	GRASSLEAF ROSELING	X	X	X
	Callisia ornata•	FLORIDA SCRUB ROSELING	X	X	
	Commelina erecta	WHITEMOUTH DAYFLOWER	X	X	X
CYPERACEAE	***Bulbostylis ciliatifolia***	CAPILLARY HAIRSEDGE	X	X	X
	Bulbostylis stenophylla	SANDYFIELD HAIRSEDGE	X	X	X
	Bulbostylis warei	WARE'S HAIRSEDGE			X
	Cyperus croceus	BALDWIN'S FLATSEDGE	X	X	X
	Cyperus filiculmis	WIRY FLATSEDGE	X		X
	Cyperus retrorsus	PINEBARREN FLATSEDGE	X	X	X
	Fimbristylis caroliniana	CAROLINA FIMBRY	X	X	X
	Rhynchospora fernaldii	FERNALD'S BEAKSEDGE	X	X	
	Rhynchospora grayi	GRAY'S BEAKSEDGE	X		X
	Rhynchospora intermedia	PINEBARREN BEAKSEDGE		X	X
	Rhynchospora megalocarpa	SANDYFIELD BEAKSEDGE	X	X	X

Family	Genus Species	Common Name	BBS	GAS	LMRC
RIOCAULACEAE	***Lachnocaulon beyrichianum***	SOUTHERN BOGBUTTON	X	X	X
	Syngonanthus flavidulus	YELLOW HATPINS	X	X	
HYPOXIDACEAE	***Hypoxis juncea***	FRINGED YELLOW STARGRASS	X	X	X
JUNCACEAE	***Juncus scirpoides***	NEEDLEPOD RUSH	X	X	X
ORCHIDACEAE	***Pteroglossaspis ecristata*** **(T - FL)**	GIANT ORCHID	X	X	X
POACEAE	***Andropogon glomeratus*** **var.** ***glaucopsis***	PURPLE BLUESTEM	X	X	X
	Andropogon virginicus **var.** ***glaucus***	CHALKY BLUESTEM	X	X	X
	Aristida spiciformis	BOTTLEBRUSH THREEAWN	X	X	X
	Aristida stricta **var.** ***beyrichiana***	WIREGRASS	X	X	X
	Dichanthelium aciculare	NEEDLELEAF WITCHGRASS	X	X	X
	Dichanthelium acuminatum	TAPERED WITCHGRASS	X	X	X
	Dichanthelium ensifolium **var.** ***breve•***	CYPRESS WITCHGRASS	X	X	X
	Dichanthelium portoricense	HEMLOCK WITCHGRASS	X	X	X
	Digitaria insularis	SOURGRASS	X		
	Eustachys petraea	PINEWOODS FINGERGRASS	X		
	Gymnopogon chapmanianus	CHAPMAN'S SKELETONGRASS	X		
	Imperata cylindrica*	COGONGRASS	X		X
	Panicum hemitomon	MAIDENCANE			X
	Panicum maximum*	GUINEAGRASS			X
	Paspalum laeve	FIELD PASPALUM	X	X	X
	Paspalum notatum **var.** ***saurae****	BAHIAGRASS	X		X
	Paspalum setaceum	THIN PASPALUM	X		X
	Paspalum urvillei*	VASEYGRASS	X		X
	Rhynchelytrum repens*	ROSE NATALGRASS	X	X	X
	Schizachyrium scoparium	LITTLE BLUESTEM	X		X
	Sorghastrum secundum	LOPSIDED INDIANGRASS	X	X	X
	Sporobolus junceus	PINEYWOODS DROPSEED			X
SMILACACEAE	***Smilax auriculata***	EARLEAF GREENBRIER	X	X	X
	Smilax bona-nox	SAW GREENBRIER	X		X
	Smilax glauca	CAT GREENBRIER			X
	Smilax pumila	SARSAPARILLA VINE	X	X	X
XYRIDACEAE	***Xyris brevifolia***	SHORTLEAF YELLOWEYED GRASS		X	
	Xyris caroliniana	CAROLINA YELLOWEYED GRASS	X	X	X

Family	Genus Species	Common Name	BBS	GAS	LMRC
DICOTS					
AMARANTHACEAE	***Chenopodium album****	LAMB'S-QUARTERS	X		X
ANACARDIACEAE	***Rhus copallinum***	WINGED SUMAC	X	X	X
	Schinus terebinthifolius*	BRAZILIAN PEPPER	X	X	
ANNONACEAE	***Asimina incana***	WOOLLY PAWPAW		X	
	Asimina reticulata•	NETTED PAWPAW	X	X	X
APOCYNACEAE	***Asclepias curtissii•*** **(E - FL)**	CURTISS' MILKWEED	X		X
	Asclepias feayi•	FLORIDA MILKWEED	X	X	X
	Asclepias pedicellata	SAVANNAH MILKWEED	X	X	
AQUIFOLIACEAE	***Ilex ambigua*** **var.** ***ambigua***	CAROLINA HOLLY		X	X
	Ilex cassine	DAHOON	X		
	Ilex glabra	INKBERRY	X	X	X
ASTERACEAE	***Ambrosia artemisiifolia***	COMMON RAGWEED	X		
	Baccharis halimifolia	GROUNDSEL TREE	X		X
	Balduina angustifolia	COASTALPLAIN HONEYCOMBHEAD		X	X
	Carphephorus corymbosus	COASTALPLAIN CHAFFHEAD	X	X	X
	Chrysopsis floridana• **(E - Fed.)**	FLORIDA GOLDENASTER	X	X	X
	Chrysopsis scabrella	COASTALPLAIN GOLDENASTER	X		X
	Conyza canadensis **var.** ***pusilla***	DWARF CANADIAN HORSEWEED	X	X	X
	Elephantopus carolinianus	CAROLINA ELEPHANTSFOOT	X		
	Emilia fosbergii*	TASSEL FLOWER	X		
	Erechtites hieraciifolius	AMERICAN BURNWEED	X	X	X
	Eupatorium capillifolium	DOGFENNEL	X		X
	Euthamia caroliniana	SLENDER FLATTOP GOLDENROD	X	X	X
	Garberia heterophylla• **(T - FL)**	GARBERIA			X
	Heterotheca subaxillaris	CAMPHORWEED			X
	Liatris chapmanii	CHAPMAN'S GAYFEATHER	X		
	Lygodesmia aphylla	ROSE-RUSH	X	X	X
	Palafoxia feayi•	FEAY'S PALAFOX	X	X	X
	Pityopsis graminifolia	NARROWLEAF SILKGRASS	X	X	X
	Pterocaulon pycnostachyum	BLACKROOT	X	X	X
	Sericocarpus tortifolius	WHITETOP ASTER	X		
	Solidago fistulosa	PINEBARREN GOLDENROD	X		X
	Solidago odora **var.** ***chapmanii***	CHAPMAN'S GOLDENROD	X	X	X

Family	Genus Species	Common Name	BBS	GAS	LMRC
CACTACEAE	***Opuntia humifusa***	PRICKLYPEAR	X	X	X
CARYOPHYLLACEAE	***Stipulicida setacea* var. *lacerata*•**	PINELAND SCALYPINK	X	X	X
CHRYSOBALANACEAE	***Licania michauxii***	GOPHER APPLE	X	X	X
CISTACEAE	***Helianthemum corymbosum***	PINEBARREN FROSTWEED	X	X	X
	***Helianthemum nashii*•**	FLORIDA SCRUB FROSTWEED	X	X	X
	***Lechea cernua*• (T - FL)**	NODDING PINWEED	X	X	X
	Lechea deckertii	DECKERT' S PINWEED	X		
	***Lechea divaricata*• (E - FL)**	DRYSAND PINWEED			X
	Lechea minor	THYMELEAF PINWEED	X	X	X
	Lechea mucronata	HAIRY PINWEED	X	X	X
	Lechea torreyi	PIEDMONT PINWEED	X	X	X
CLUSIACEAE	***Hypericum reductum***	ATLANTIC ST.JOHN'S-WORT	X	X	X
	Hypericum tetrapetalum	FOURPETAL ST.JOHN'S-WORT	X	X	X
EBENACEAE	***Diospyros virginiana***	COMMON PERSIMMON	X		X
ERICACEAE	***Bejaria racemosa***	TARFLOWER	X	X	X
	Ceratiola ericoides	FLORIDA ROSEMARY	X	X	
	Gaylussacia dumosa	DWARF HUCKLEBERRY			X
	Lyonia ferruginea	RUSTY STAGGERBUSH	X	X	X
	Lyonia fruticosa	COASTALPLAIN STAGGERBUSH	X	X	X
	Lyonia lucida	FETTERBUSH	X	X	X
	Vaccinium arboreum	SPARKLEBERRY	X	X	X
	Vaccinium darrowii	DARROW'S BLUEBERRY	X	X	X
	Vaccinium myrsinites	SHINY BLUEBERRY	X		X
	Vaccinium stamineum	DEERBERRY	X	X	X
EUPHORBIACEAE	***Cnidoscolus stimulosus***	TREAD-SOFTLY; FINGER-ROT	X	X	X
	Croton argyranthemus	SILVER CROTON	X	X	X
	***Euphorbia polyphylla*•**	LESSER FLORIDA SPURGE	X	X	X
	Stillingia sylvatica	QUEENSDELIGHT	X	X	X

Family	Genus Species	Common Name	BBS	GAS	LMRC
FABACEAE	***Baptisia lanceolata***	GOPHERWEED			X
	Centrosema virginianum	SPURRED BUTTERFLY PEA			X
	Chamaecrista nictitans	SENSITIVE PEA		X	X
	Chapmannia floridana•	FLORIDA ALICIA	X	X	X
	Crotalaria rotundifolia	RABBITBELLS	X	X	X
	Dalea feayi	FEAY'S PRAIRIECLOVER			X
	Galactia elliottii	ELLIOTT'S MILKPEA	X	X	X
	Galactia regularis	EASTERN MILKPEA	X		X
	Indigofera caroliniana	CAROLINA INDIGO			X
	Lupinus diffusus	SKYBLUE LUPINE	X	X	X
	Macroptilium lathyroides*	WILD BUSHBEAN	X		
	Phaseolus polystachios **var. *sinuatus***	THICKET BEAN	X		
FAGACEAE	***Quercus chapmanii***	CHAPMAN'S OAK	X	X	X
	Quercus elliottii	RUNNING OAK	X	X	X
	Quercus geminata	SAND LIVE OAK	X	X	X
	Quercus incana	BLUEJACK OAK			X
	Quercus inopina•	SCRUB OAK	X	X	
	Quercus laevis	TURKEY OAK			X
	Quercus laurifolia	LAUREL OAK	X	X	
	Quercus minima	DWARF LIVE OAK	X	X	X
	Quercus myrtifolia	MYRTLE OAK	X	X	X
	Quercus nigra	WATER OAK	X		
GELSEMIACEAE	***Gelsemium sempervirens***	YELLOW JESSAMINE	X	X	X
LAMIACEAE	***Callicarpa americana***	AMERICAN BEAUTYBERRY	X		X
	Hyptis verticillata*	JOHN CHARLES	X		
	Piloblephis rigida	WILD PENNYROYAL	X	X	
	Scutellaria arenicola•	FLORIDA SCRUB SKULLCAP	X		X
LAURACEAE	***Persea borbonia*** **var. *humilis•***	SILK BAY			X
MALVACEAE	***Urena lobata****	CAESARWEED	X		
MELASTOMATACEAE	***Rhexia mariana***	PALE MEADOWBEAUTY	X	X	X
MELIACEAE	***Melia azedarach****	CHINABERRYTREE			X

Family	Genus Species	Common Name	BBS	GAS	LMRC
OLLUGINACEAE	***Mollugo verticllata****	GREEN CARPETWEED	X		
MYRICACEAE	***Myrica cerifera***	SOUTHERN BAYBERRY	X	X	X
OLACACEAE	***Ximenia americana***	TALLOW WOOD; HOG PLUM	X	X	X
OLEACEAE	***Osmanthus megacarpus•***	SCRUB WILD OLIVE			X
OROBANCHACEAE	***Seymeria pectinata***	PIEDMONT BLACKSENNA			X
PHYTOLACCACEAE	***Phytolacca americana***	AMERICAN POKEWEED	X	X	X
POLYGONACEAE	***Polygonella ciliata•***	HAIRY JOINTWEED	X		
	Polygonella gracilis	TALL JOINTWEED		X	
	Polygonella polygama* var. *polygama	OCTOBER FLOWER	X	X	X
	Polygonella robusta•	LARGEFLOWER JOINTWEED			X
PORTULACACEAE	***Portulaca pilosa***	PINK PURSLANE	X		
ROSACEAE	***Rubus cuneifolius***	SAND BLACKBERRY	X	X	X
RUBIACEAE	***Diodia terea***	ROUGH BUTTONWEED			X
	Galium hispidulum	COASTAL BEDSTRAW	X		X
	Richardia brasiliensis*	TROPICAL MEXICAN CLOVER			X
SAPOTACEAE	***Sideroxylon reclinatum***	FLORIDA BULLY		X	
SOLANACEAE	***Solanum viarum****	TROPICAL SODA APPLE	X		X
TETRACHONDRACEAE	***Polypremum procumbens***	RUSTWEED	X	X	X
THEACEAE	***Gordonia lasianthus***	LOBLOLLY BAY	X		
VERONICACEAE	***Gratiola hispida***	ROUGH HEDGEHYSSOP	X	X	X
	Scoparia dulcis	SWEETBROOM	X	X	X
VITACEAE	***Vitis rotundifolia***	MUSCADINE GRAPE	X	X	X

Figures

TABLES

Table 1. Acreage of restoration sites, dates of mechanical treatments, and linear feet of fire lanes cut.

Site	Acreage	Date of Roller chopping	Fire lanes (linear feet)
Balm Boyette Scrub	148	Jul. – Oct. 2004	27, 850
Golden Aster Scrub	70	Jun. 2004	6,260
Little Manatee River Corridor	173	Nov. 2003 – May 2004	30, 910
Totals	391		65,020

Table 2. Acreage of subdivided areas and dates of prescribed burns.

Site	Area	Acreage	Date of Prescribed burn
BBS East	Not subdivided	30	7 Dec. 2004
BBS West	1	35	Not burned
BBS West	2	10	3 Feb. 2005*
BBS West	3E	14	Not burned
BBS West	3W	13	3 Nov. 2004
BBS West	4	14	Not burned
BBS West	5	32	2 Nov. 2004
GAS	1	29	22 Dec. 2004
GAS	2	26	18 Feb. 2005
GAS	3	8	Not burned
GAS	North	14	28 Oct. 2004
LMR	North	15	11 Apr. 2005
LMR	Northwest	7	29 Apr. 2005
LMR	South	14	11 Apr. 2005
LMR	West	38	18 Apr. 2005
ULMR	Northeast	24	24 May 2005
ULMR	Northwest	23	Not burned
ULMR	Southeast	30	25 May 2005
ULMR	Southwest	22	13 Jul. 2004
Total		398	

* Date approximate.

Attachment 2

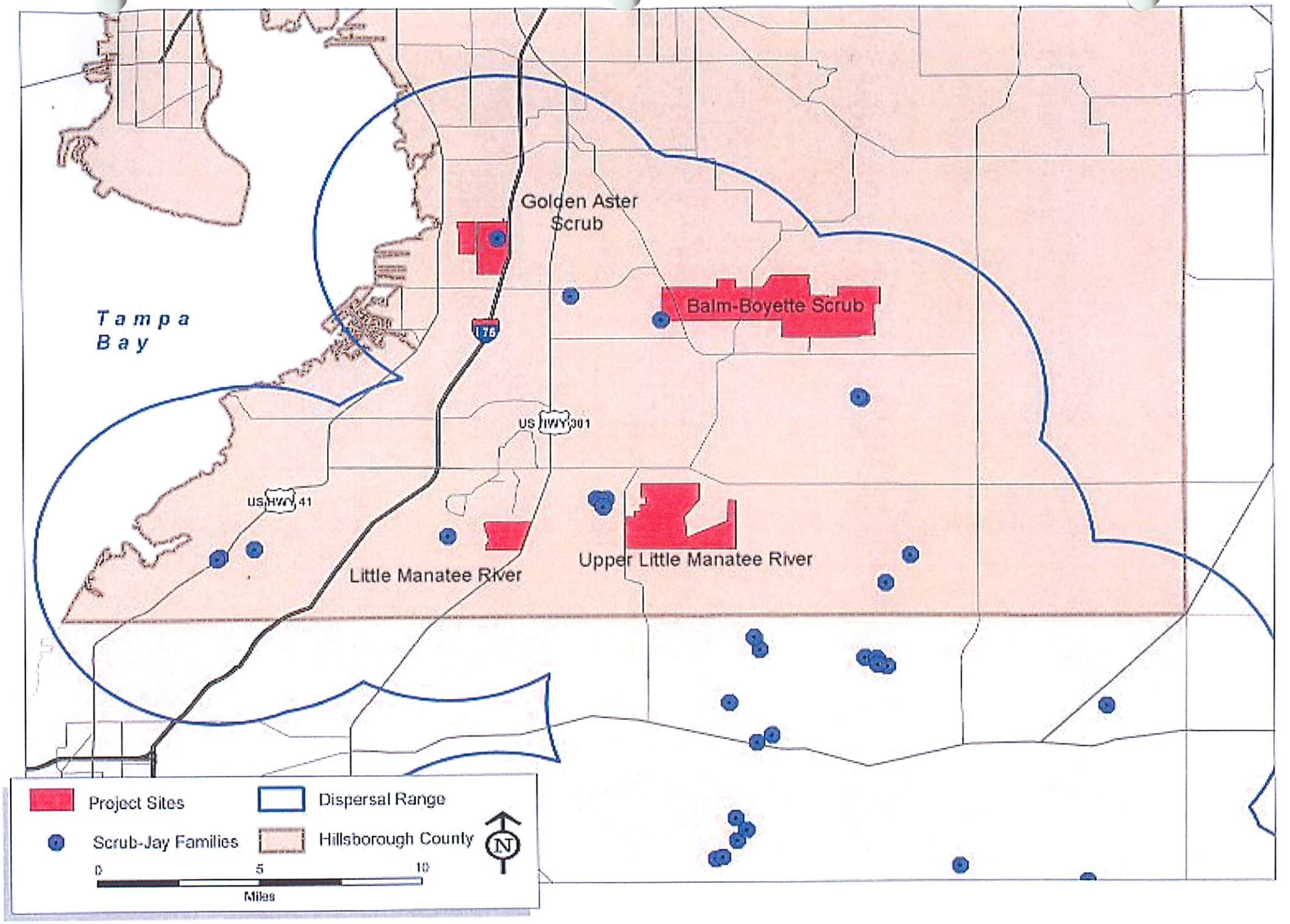


Figure 1a

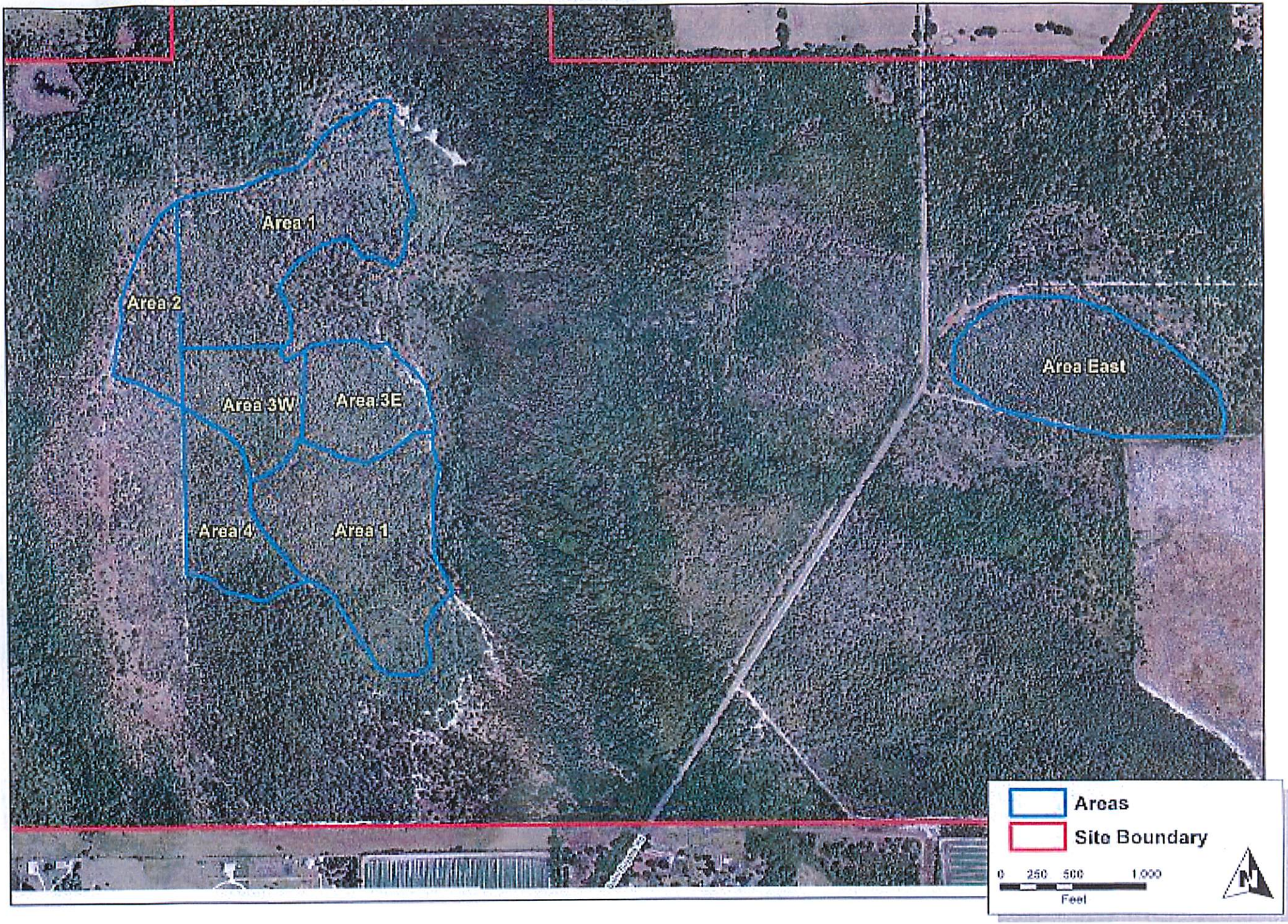

Area 1
Area 2
Area 3W
Area 3E
Area 4
Area 1
Area East
Areas
Site Boundary
0 250 500 1,000
Feet
N

Figure 1b

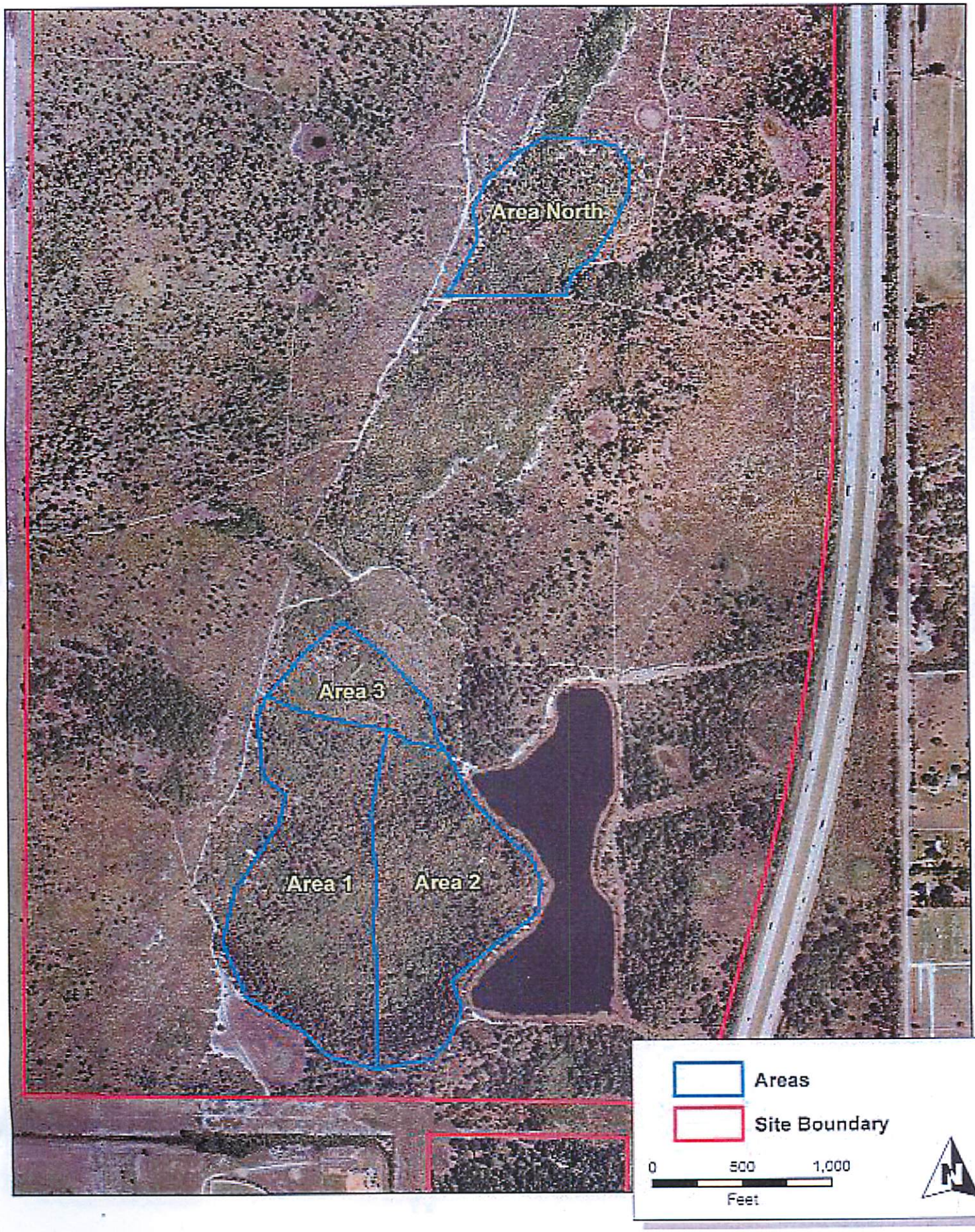

Area North
Area 3
Area 1
Area 2
Areas
Site Boundary
0
500
1,000
Feet
N

Figure 1c

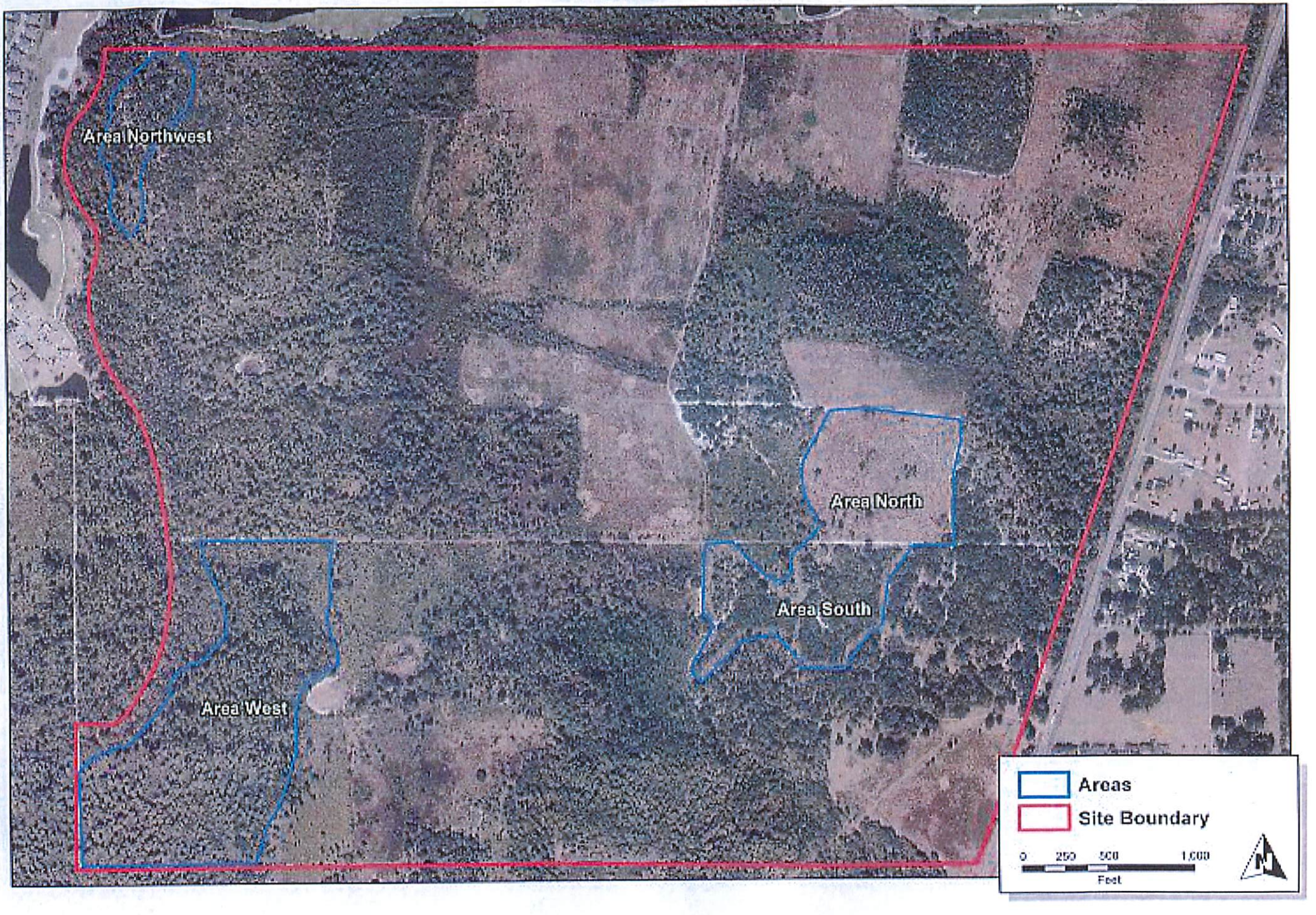

Area Northwest
Area North
Area South
Area West
Areas
Site Boundary
0 250 500 1,000
Feet

Figure 1d

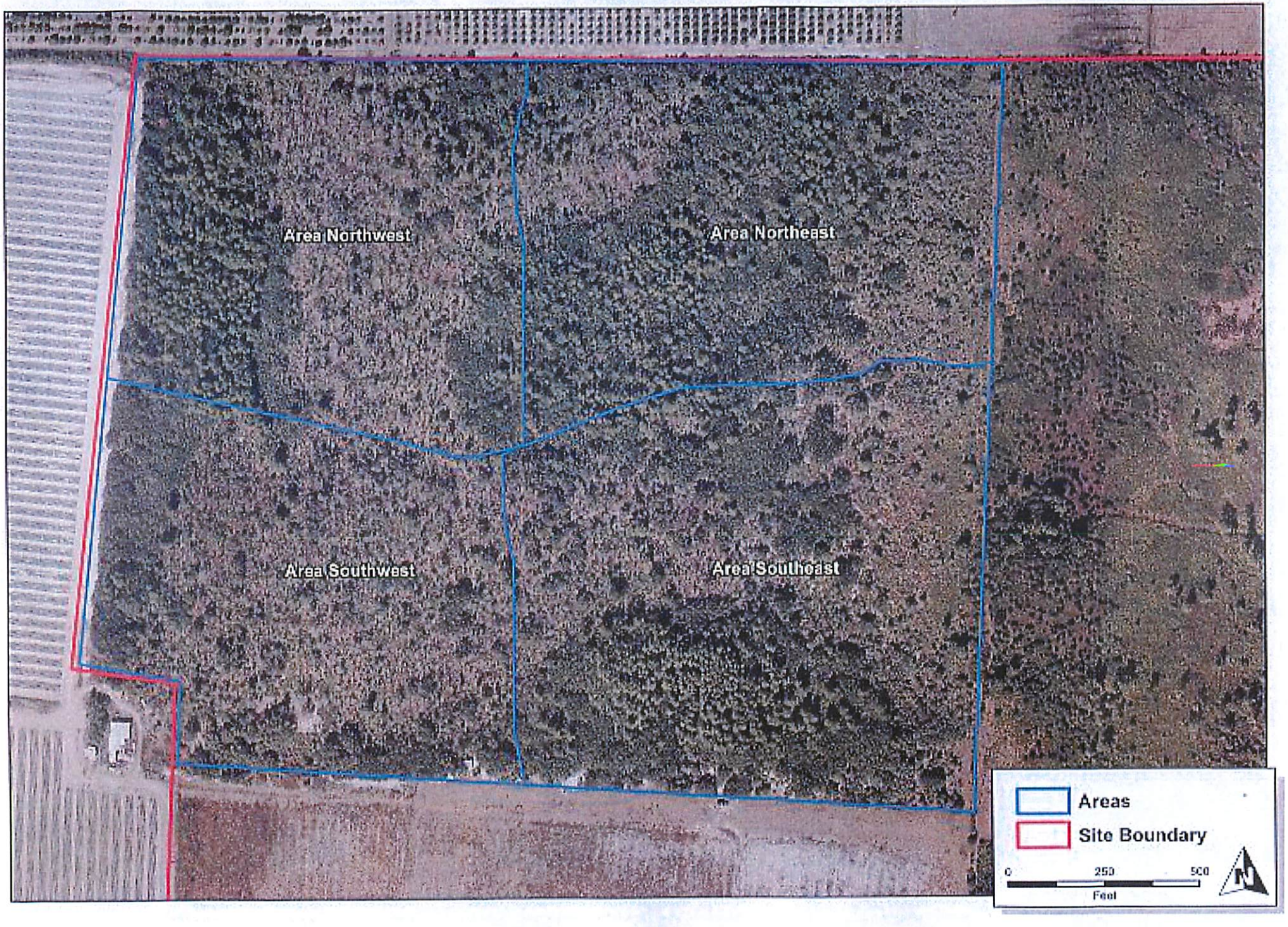

Area Northwest
Area Northeast
Area Southwest
Area Southeast
Areas
Site Boundary
0
250
500
Feet
N

Figure 2a

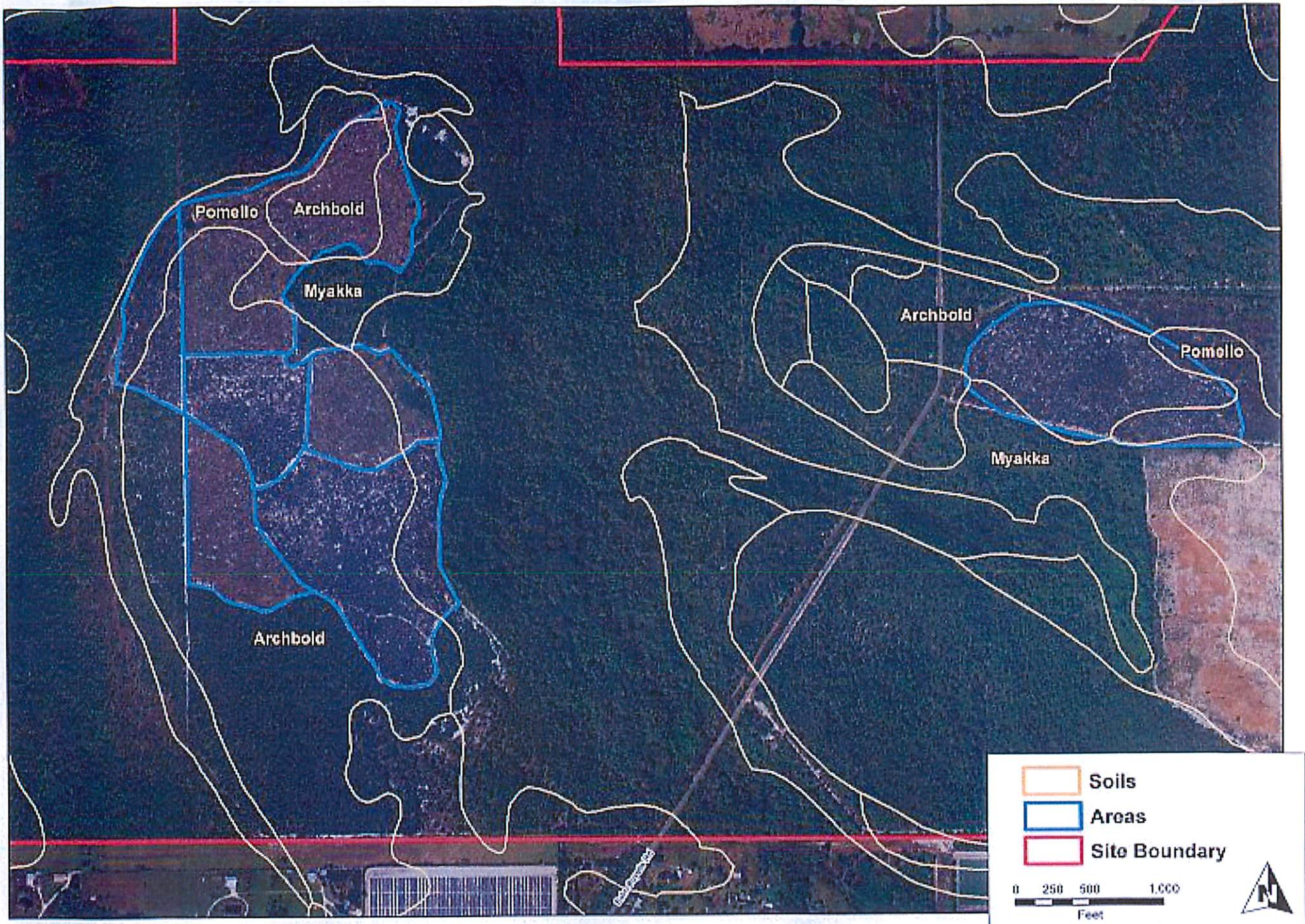

Pomello
Archbold
Myakka
Archbold
Archbold
Pomello
Myakka
Soils
Areas
Site Boundary
0 250 500 1,000
Feet
N

Figure 2b

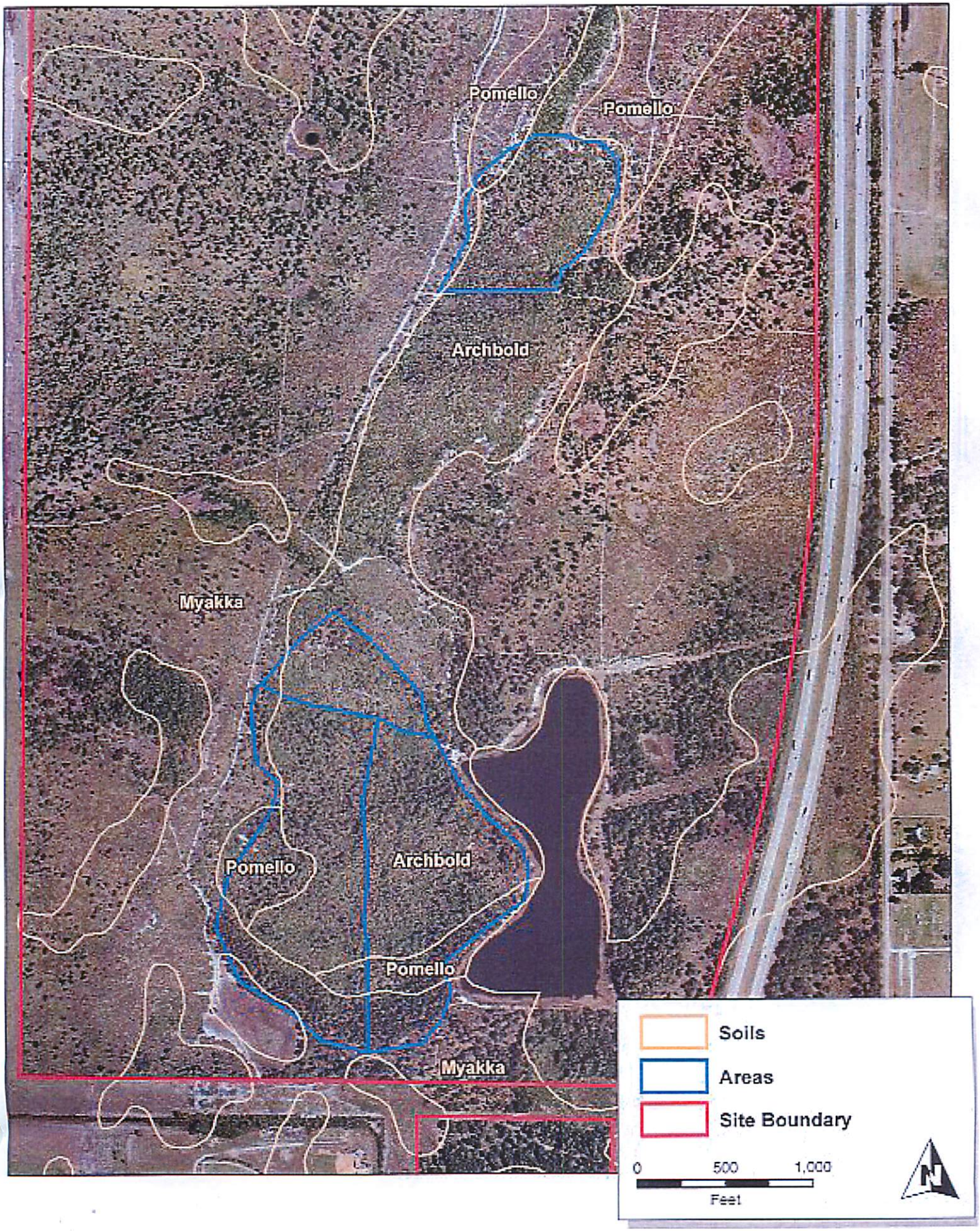

Pomello
Pomello
Archbold
Myakka
Pomello
Archbold
Pomello
Myakka
Soils
Areas
Site Boundary
0
500
1,000
Feet
N

Figure 2c

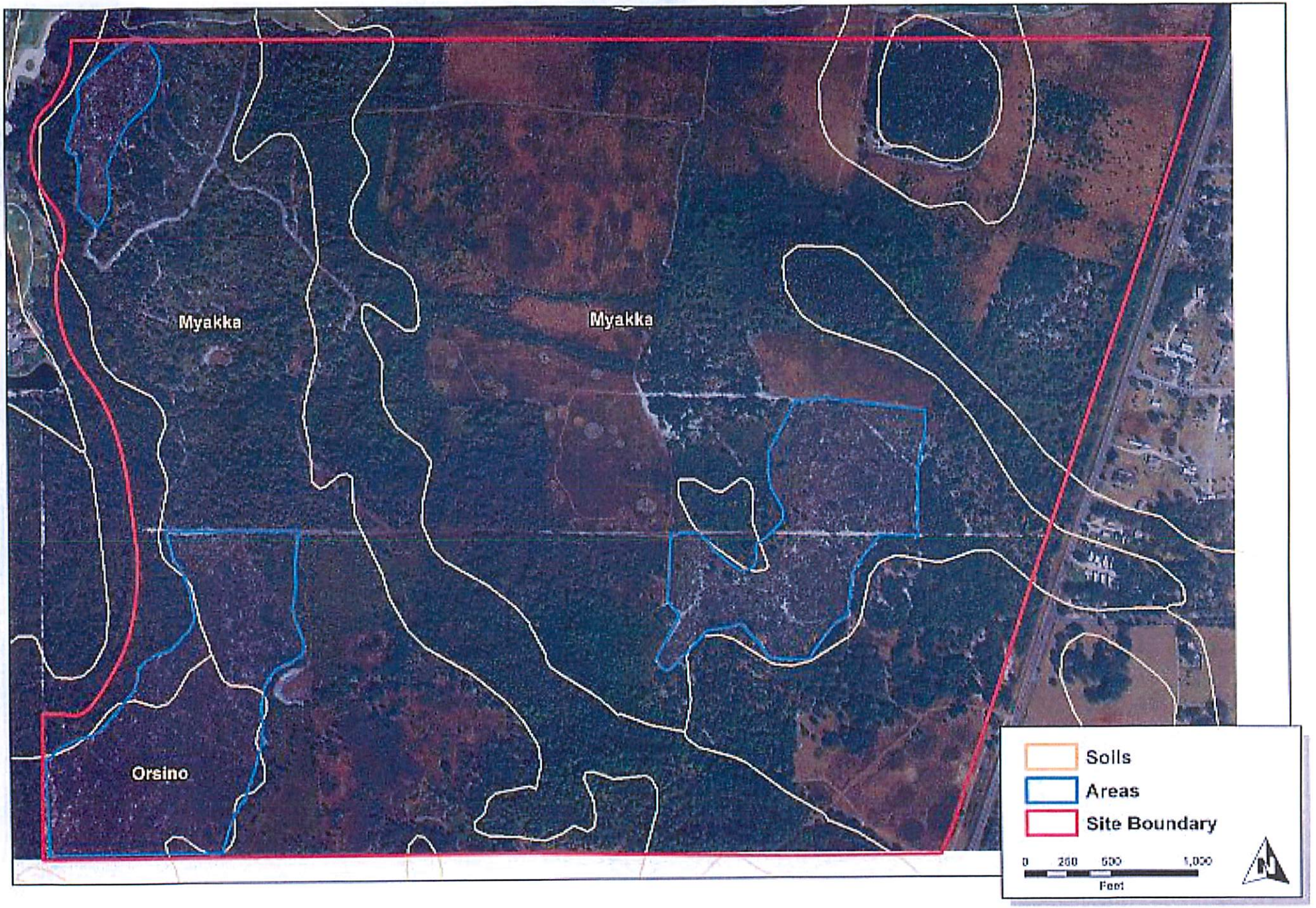

Myakka
Myakka
Orsino
Solls
Areas
Site Boundary
0
200
500
1,000
Feet

Figure 2d

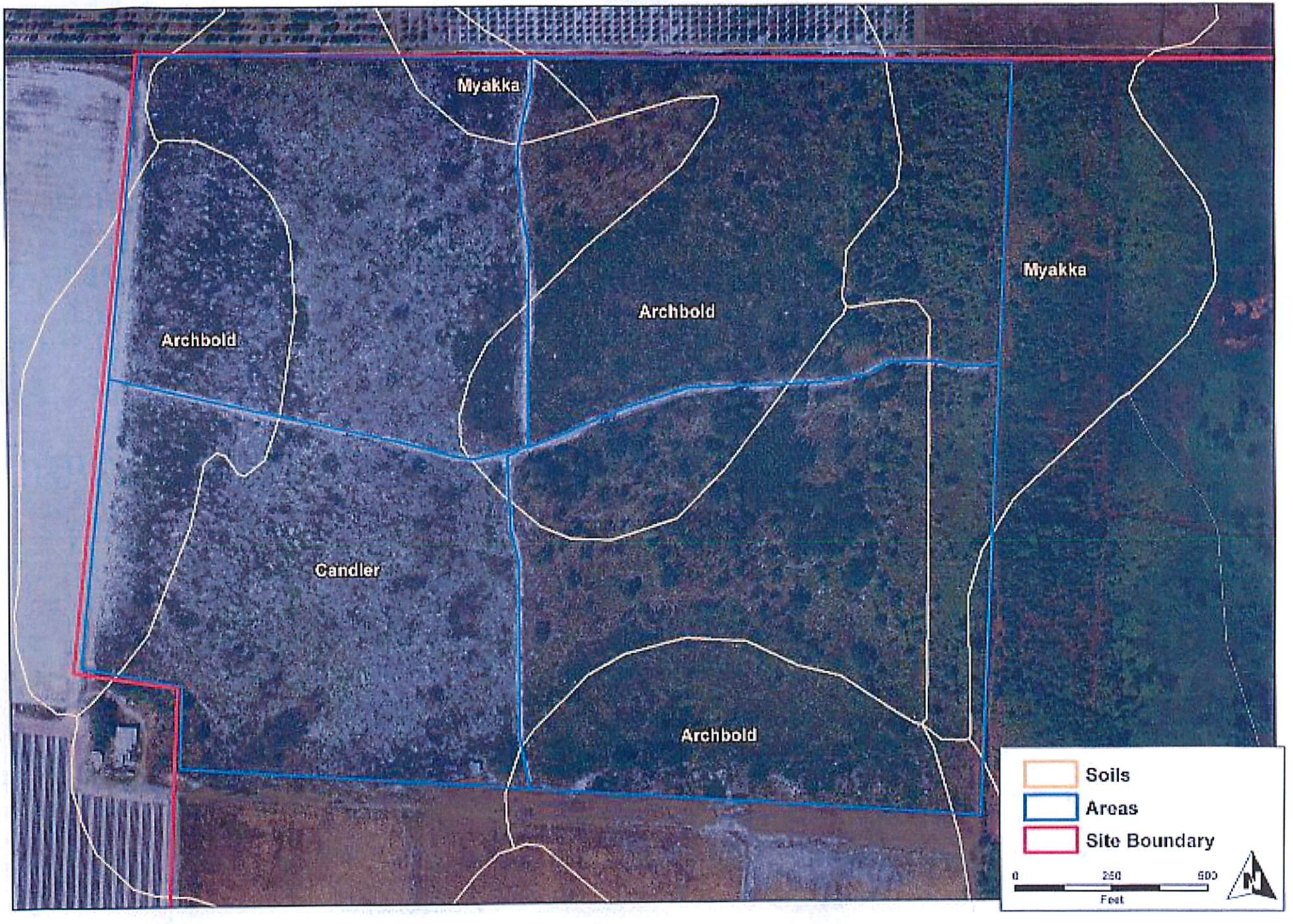

Myakka
Archbold
Archbold
Myakka
Candler
Archbold
Soils
Areas
Site Boundary
0
250
500
Feet

Figure 3a

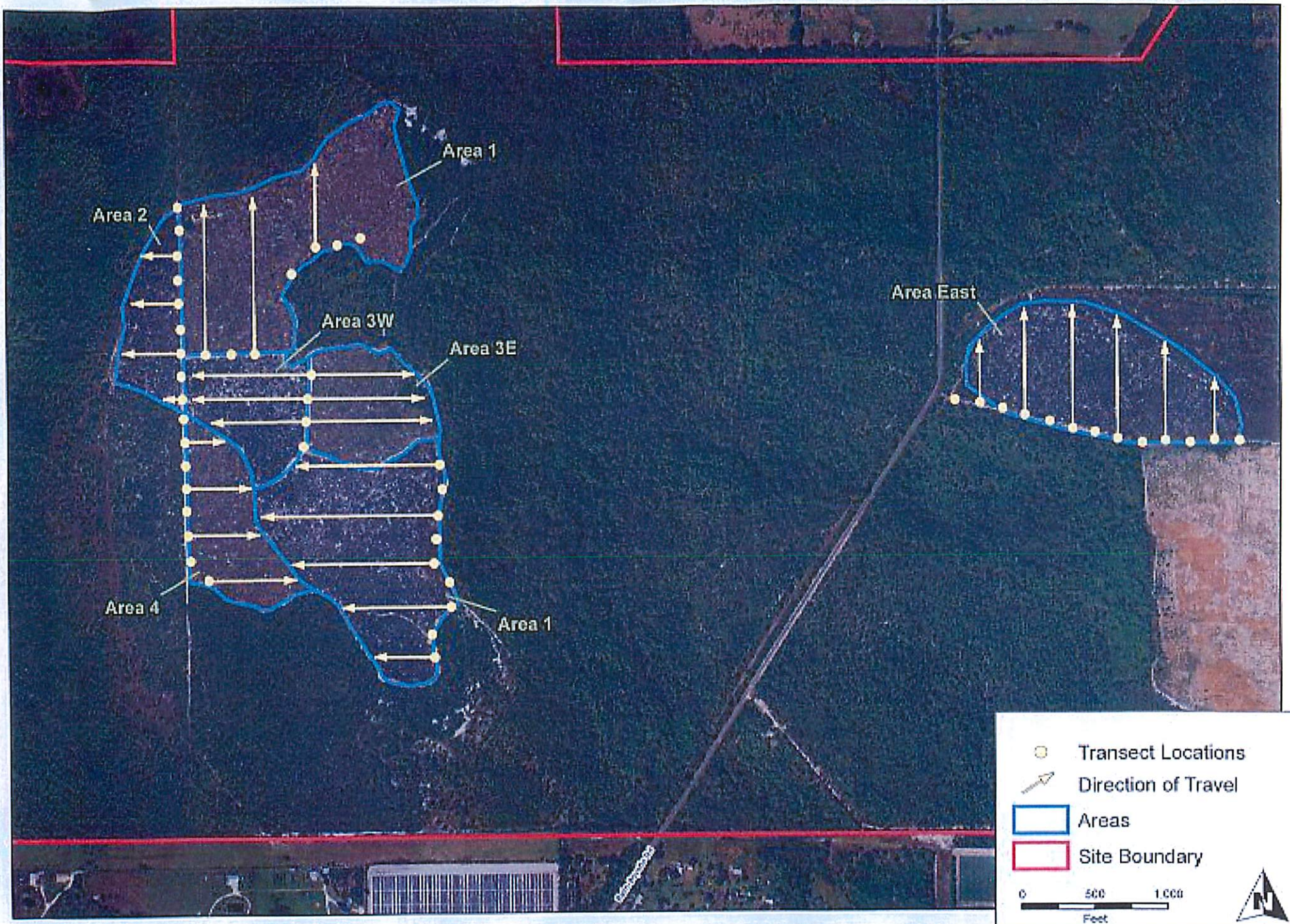

Area 1
Area 2
Area 3W
Area 3E
Area 4
Area 1
Area East
Transect Locations
Direction of Travel
Areas
Site Boundary
0
500
1,000
Feet
N

Figure 3b

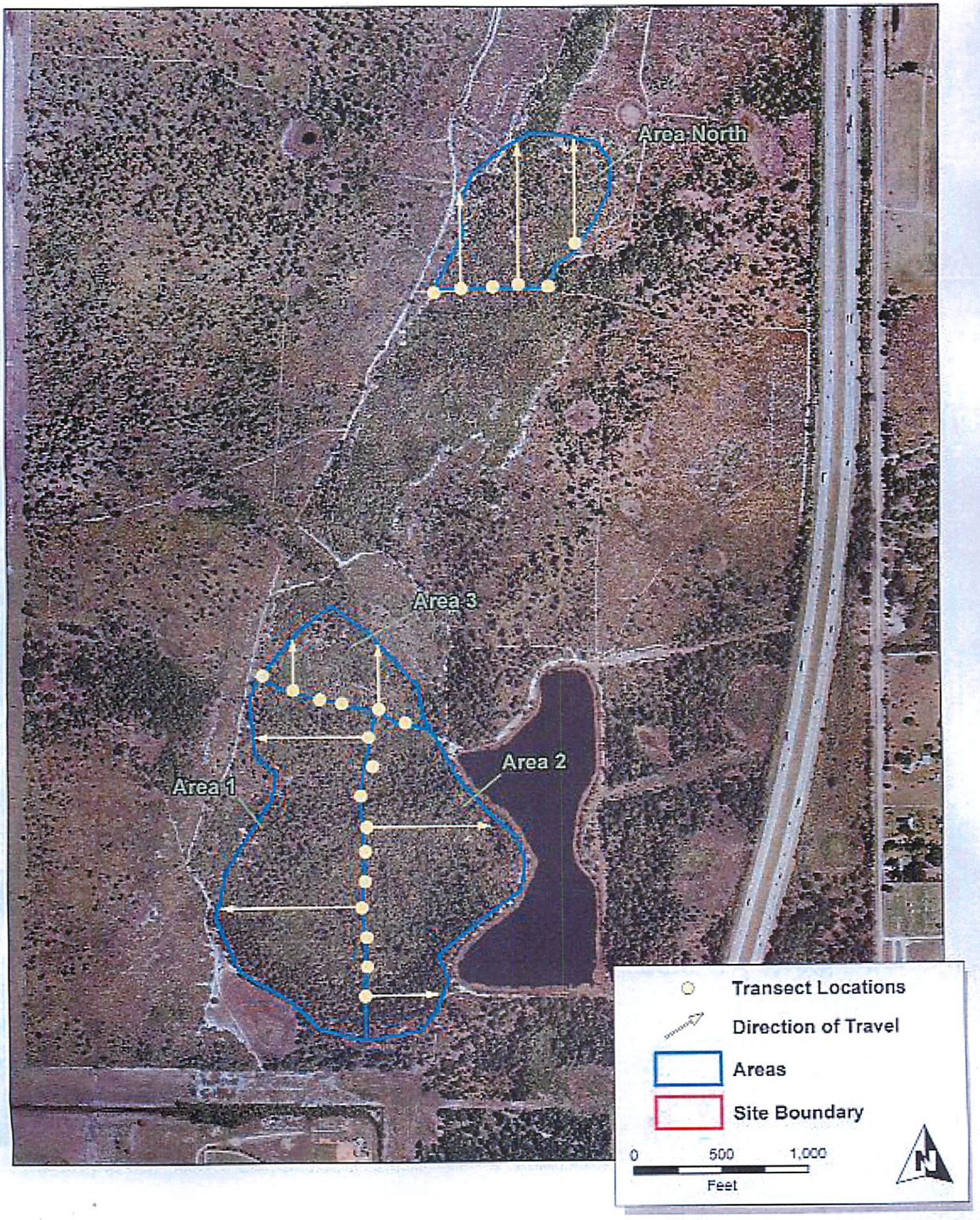

Area North
Area 3
Area 2
Area 1
Transect Locations
Direction of Travel
Areas
Site Boundary
0
500
1,000
Feet

Figure 3c

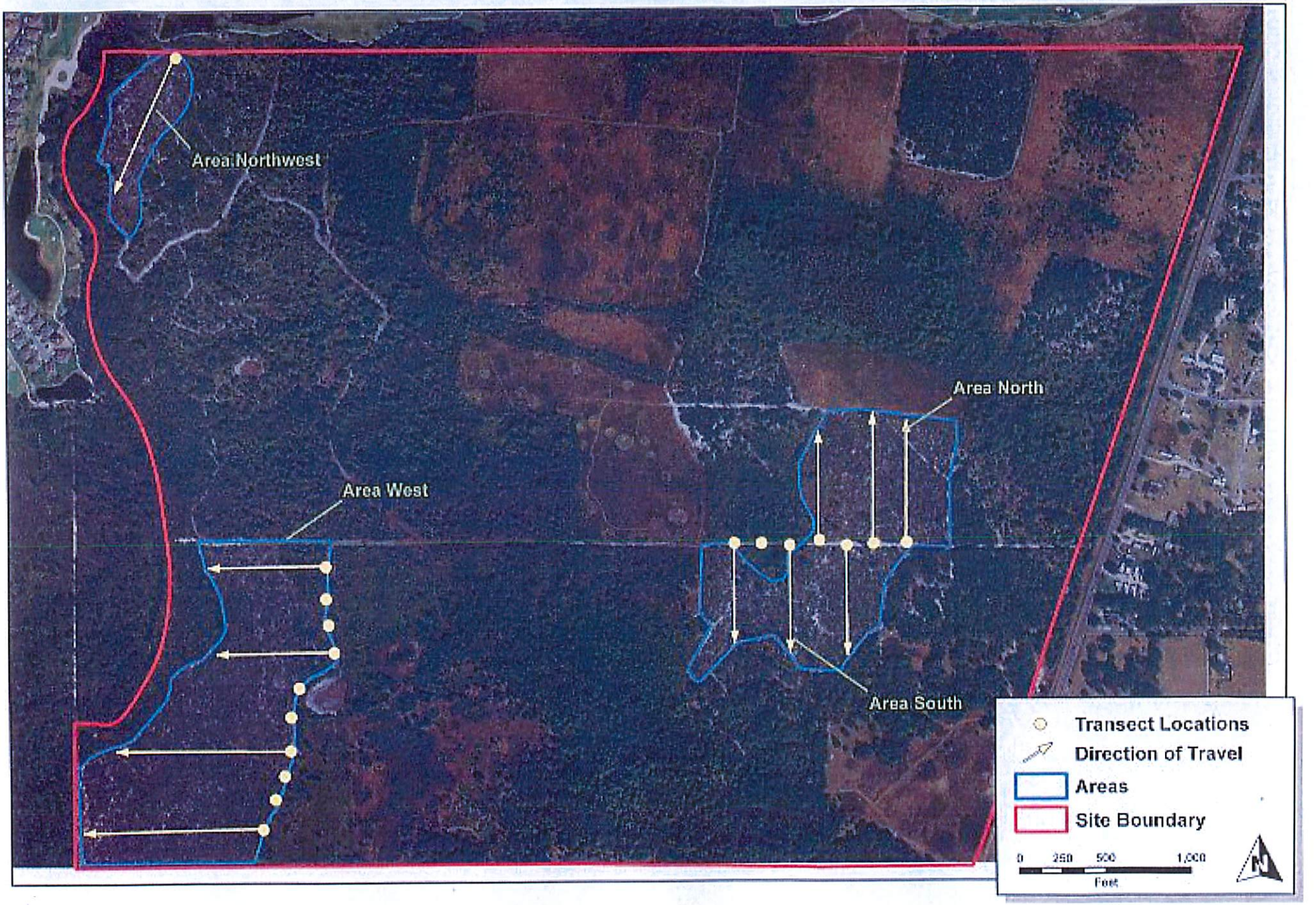

Area Northwest
Area North
Area West
Area South
Transect Locations
Direction of Travel
Areas
Site Boundary
0
250
500
1,000
Feet
N

Figure 3d


Area Northwest
Area Northeast
Area Southeast
Area Southwest
Transect Locations
Direction of Travel
Areas
Site Boundary
0
250
Feet
N

Table 3. Sample effort at each subdivided area and months sampled.

Site	Area	No. of Transects	No. of Plots	Month Sampled
BBS East	East	6	51	July
BBS West	1	3	26	August
BBS West	2	4	14	July
BBS West	3E	3	29	August
BBS West	3W	3	22	August
BBS West	4	4	22	July
BBS West	5	5	51	August
GAS	1	2	20	May
GAS	2	2	12	May
GAS	3	2	12	May
GAS	North	3	23	June
LMR	North	3	24	June
LMR	Northwest	1	12	July
LMR	South	3	22	June
LMR	West	4	43	June
ULMR	Northeast	2	21	July
ULMR	Northwest	3	32	June
ULMR	Southeast	3	19	July
ULMR	Southwest	3	33	July

Table 4. Mean maximum heights (± 1 s.d.) of scrub oak and vegetation in subdivided areas.

Site	Area	Scrub oaks	Vegetation
BBS East	East	0.68 (±0.40)	0.70 (±0.41)
BBS West	1	0.99 (±0.50)	0.91 (±0.49)
BBS West	2	0.75 (±0.27)	0.78 (±0.36)
BBS West	3E	1.08 (±0.41)	1.03 (±0.42)
BBS West	3W	0.81 (±0.33)	0.75 (±0.38)
BBS West	4	1.18 (±0.41)	1.18 (±0.41)
BBS West	5	0.92 (±0.47)	0.92 (±0.43)
GAS	1	0.61 (±0.33)	0.64 (±0.30)
GAS	2	1.17 (±0.38)	0.93 (±0.46)
GAS	3	0.70 (±0.35)	0.75 (±0.35)
GAS	North	0.57 (±0.26)	0.63 (±0.26)
LMR	North	0.55 (±0.26)	0.63 (±0.31)
LMR	Northwest	1.20 (±1.05)	0.89 (±0.74)
LMR	South	0.64 (±0.22)	0.64 (±0.29)
LMR	West	0.63 (±0.30)	0.61 (±0.29)
ULMR	Northeast	0.55 (±0.33)	0.65 (±0.27)
ULMR	Northwest	0.84 (±0.38)	0.73 (±0.37)
ULMR	Southeast	1.00 (±0.30)	0.77 (±0.37)
ULMR	Southwest	0.75 (±0.20)	0.67 (±0.29)

Table 5. Frequency of occurrence of bare ground, litter, scrub oaks, and palmetto on the restoration sites.

Restoration Site	Bare Ground	Litter	Scrub oaks	Palmetto
BBS East	67	100	59	39
BBS West	58	98	77	38
GAS	82	97	88	48
LMR	88	99	57	36
ULMR	86	95	43	57

Table 6. Mean percent cover (± 1 s.d.) of bare ground, litter, scrub oaks, and palmetto on the restoration sites.

Restoration Site	Bare Ground	Litter	Scrub oaks	Palmetto
BBS East	18.35 (±25.49)	66.67 (±27.80)	11.27 (±17.78)	9.25 (±18.83)
BBS West	21.42 (±28.94)	67.13 (±29.96)	22.38 (±23.18)	7.37 (±13.70)
GAS	27.06 (±28.13)	55.67 (±33.26)	24.40 (±24.92)	9.43 (±17.65)
LMR	27.35 (±28.91)	59.60 (±29.01)	16.39 (±24.56)	7.92 (±16.72)
ULMR	30.60 (±29.05)	48.22 (±31.20)	10.94 (±20.69)	9.34 (±13.66)

Table 7. Frequency of occurrence for the habitat structure variables bare ground, litter, and scrub oaks.

Site	Area	Habitat Structure Variables			
		Bare Ground (% of plots)	**Litter (% of plots)**	**Scrub Oaks (% of plots)**	**Palmetto (% of plots)**
BBS	East	67	100	59	39
BBS West	1	38	92	73	31
BBS West	2	50	100	50	50
BBS West	3E	32	95	91	36
BBS West	3W	83	96	76	38
BBS West	4	32	100	87	18
BBS West	5	77	98	77	47
GAS	1	100	95	95	45
GAS	2	58	100	67	50
GAS	3	75	100	92	50
GAS	North	83	96	92	48
LMR North		86	100	45	25
LMR Northwest		92	100	42	42
LMR South		88	100	38	50
LMR West		88	98	79	32
ULMR Northeast	21	67	95	48	52
ULMR Northwest	32	91	97	47	53
ULMR Southeast	19	84	84	79	53
ULMR Southwest	33	94	100	15	67

Table 8. Mean percent cover (± 1 s.d.) of the habitat structure variables bare ground, litter, and scrub oaks, and palmetto within each area.

Site	Area	Habitat Structure Variables			
		Bare Ground	Litter	Scrub Oaks	Palmetto
BBS East	BBS East	18.35 (±25.49)	66.67 (±27.80)	11.27 (±17.78)	9.25 (±18.83)
BBS West	1	2.73 (±4.04)	86.88 (±9.76)	19.77 (±21.26)	6.92 (±14.15)
BBS West	2	6.21 (±10.69)	72.50 (±25.55)	9.07 (±14.21)	10.71 (±14.79)
BBS West	3E	4.32 (±9.04)	82.14 (±15.70)	28.14 (±24.72)	8.18 (±13.68)
BBS West	3W	49.81 (±30.84)	45.89 (±33.31)	19.66 (±20.71)	3.90 (±7.10)
BBS West	4	5.05 (±11.32)	86.14 (±12.81)	31.05 (±26.41)	5.55 (±17.63)
BBS West	5	35.65 (±31.21)	53.63 (±31.40)	22.69 (±24.05)	9.08 (±14.25)
GAS	1	39.75 (±29.22)	41.50 (±28.29)	24.10 (±25.69)	10.10 (±22.43)
GAS	2	22.50 (±26.76)	52.92 (±39.80)	28.33 (±29.02)	9.33 (±18.23)
GAS	3	21.67 (±26.57)	69.17 (±25.39)	25.50 (±29.33)	5.92 (±9.20)
GAS	North	21.22 (±26.78)	62.39 (±34.34)	22.04 (±20.66)	10.74 (±16.82)
LMR	North	22.50 (±26.00)	60.63 (±28.06)	9.88 (±16.29)	11.50 (±24.81)
LMR	Northwest	21.00 (±23.66)	60.00 (±27.63)	15.08 (±29.42)	7.17 (±13.68)
LMR	South	29.64 (±29.94)	55.68 (±30.91)	15.77 (±26.83)	11.59 (±18.48)
LMR	West	30.65 (±31.39)	60.93 (±29.75)	20.70 (±25.70)	4.26 (±8.96)
ULMR	Northeast	21.00 (±29.82)	66.67 (±30.71)	12.33 (±18.82)	9.05 (±14.63)
ULMR	Northwest	37.13 (±31.87)	42.56 (±33.64)	12.59 (±22.11)	10.38 (±16.86)
ULMR	Southeast	35.79 (±35.13)	45.32 (±35.93)	20.05 (±27.95)	8.16 (±10.70)
ULMR	Southwest	27.58 (±19.65)	43.64 (±21.66)	3.21 (±11.91)	9.21 (±11.46)

Table 9. Numbers of plant species observed at the three preserves.

Preserve	Numbers of species			
	Total	Endemic Species	Listed Species	New County Records
Balm Boyette Scrub	141	13	4	2
Golden Aster Scrub	106	10	2	0
Little Manatee River Corridor	121	15	5	2

Table 10. Summary of endemic plant species found at the three preserves.

Family	Species	Balm Boyette Scrub	Golden Aster Scrub	Little Manatee River Corridor
Arecaceae	*Sabal etonia*			X
Commelinaceae	*Callisia ornata*	X	X	
Annonaceae	*Asimina reticlata*	X	X	X
Apocynaceae	*Asclepias curtissii*	X		X
Apocynaceae	*Asclepias feayi*	X	X	X
Asteraceae	*Chrysopsis floridana*	X	X	X
Asteraceae	*Garberia heterophylla*			X
Asteraceae	*Palafoxia feayi*	X	X	X
Cistaceae	*Helianthemum nashii*	X	X	X
Cistaceae	*Lechea cernua*	X	X	X
Cistaceae	*Lechea divaricata*			X
Euphorbiaceae	*Euphorbia polyphylla*	X	X	X
Fabaceae	*Chapmannia floridana*	X	X	X
Fagaceae	*Quercus inopina*	X	X	
Lamiaceae	*Scutellaria arenicola*	X		X
Oleaceae	*Osmanthus megacarpus*			X
Polygonaceae	*Polygonella ciliata*	X		
Polygonaceae	*Polygonella robusta*			X

Table 11. Summary of listed plant species found at the three preserves.

Family	Species	Listed Status	Balm Boyette Scrub	Golden Aster Scrub	Little Manatee River Corridor
Orchidaceae	*Pteroglossaspis cristata*	T-FL	X	X	
Apocynaceae	*Asclepias curtissii*	E-FL	X		X
Asteraceae	*Chrysopsis floridana*	E-US;E-FL	X	X	X
Asteraceae	*Garberia heterophylla*	T-FL			X
Cistaceae	*Lechea cernua*	T-FL	X	X	X
Cistaceae	*Lechea divaricata*	E-FL			X
Orchidaceae	*Pteroglossaspis cristata*	T-FL	X	X	

Table 12. Summary of new county records for plant species, by preserve.

Family	Species	Balm Boyette Scrub	Little Manatee River Corridor
Arecaceae	*Sabal etonia*		X
Cistaceae	*Lechea deckertii*	X	
Cistaceae	*Lechea minor*		X
Poaceae	*Digitaria insularis*	X	

Table 13. Banded and non-banded scrub jays observed during surveys.

Preserve	Dates Observed	Banding Sequence[1]	USFWS Band Number	Date Banded
Golden Aster Scrub	13 – 14 Mar. 2006	_-OKS	1083-78858	3 Mar. 2001
Golden Aster Scrub	13 – 14 Mar. 2006	Not banded	Not banded	Not banded
Little Manatee River Corridor	17 – 19 Apr. 2006	_-SKO	1083-78861	4 Mar. 2001
Little Manatee River Corridor	17 – 19 Apr. 2006	_-SKG	No data	No data

[1]Banding Sequence refers to color bands: 'O'- orange; 'K' - black; 'S' - silver; 'G' – green.

APPENDIX J

HILLSBOROUGH GREENWAYS MASTER PLAN (excerpt)



HILLSBOROUGH

Greenways

Master Plan

May 9, 1995

Hillsborough County Greenways Advisory Committee
National Park Service Rivers, Trails, and Conservation Assistance
Hillsborough County Planning and Development Management Department

likely be limited. For example, rather than follow the TECO corridor across the Boyette Scrub Preserve, a paved trail parallel to Balm-Boyette Road where it crosses the Boyette Scrub Preserve would be more appropriate, given the sensitive nature of the site. Ecologically important lands along this greenway are good candidates for educational/interpretive facilities and programs. Such facilities and programs already exist within State and County parks along the way and at Nature's Classroom on the Hillsborough River near Trout Creek Park.

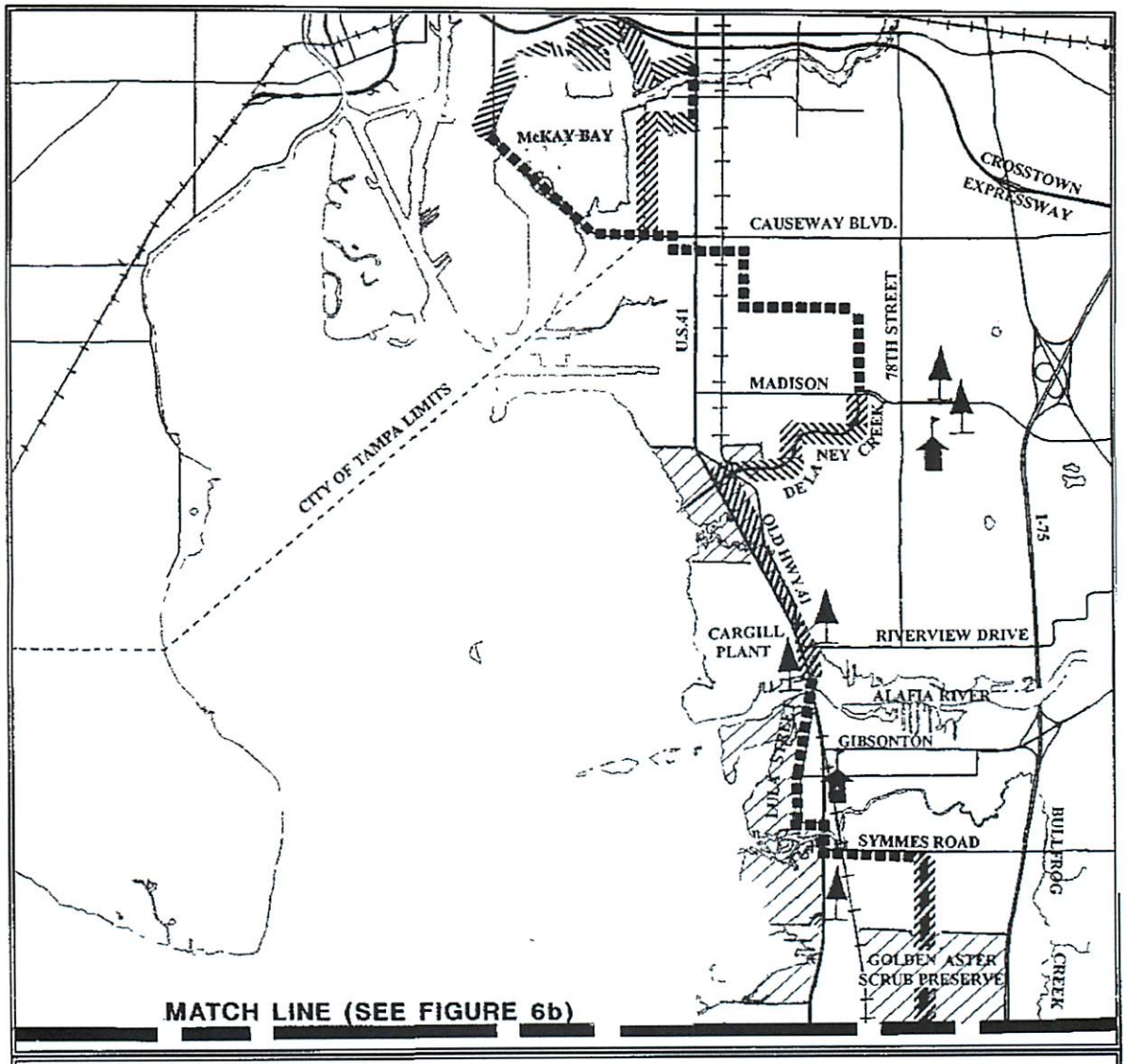
Opportunities and Constraints: Opportunities include: 1) a number of publicly owned parcels and off-road corridors connecting distant locations (e.g., Tampa By-Pass Canal, Harney Canal, Lower Hillsborough Flood Detention Area, and the Boyette Scrub Preserve), and 2) an abandoned rail corridor and other parcels owned by Tampa Electric Company (TECO) TECO has expressed interest in pursuing cooperative efforts for multiple-use of the company's rights-of-way in the county.

Possible constraints include' 1) whether multiple-use of the off-road corridors will be compatible with the use and management objectives of the o wners/land managing entities, 2) whether easement agreements with private property owners can be negotiated, 3) the feasibility and cost of crossing roads, canals, and rivers that intersect the greenway, and 4) whether any safety concerns exist and can be adequately addressed for those portions of the greenway adjacent to industrial.uses or potentially hazardous sites, such as those along the south leg of the Tampa By-Pass Canal.

- SOUTH COAST GREENWAY - McKay Bay to River Bend Ranch (Figure 6a-b)

Location and Destination Points: The alignment of this greenway is generally north-south. The greenway connects recently acquired public lands on the Little Manatee River to the planned McKay Bay Bikeway in the City of Tampa The greenway provides the southern coastal communities of Ruskin, Apollo Beach, Gardenville, Gibsonton, and Progress Village with access to an off-road multi-use trail.

Due to development along portions of this route, on-road bike facilities or facilities parallel to the roadway will be needed to link off-road trail segments. On-road facilities north of Madison Avenue near Delaney Creek and a pedestrian crossing of U.S. Hwy. 41 will be needed to provide a safe connection to the McKay Bay Bikeway.



LEGEND

- PROPOSED GREENWAY
- PARK
- ELAP SITE
- POWERLINE CORRIDOR
- SCHOOL
- PROPOSED BIKE LANES

SOUTH COAST GREENWAY

Figure 6a

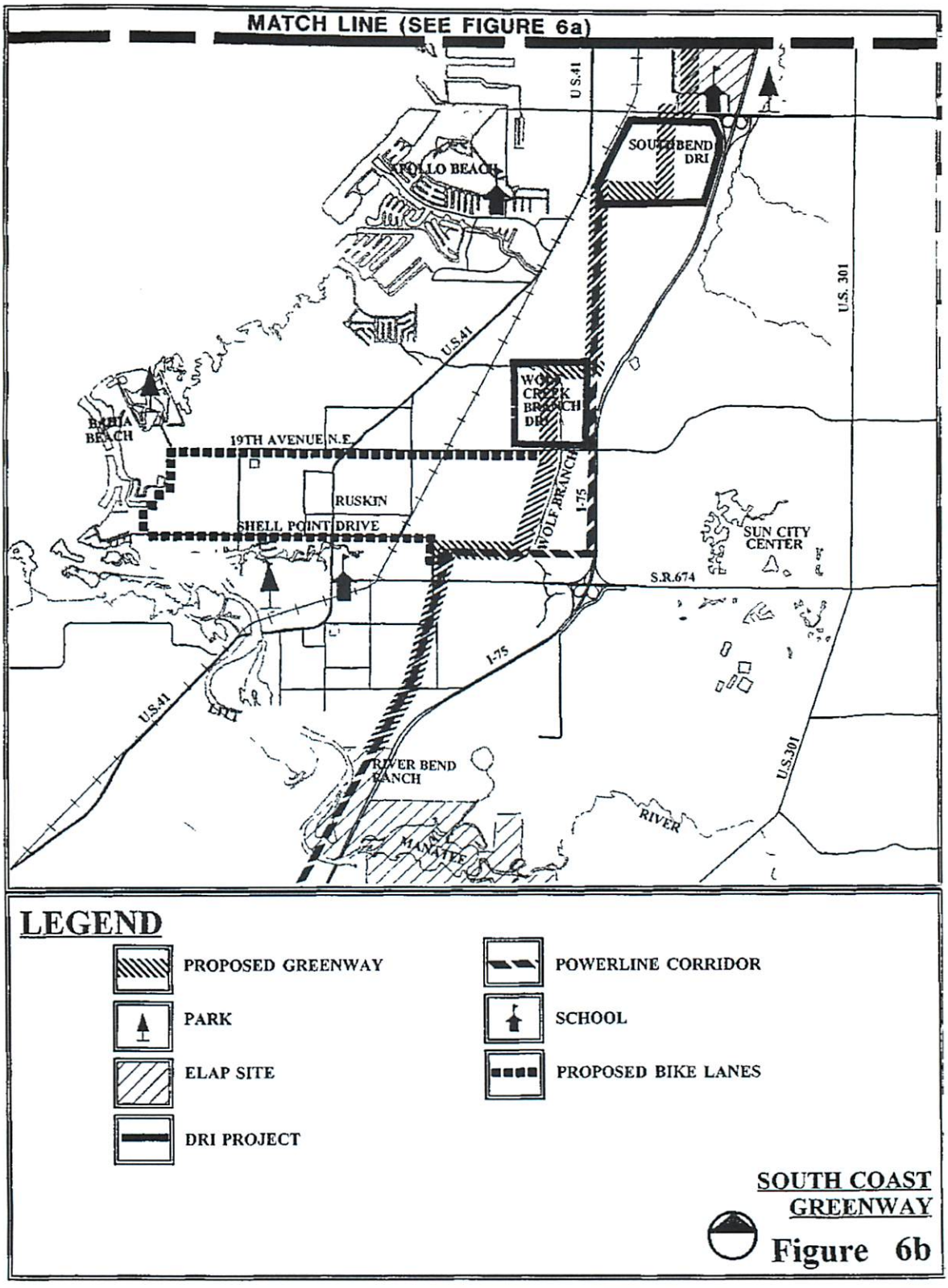

MATCH LINE (SEE FIGURE 6a)
U.S.41
SOUTH BEND DRI
APOLLO BEACH
U.S. 301
U.S.41
WOLF CREEK BRANCH DRI
BAHIA BEACH
19TH AVENUE N.E.
RUSKIN
SHELL POINT DRIVE
WOLF BRANCH
I-75
SUN CITY CENTER
S.R.674
I-75
U.S.41
RIVER BEND RANCH
U.S.301
RIVER
MANATEE
LEGEND
PROPOSED GREENWAY
PARK
ELAP SITE
DRI PROJECT
POWERLINE CORRIDOR
SCHOOL
PROPOSED BIKE LANES
SOUTH COAST GREENWAY

Figure 6b

The off-road segment of the greenway begins at Madison Avenue and runs southwest along Delaney Creek to intersection of the creek and Old Hwy. 41. This little used road provides the link to U.S. Hwy. 41. Alternatively, if the ELAP Program purchases sites identified between U.S. Hwy. 41 and Old Hwy. 41 south of Delaney Creek, an off-road trail might be possible.

At U.S. Hwy. 41 near the Cargill fertilizer plant, the route south across the Alafia River is on-road using backroads where ever possible. A parallel or on-road facility along the highway and across the Alafia River bridge links to Lula Street on the south side of the Alafia River west of U.S. Hwy. 41., with access points to the coast via ELAP sites. Depending on the environmental sensitivity of the sites, portions of the route might be off-road via boardwalks along coastal wetlands, providing excellent birding opportunities.

At Beach Avenue, the route turns east and south over Bullfrog Creek via the bridge at U.S. Hwy. 41 to Symmes Road, and then east on Symmes, past the Gardenville neighborhood park, to a north-south TECO right-or-way. Here the route is off-road again beginning at the intersection of Symmes Road and the TECO powerline corridor and running south along the powerline corridor through the Golden Aster Scrub Preserve, a recently acquired ELAP site north of Big Bend Road, to East Bay High School.

The remainder of the South Coast Greenway corridor is described from south to north beginning at the Little Manatee River. Most of this portion of the corridor follows the TECO powerline right-or-way.

River Bend Ranch, an ELAP/Save Our Rivers (SOR) site on the north side of the Little Manatee River, is the southern trailhead of the South Coast Greenways. Hiking within River Bend Ranch will be possible, with a trail connecting to public lands upstream along the river.

The greenway runs north using the TECO corridor west of I-75. Where the TECO corridor intersects Wolf Branch, the greenway follows along the edge of the creek on both the south and north side of 19th Avenue N.E. A portion of this route would be within the Wolf Creek Branch DRI, an undeveloped project approved for residential, commercial, and office uses, located on the north side of 19th Avenue N.E.

On-road bike lanes on 19th Avenue N.E. and Shell Point Road will provide the Ruskin and Bahia Beach communities access to the greenway and provide destination points for greenway users. Significantly, in the town of Ruskin, citizens are working on a vision for the community (The Ruskin Project) which, if implemented, will result in an attractive destination point for greenway users.

The Ruskin Project envisions a linear park along U.S. Hwy. 41 between Shell Point Road and College Avenue providing a shaded public walk separated from the road and Unking important public structures and historic buildings, including the Chamber of Commerce and Ruskin Women's Club. The Ruskin Project also calls for a more cohesive shopping area in the vicinity of Thriftway Plaza and the Post Office to be created by restructuring the parking configuration to make more inhabitable public spaces and connections between buildings. Another aspect of the project is to create a civic intersection in the vicinity of Ruskin Inlet and NW 2nd Avenue on both sides of U.S. Hwy. 41, which includes Commongood Park, the public library, and the Sheriffs Office.

North of Wolf Creek Branch DRI, the greenway utilizes the TECO corridor where it crosses agricultural land. Just north of the intersection of Elsberry Road, U.S. 41, and SCL Railroad, the greenway leaves the TECO corridor and jogs east along the south side of Southbend DRI, an undeveloped project approved for light industrial, office, and regional commercial uses. An easement across this project to Big Bend Road as well as across the west side of East Bay High School will be needed to reconnect to the north-south TECO right-of-way. North of the high school, the greenway follows the TECO right-of-way where it traverses the Golden Aster Scrub Preserve.

An historic site located west of this section of the greenway corridor is located immediately southeast of Apollo Beach on the east side of U.S. Hwy. 41. Also, several archaeological sites are located within the Golden Aster Scrub Preserve. Near the greenway's juncture with the Alafia River are clustered a number of historic and archaeological sites.

Physical Characteristics; The greenway's physical character varies depending on the location. Public natural preserves (both acquired and proposed), a drainage right-of-way along Delaney Creek, a TECO powerline corridor, and on-road facilities connecting off-road segments characterize the greenway corridor.

Possible Uses and Functions; This greenway will function as a multi-use recreational trail for bicycling, skating, and jogging and will provide a route for alternative (non-motorized) transportation. Other activities include environmental education, nature appreciation, and hiking in the preserves along the greenway corridor.

Opportunities and Constraints; The opportunities include: 1) an existing off-road TECO powerline corridor that connects distant locations, 2) several undeveloped, large DRI projects which may be able to accommodate a greenway crossing, 3) the efforts and complementary objectives of the AWARE project, which was recently initiated by the National Audubon Society to develop and implement a phased series of habitat restoration

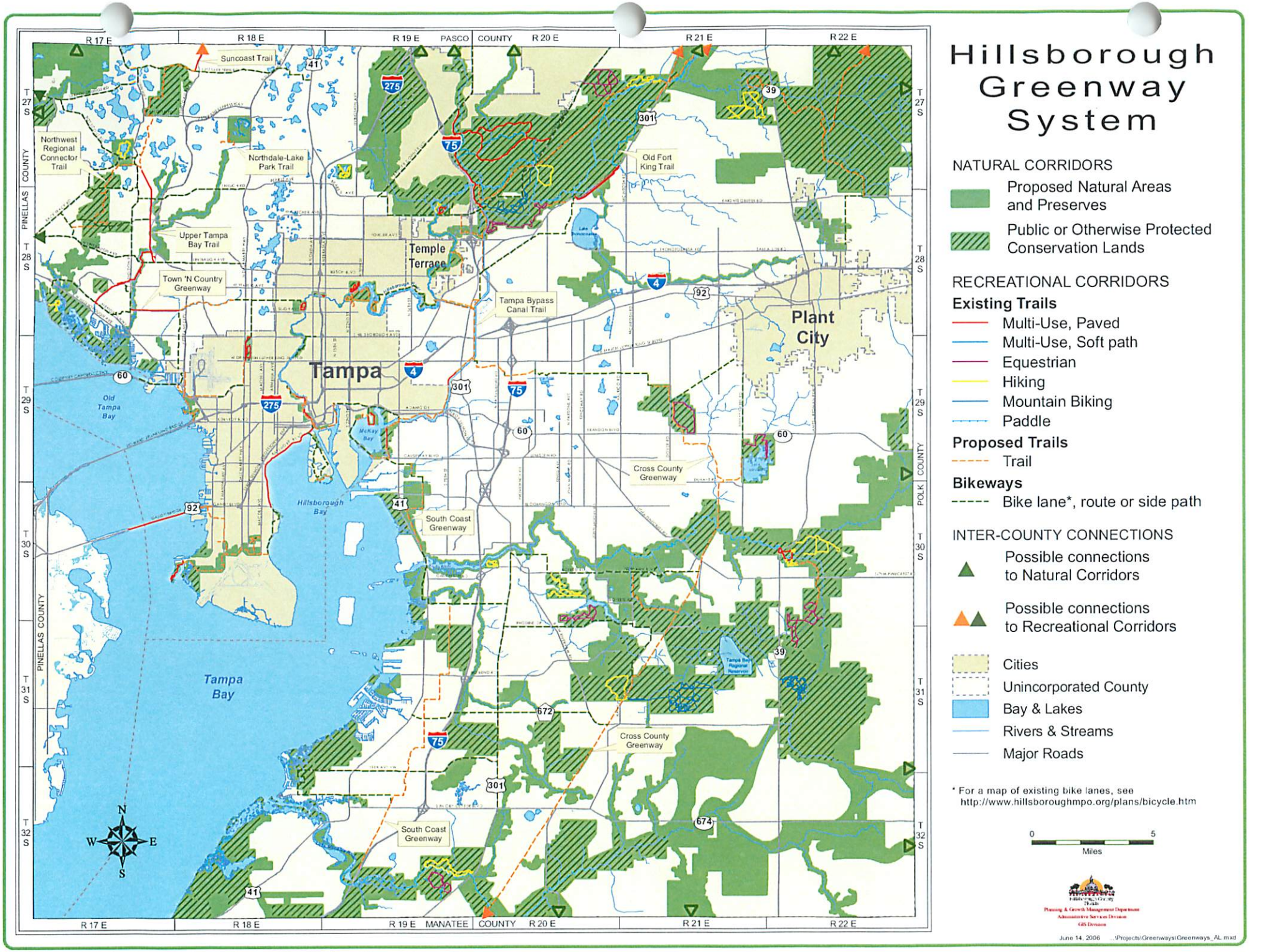
projects in the vicinity of the South Coast Greenway and the communities of Gibsonton, Progress Village, and Gardenville, 4) the identification of several parcels along the greenway for acquisition and restoration by the SWIM, Save Our Rivers (SOR), and ELAP Programs, and 5) the Ruskin Project, which could achieve a number of greenway objectives by linking public lands, common areas, public buildings, and historic structures.

Possible constraints to creating the South Coast Greenway include: 1) few lands presently in public ownership, 2) whether easement agreements with private property owners/land managing entities can be negotiated, 3) the feasibility of crossing roads and drainage ditches where these intersect the greenway, and 4) whether safety concerns can be satisfactorily addressed for portions of the greenway adjacent to industrial uses, such as Cargill's fertilizer plant.

♦ **LUTZ COMMUNITY GREENWAY** - trail and open space corridor parallel to U.S. Hwy. 41 and CSX railroad between Newberger Road and Crenshaw Lake Road (Figure 7)

Location and Destination Points: This greenway runs parallel to U.S. Hwy. 41 in the community of Lutz. Destination points include the Lutz Library and site of the Lutz Arts and Crafts Festival on Lutz-Lake Fern Road, the historic Old Lutz School, Lutz Elementary, and the commercial district. On-road bike facilities connect this greenway to the northwest via Lake Lutz Fern Road. The Lutz Athletic Fields on Crooked Lane and Nye Park on Sunset Lane are also accessible from the greenway via on-road bike facilities. A connection to the Tampa Palms area might be possible via the Florida Power or TECO utility corridor and the Cypress Creek Greenway.

Physical Characteristics: This greenway parallels U.S. Hwy. 41 and CSX railroad, utilizing the unused portions of the rights-of-way of these facilities. While the majority of the natural vegetation in the area has been impacted by development, some cypress wetlands and agriculturally improved uplands exist in the area.


Hillsborough Greenway System
NATURAL CORRIDORS
Proposed Natural Areas and Preserves
Public or Otherwise Protected Conservation Lands
RECREATIONAL CORRIDORS
Existing Trails
Multi-Use, Paved
Multi-Use, Soft path
Equestrian
Hiking
Mountain Biking
Paddle
Proposed Trails
Trail
Bikeways
Bike lane*, route or side path
INTER-COUNTY CONNECTIONS
Possible connections to Natural Corridors
Possible connections to Recreational Corridors
Cities
Unincorporated County
Bay & Lakes
Rivers & Streams
Major Roads
* For a map of existing bike lanes, see http://www.hillsboroughmpo.org/plans/bicycle.htm
0
5
Miles
Planning & Growth Management Department
Administrative Services Division
GIS Division
June 14, 2006 ...\Projects\Greenways\Greenways_AL.mxd
Tampa
Temple Terrace
Plant City
Tampa Bay
Old Tampa Bay
Hillsborough Bay
McKay Bay
Suncoast Trail
Northwest Regional Connector Trail
Northdale-Lake Park Trail
Upper Tampa Bay Trail
Town 'N Country Greenway
Tampa Bypass Canal Trail
Old Fort King Trail
Cross County Greenway
South Coast Greenway
R 17 E
R 18 E
R 19 E
R 20 E
R 21 E
R 22 E
PASCO COUNTY
PINELLAS COUNTY
POLK COUNTY
MANATEE COUNTY
T 27 S
T 28 S
T 29 S
T 30 S
T 31 S
T 32 S
N
S
E
W

Appendix K
Arthropod Control Plan

Florida Department of Agriculture and Consumer Services
Division of Agricultural Environmental Services

ARTHROPOD MANAGEMENT PLAN - PUBLIC LANDS

Section 388.4111, F.S.
Telephone: (850) 617-7995

Return to:
Mosquito Control Program
3125 Conner Blvd, Bldg 6,
Tallahassee, Florida 32399-1650

NICOLE "NIKKI" FRIED
COMMISSIONER

For use in documenting an Arthropod Control Pan for lands designated by the State of Florida or any political subdivision thereof as being environmentally sensitive and biologically highly productive therein. Fill this form out if control work is necessary or planned.

Name of Designated Land: Golden Aster Scub

Is Control Work Necessary: ☒ Yes ☐ No

Location: Hillsborough County

Land Management Agency: Hillsborough County Conservation and Environmental Lands Management

Are Arthropod Surveillance Activities Necessary? ☒ Yes ☐ No
If "Yes", please explain: Surveillance of this area is used to possibly control nuisance mosquitos and disease vector mosquitos when necessary.

Which Surveillance Techniques Are Proposed?
Please Check All That Apply:

☒ Landing Rate Counts	☒ Light Traps	☒ Sentinel Chickens
☒ Citizen Complaints	☒ Larval Dips	☐ Other

If "Other", please explain:

Arthropod Species for Which Control is Proposed: Mosquitoes

Proposed Larval Control:

In the event of a public health concern or citizens in adjacent communities submit requests for service because of a significant increase in adult mosquito activities a technician is sent to the area to conduct adult landing rate counts, identification, and cavas tha area to identify standing water that is harboring mosquito larvae.

Proposed larval monitoring procedure:

Are post treatment counts being obtained: ☐ Yes ☒ No

Biological Control of Larvae:

Might predacious fish be stocked: ☐ Yes ☒ No

Other biological controls that might be used:

Material to be Used for Larvaciding Applications:

(Please Check All That Apply:)

☒ Bti

☒ Bs

☒ Methoprene

☒ Non-Petroleum Surface Film

☐ Other, please specify:

Please specify the following for each larvacide:

Chemical or Common name: Vecto Bac GS, Altosid LLC SR-5, Vecto Bac 12-AS, Coco Bear, Vecto Max FG

☒ Ground ☒ Aerial

Rate of application: Per label recommendations.

Method of application: Ground and aerial.

Proposed Adult Mosquito Control:

Aerial adulticiding ☒ Yes ☐ No

Ground adulticiding ☒ Yes ☐ No

Please specify the following for each adulticide:

Chemical or common name: Perm-X 30-30, Permanone 30-30, Dibrom, Anvil 10+10, Duet HD

Rate of application: Per label recommendations.

Method of application: Ground and aerial.

Proposed Modifications for Public Health Emergency Control: Arthropod control agency may request special exception to this plan during a threat to public or animal health declared by State Health Officer or Commissioner of Agriculture.

Proposed Notification Procedure for Control Activities:

Records:

Are records being kept in accordance with Chapter 388, F.S.:

☒ Yes ☐ No

Records Location: 6527 Eureka Springs Rd, Tampa FL, 33610

How long are records maintained: 3 Years

Vegetation Modification:

What trimming or altering of vegetation to conduct surveillance or treatment is proposed? None

Proposed Land Modifications:

Is any land modification, i.e., rotary ditching, proposed: None

Include proposed operational schedules for water fluctuations: None

List any periodic restrictions, as applicable, for example peak fish spawning times. None

Proposed Modification of Aquatic Vegetation: None

Land Manager Comments:

Arthropod Control Agency Comments:

Signature of Lands Manager or Representative Date

Rachel T. Thomas 7/7/2022

Signature of Mosquito Control Director/ Manager Date

APPENDIX L

EXOTIC SPECIES INFORMATION

WEC 191

UF UNIVERSITY of FLORIDA
IFAS Extension

Ecology of Wild Hogs in Florida[1]

William M. Giuliano and George W. Tanner[2]



Figure 1. A wild hog foraging in a field. These animals are true pigs and not native to Florida or North America. Credits: Photo by M.S. Smith.

History, Distribution, and Abundance

Florida's wild hogs (Figure 1) are often referred to as feral hogs or swine and are of three general types. These include free-ranging swine that come from domesticated stock, Eurasian wild boar, and hybrids of the two. Although technically, feral refers to free-ranging animals from domesticated stock, all wild hogs are typically referred to as feral in Florida and all are considered the same species, *Sus scrofa*. Wild hogs are in the family Suidae (true wild pigs), none of which are native to the Americas. Although not found in Florida, the only native pig-like mammal found in the United States is the collared peccary or javelina (*Tayassu tajacu;* Figure 2). These are not true pigs, in the family Tayassuidae, and about half the size of typical wild hogs.

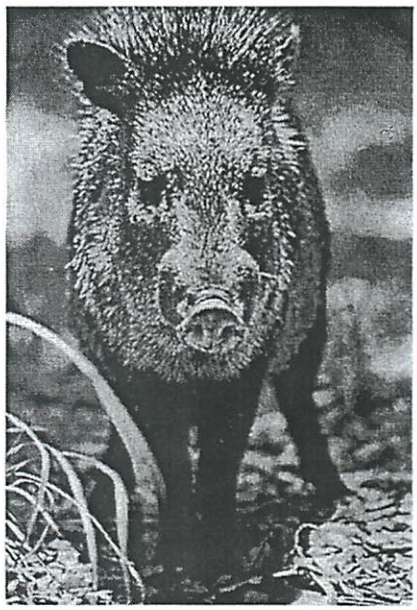


Figure 2. Although they look similar to wild hogs, peccaries are not true pigs. Not found in Florida, they are the only native, pig-like animal in North America. Credits: U.S. Fish and Wildlife Service/Photo by T. Stehn.

1. This document is WEC 191 and is one of a series of the Department of Wildlife Ecology and Conservation, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences (IFAS), University of Florida. First published: April 2005. Please visit the EDIS Web site at http://edis.ifas.ufl.edu for more publications.

2. William M. Giuliano is an Assistant Professor and Wildlife Extension Specialist; and George W. Tanner is a Professor; Department of Wildlife Ecology and Conservation, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL 32611.

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It is believed that hogs were first brought to Florida, and possibly the U.S., in 1539, when Hernando de Soto brought swine to provision a settlement he established at Charlotte Harbor in Lee County. However, it is possible that hogs had been brought to the same site in 1521 by Ponce de Leon during a brief visit. During the next 4 centuries, explorers and settlers brought pigs with them throughout Florida. Many of these animals were given to or stolen by Native Americans who expanded pig numbers and distribution in the State. Europeans and Native Americans alike often raised their swine in semi-wild conditions (at least until the mid-1900s when open range ended and it became illegal) where hogs were allowed to roam freely and only rounded up when needed. Many of these animals and those escaping from captivity established feral populations throughout Florida. These feral populations have been further supplemented through deliberate releases of hogs in many areas by private individuals and the Florida Fish and Wildlife Conservation Commission to improve hunting opportunities (although the State no longer does this).

Eurasian wild boar were first released in the U.S. in New Hampshire in 1886. Boar were then released in New York (1900), North Carolina/Tennessee (1912), Texas (1919), Washington State (1981), and possibly other locations to provide a new, huntable big game species, and increase the sporting and trophy value of feral hogs through hybridization. Although most were released in enclosed areas, many escaped and readily hybridized with local feral hogs. A few Eurasian wild boar and many hybrids naturally dispersed to areas around release sites, including neighboring states. Hybrids have been trapped and moved to many parts of Florida by private individuals. In addition, the Florida Fish and Wildlife Conservation Commission has trapped and released feral hogs and hybrids in many areas to control hog-related problems in some areas and improve hunting opportunities in others. There are not believed to be any free-ranging, pure Eurasian wild boar in Florida, only feral hogs and hybrids.

Wild hogs are now found in every county in Florida and in at least 35 states and Canadian provinces, including most of the Southeast. Florida, second only to Texas, is estimated to have 500,000+ wild hogs in a relatively stable population, with 1 to 2 million in the Southeastern U.S. Some of the highest densities of hogs in Florida can be found north and west of Lake Okeechobee in areas with large forested tracts, dense understory vegetation, and limited public access. Hog numbers tend to be lower in areas with intensive agriculture and urbanization, and little water.

Description

All wild hogs are hoofed mammals, stocky with relatively short legs, long snouts ending in a disk, and long canine teeth that appear as tusks. Feral hogs resemble domestic hogs, but are usually leaner and have developed different behaviors that promote survival in the wild. Eurasian wild boar stand slightly taller but are approximately the same weight as feral hogs, and typically have longer hair (especially bristles), a leaner appearance, larger heads, and longer snouts. Coloration of feral hogs and Eurasian wild boar can vary. Feral hogs typically have solid-colored, black, white, and/or reddish-brown hair either in solid or mottled patterns across the body (Figure 3). The hair of Eurasian wild boar is typically brown at the base and light-tipped over most of the body, with some areas having brown or black, solid-colored hair. They also often have white-tipped hairs on the head forming a saddle-like patch of hair or streak of hair around the mouth. Hybrids have various combinations of feral hog and Eurasian wild boar characteristics. Appearance alone can be deceiving and is not considered a reliable means of determining whether a wild hog is of Eurasian wild boar decent, a feral hog, or a hybrid.



Figure 3. Wild hogs occur in a variety of colors. Credits: Photo by J. Allen.

Wild hog size and weight are variable, and depend on genetics and local conditions. Typically, male hogs (called boars) are larger than females (called sows). Average adult males may weigh 200+ pounds, stand 3 feet at the shoulder, have tails reaching 12 inches, and are almost 5 feet from the tip of the tail to the tip of the snout. However, males greater than twice this size have been recorded. Hogs have 4 continually growing, self-sharpening tusks (2 in the upper and 2 in the lower jaw; the rubbing of upper and lower tusks keeps them sharp). Tusks in females are relatively small, while in males they become quite pronounced and have trophy value. Male hogs generally possess a thick hide on their shoulders (up to 3/4" thick) known as a hog shield that protects them during fights. All wild hogs have an excellent sense of smell and good hearing, but relatively poor vision. Wild hogs use a variety of vocalizations, including an alarm grunt given by the first hog to sense an intruder that causes a flight response by the rest of the herd. Other vocalizations are similar to domesticated pigs. Wild hogs also communicate through scent posts that are often also used for body-scratching and rubbing. Boars also "tusk" small trees, frequently pines, scraping off the outside bark with their tusks. This behavior may play a part in some type of dominance display. Such actions can seriously damage the rubbed objects, often trees (Figure 4).



Figure 4. Wild hogs use objects, often trees, for body-scratching, and boars may "tusk" small trees as part of a dominance display. Credits: U.S. Department of Agriculture Photo.

Hog sign includes tracks, trails, wallows, rooting, rubbing, and scat (Figure 5).



Figure 5. Wild hog feet and tracks are similar to those of domesticated pigs. Typically, the rear toes make little or no mark on the ground. Credits: Photos by C.L. Giuliano.

Habitat Relationships

Hogs use a variety of habitat types in Florida, from flatwoods, upland pine, and bottomland hardwood forests to coastal areas, marshes, swamps, and more open agricultural lands. However, hogs prefer large forested areas with abundant food, particularly acorns, interspersed with marshes,

hammocks, ponds, and drainages; cover in the form of dense brush; and limited human disturbance. Dense cover is used as bedding areas and provides protection from predators and hunters (Figure 6).

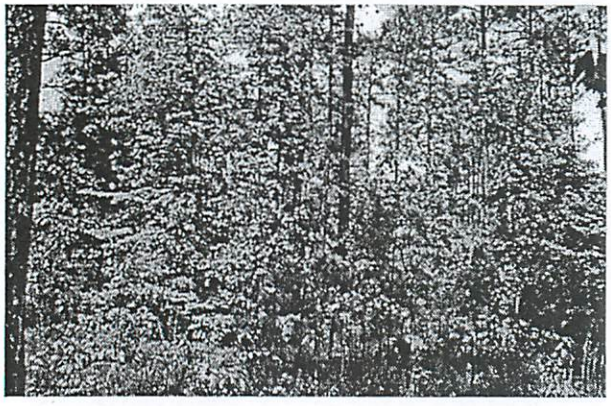


Figure 6. Wild pigs prefer to live in large tracks of forest with abundant food, dense understories, access to water, and little human disturbance. Credits: U.S. Department of Agriculture/Photo by W. Boyer.

The absence of water or wet soil conditions will eliminate or severely limit the use of an area by hogs. Wet conditions are important for hog wallowing in the warm climate of Florida. Hogs have poor physiological cooling mechanisms and keep from over heating by wallowing in mud and water (Figure 7). Wallowing also serves as a means of reducing ectoparasites, and will occur in almost any wet area. In cooler weather, hogs may seek open areas that allow maximum warming from the sun.

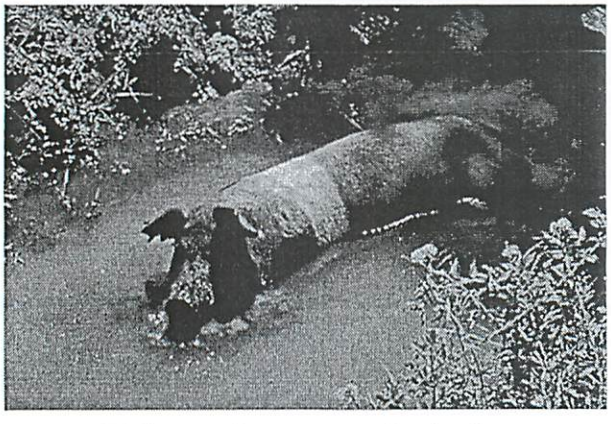


Figure 7. Wild hogs wallow to stay cool and reduce parasite infestation. Credits: U.S. Department of Agriculture Photo.

Seasonal changes in habitat use are typically related to food availability, with hogs preferring areas containing abundant hard mast (such as acorns and hickory nuts; Figure 8) and if unavailable, soft mast such as plums and other fruits.

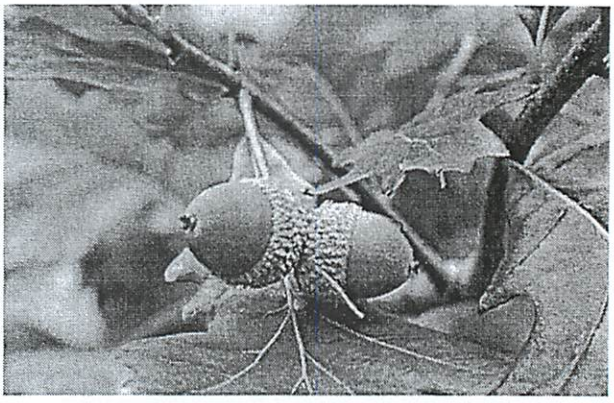


Figure 8. Although they are opportunistic and omnivorous feeders, the favorite food of wild hogs is acorns. Credits: U.S. Department of Agriculture/Photo by P. Wray.

Wild hogs are omnivorous, opportunistic feeders. However, they consume far more plant than animal material, and may occasionally consume carrion (dead animals). The list of foods eaten by hogs is diverse and includes grass, forb, and woody plant stems, roots, tubers, leaves, seeds, and fruits, fungi, and a variety of animals including worms, insects, crustaceans, mollusks, fish, small birds, mammals, reptiles, and amphibians. The opportunistic tendencies of wild hogs often lead them to forage in agricultural lands and forest plantations where they can cause significant losses of crops, including corn, rice, sorghum, melons, peanuts, forage grasses, grains, various vegetables, and tree seedlings. Wild hogs will also readily exploit game feeders, placed for deer, turkey, and other wildlife, and may destroy wildlife food plots by rooting (digging for foods below the surface of the ground).

General Biology

In Florida, wild hogs breed year round with peaks in the breeding cycle during fall and spring. Breeding activity includes courtship behavior, males fighting to achieve dominance and access to mates, and copulation. While hogs may be sexually mature at 6 months of age, they typically do not breed until about one year of age, provided there is good nutrition. Sows produce a "nest", which is usually a shallow depression in the ground, with or without vegetative nesting material, located in shaded, upland sites. With pregnancy lasting about 115 days, hogs

can produce (farrow) 2 litters of 1-13 (usually 5-7) piglets per year, with the young usually born in a 1:1 male:female ratio. Piglets remain in the nest for 3 weeks, during which time they are frequently nursed by the sow. Piglets then begin to move with the sow away from the nest and progressively rely less on nursing for food. When sow nutrition is poor, reproduction may be reduced or delayed, and sows have been known to eat their young (Figure 9). Typically, boars are solitary animals except when breeding. However, sows (1-3) and their offspring travel in groups called sounders.



Figure 9. A female wild hog in poor condition forages along a road. Poor nutrition will lead to lower breeding success. Credits: U.S. Department of Agriculture/Photo by T.C. Crocker.

Although they breed much earlier, it may take 3-5 years until hogs are fully grown. Under good conditions, wild hogs usually live 4-5 years, with some living 8+ years. Hog mortality is greatest during the first 6 months of life, with predation, accidents, and starvation as leading causes of death during this time. As adults, hogs typically have higher survival rates, with hunting, a wide variety of diseases and parasites, and starvation as leading causes of mortality. Humans are the main predators of wild hogs, but large carnivores such as alligators, black bears, and Florida panthers may be capable of preying on adult animals (Figure 10). Piglets are also preyed upon by smaller predators including foxes, coyotes, and bobcats. When conditions are favorable, hog reproduction exceeds mortality leading to growing and overabundant populations.

Wild hogs typically range over 450-750 acres, but may range wider in search of food. During the cooler months of the year, hogs may be active and



Figure 10. Humans are the primary predator of adult wild hogs. However, the Florida panther and other predators can easily prey upon younger animals. Credits: U.S. Fish and Wildlife Service/Photo by G. Gentry.

feed during both day and night. However, if hunting pressure or temperatures are high, they will seek cover during the day, and feed and be most active at night. Seasonal changes in activity are also related to breeding, with sows being less active and traveling over significantly smaller areas when piglets are in the nest, and males traveling over considerably larger areas in search of mates.

Problems

The opportunistic and omnivorous tendencies of wild hogs lead to many conflicts with people and wildlife. With hard mast as their preferred food, hogs directly compete with many popular game animals, including deer, turkeys, and squirrels. This competition is considered to be a significant limiting factor for populations of these native species in some areas. In addition, hogs may consume the nests and young of many reptiles (including sea turtles; Figure 11), ground-nesting birds, and mammals (including deer fawns). Wild hogs have also been known to consume young domestic livestock including poultry, lambs, and goats.

When natural foods are scarce or inaccessible, hogs will readily forage on almost any agricultural crop and feed set out for livestock and wildlife, leading to significant losses. Wild hogs will also feed on tree seeds and seedlings, causing significant damage in forests, orchards, and plantations. In Florida and the Southeast, this may be a serious

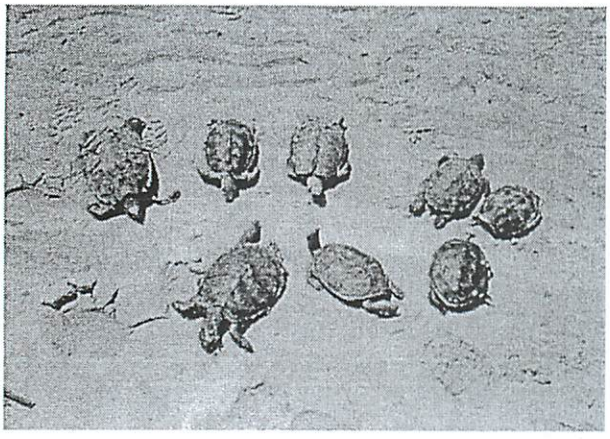


Figure 11. Hogs often prey upon the nests of ground nesting wildlife, including sea turtles. Credits: National Oceanic and Atmospheric Administration/Department of Commerce Photo.

problem in regenerating important long-leaf pine forests.

In addition to the effects of consuming, knocking down, rubbing, and trampling large amounts of native vegetation and crops, the rooting behavior of hogs also causes significant damage. Rooting destabilizes the soil surface, which can lead to erosion and exotic plant establishment; uproots or weakens native vegetation; and damages lawns, dikes, roads, trails, and recreation areas (Figure 12). They have also been known to damage fences and other structures. Wallowing behavior also destroys small ponds and stream banks, and can lead to declines in water quality.

Another area of concern is the potential for wild hogs to serve as reservoirs for many diseases and parasites that may affect native wildlife, livestock, and people. Hogs have been known to carry dozens of such pathogens, including cholera, psuedorabies, brucellosis, tuberculosis, salmonellosis, anthrax, ticks, fleas, lice, and various flukes and worms. Although not considered a serious threat to people, millions of dollars are spent each year to keep livestock safe from such problems.

Finally, hogs can be dangerous. Although wild hogs prefer to run and escape danger, if injured, cornered, or with young they can become aggressive, move with great speed, and cause serious injury (mainly with their tusks; Figure 13).

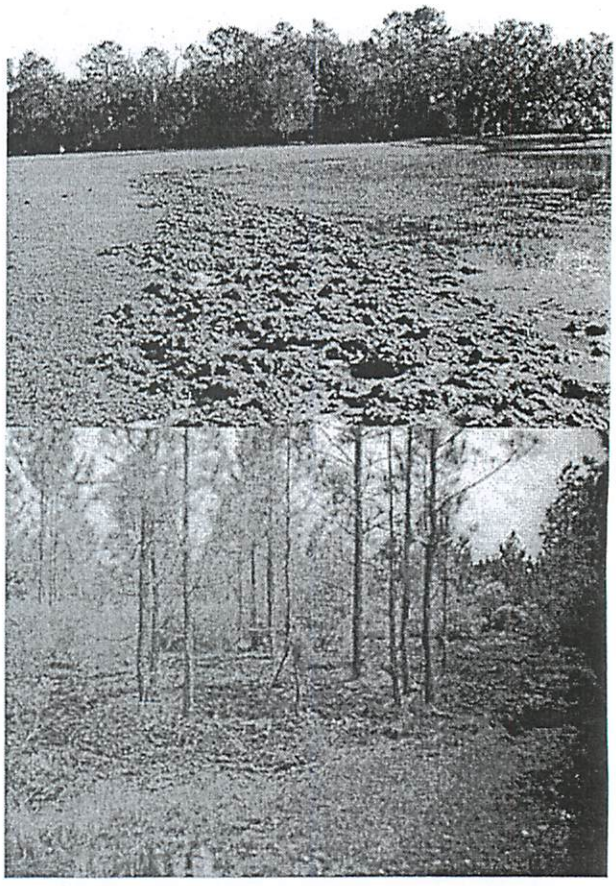


Figure 12. Rooting by wild hogs in search of buried foods can lead to erosion and water quality problems, as well as the destruction of native vegetation around ponds and in the forest. Credits: Top Photo by W.M. Giuliano; Bottom Photo by W. Frankenberger.

Information on control and management of wild hogs in Florida can be found at: http://edis.ifas.ufl.edu/UW221 or through The Florida Fish and Wildlife Conservation Commission (http://www.floridaconservation.org).

Additional Information on Wild Hogs:

http://www.wildflorida.org/critters/hog.asp

http://texnat.tamu.edu/symposia/feral/feral-14.htm

http://wildlifedamage.unl.edu/handbook/handbook/allPDF/mam_d65.pdf

http://ector-co.tamu.edu/publications/l1925.pdf

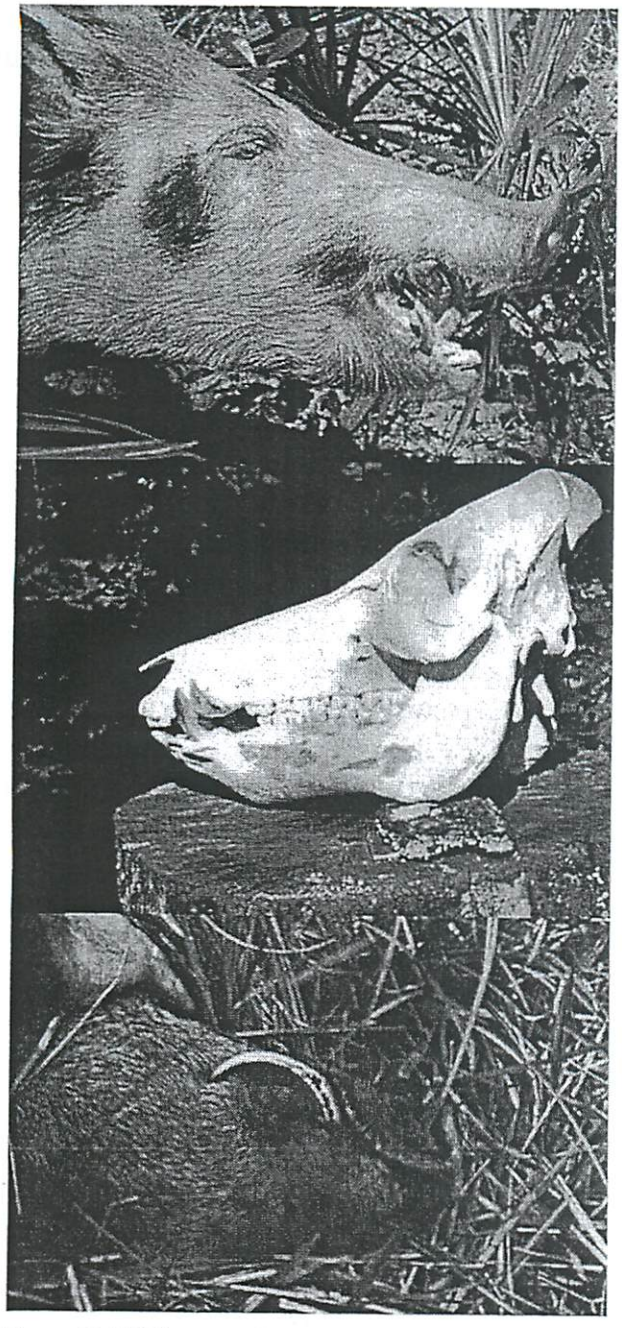


Figure 13. Wild hogs can be aggressive, and long, sharp tusks make them dangerous. Credits: Top Photos by J. Dunlap and M. Ludlow; Bottom Photo by W. Frankenberger.

http://www.noble.org/Ag/Wildlife/FeralHogs/03-Current.htm

http://feralhog.tamu.edu/

Feral Hog or European Wild Boar (*Sus scrofa*). The domestic pig's current status is domestic, semidomestic, feral, introduced, and immigrant (Tiebout 1983). It has this status because the domestic pig and the European wild boar are classified as the same species and freely interbreed. Any attempt to differentiate wild and domestic stock is futile because of the continuous interbreeding. Hogs were originally introduced into Florida by Spanish explorers more than 400 years ago (Frankenberger and Belden 1976), and in 1912, a wild stock of hogs was introduced for hunters into the mountains of Tennessee and North Carolina (Jones 1959). This wild boar population probably expanded to Florida on its own while other hogs were simultaneously introduced repeatedly by Florida sportsmen (Tiebout 1983). The feral hog population continues to breed with escaped domestic stock, which widens their genetic diversity (Tiebout 1983). Most free-roaming hogs are classified as semi-domesticated because of what is known as "hog claims" or the entitlements of land owners to lay claim to all hogs on their lands (Tiebout 1983). When feral hogs exist in large numbers, they may harm agriculture, forestry, wildlife, and natural ecosystems (Tisdell 1982), primarily because of their habit of rooting while foraging. This behavior may disturb large patches of land (250 m2 or more). Rooting can destroy understory vegetation and habitat for ground-nesting birds, terrestrial salamander, and other animals and may cause soil erosion (Belden and Pelton 1975). More specifically, rooting disrupts vegetative communities and successional patterns and alters nutrient cycling. Therefore, feral hogs directly and indirectly hurt other wildlife with predation or with alteration of the forest-floor habitat (Tate 1984). Thompson (1977) hypothesized that the wild hog is a notable competitor for food with many wildlife species such as deer (*Odocoileus virginianus*), turkeys (*Meleagris gallopavo*), squirrels (Family sciuridae), and waterfowl (Anatidae). An inverse relation between higher predation by snakes where hog populations are low suggests that wild hogs may use snakes as a prey base and therefore reduce predation by snakes (Thompson 1977). Thompson also concluded that the European wild hog is a minor predator of bird eggs and nestlings. Indirect evidence exists that hogs may take injured wildlife such as deer (*Odocoileus virginianus*) and newly dropped fawns (Belden 1990). Wild hogs may also pose a serious threat to the traditional, coastal nesting areas for marine turtles, especially the loggerhead turtle (*Caretta caretta*; Thompson 1977). Feral hogs frequently are in the same areas as domestic sheep and cattle and thus elevate the possibility of transmission of any disease to livestock. Because humans altered the populations of predators on the feral hog, wild hog populations may increase to damaging levels without human intervention (Tisdell 1982). Feral hogs can serve as vectors of diseases and parasites to domestic pigs (Becker et al. 1978; McVicar et al. 1981; Forrester et al. 1982; and Greiner et al. 1982). The hogs are able to smell dead animals, which may carry diseases and parasites and become infected while feeding on the carcasses and subsequently spread diseases and parasites to other species, including domesticated hogs.

Wood and Barrett (1979) were of the opinion that the introduction or enhancement of wild hog populations was ecologically unsound. They cited as adverse effects the competition with native wildlife species, forest and agricultural crop depredations, and the potential of the wild hog as a reservoir for diseases communicable to man and his domestic animals.

The detrimental effects of wild hogs are multifaceted and result from their movements, habitat utilization, and food habits. Their rooting disrupts vegetative communities and successional patterns as well as alters nutrient cycling. Therefore, they can have both direct and indirect effects on some fauna either through predation or alteration of the forest floor habitat (Tate 1983). It is hypothesized that the wild hog is a fairly significant competitor for food with a number of other wildlife species such as deer, turkey, squirrels and even waterfowl (Thompson 1977). Evidence to support the hypothesis of competition is not available; however, if it does exist, most all agree that the effects would be worse during years of poor mast crops (Tate 1983).

There is indirect evidence that hogs may take injured wildlife including deer and perhaps newly dropped fawns. Wild hogs on coastal areas which serve as important nesting areas for marine turtles, especially the loggerhead, pose a serious threat to successful nesting of turtles which return to a traditional beach to nest (Thompson 1977).

Wild hogs in Florida are known to have 45 different parasitic and infectious diseases. These include 37 parasites (12 protozoans, 17 nematodes, 1 acanthocephalan, 1 sucking louse, 4 ticks and 2 mites), 7 bacteria, and 1 virus. Eight of these parasitic and infectious diseases can infect man. These include brucellosis, leptospirosis, salmonellosis, toxoplasmosis, balantidiasis, trichinosis, trichostrongylosis, and sarcoptic mange. In addition, all four species of ticks will feed on man if the opportunity is presented. These potential public health threats should be kept in mind when considering a wild hog stocking program (Forrester 1991).

In general, feral swine populations do not appear to be compatible with human activities in a rapidly developing region. The extensive rooting, wallowing, and nocturnal foraging activities are ecologically destructive to many natural habitats as well as most cover types created and maintained by man (Brown 1985). Wild hogs can also be a costly nuisance to agricultural landowners. Each year wild hogs uproot acres of improved pasture, sod fields, horticultural plots, and forage, vegetable, and fruit crops. Landowners then look for ways to economically and effectively control wild hog populations to suppress crop damage (Alshouse 1989).

Florida Exotic Pest Plant Council's 2007 List of Invasive Plant Species

Purpose of the List: *To focus attention on —*

- the adverse effects exotic pest plants have on Florida's biodiversity and plant communities,
- the habitat losses from exotic pest plant infestations,
- the impacts on endangered species via habitat loss and alteration,
- the need to prevent habitat losses through pest-plant management,
- the socio-economic impacts of these plants (e.g., increased wildfires in certain areas),
- changes in the seriousness of different pest plants over time,
- the need to provide information that helps managers set priorities for control programs.

CATEGORY I

Invasive exotics that are altering native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives. *This definition does not rely on the economic severity or geographic range of the problem, but on the documented ecological damage caused.*

Scientific Name	Common Name	FLEPPC Cat.	Gov. List	Reg. Dist.
Abrus precatorius	rosary pea	I	N	C, S
Acacia auriculiformis	earleaf acacia	I		C, S
Albizia julibrissin	mimosa, silk tree	I		N, C
Albizia lebbeck	woman's tongue	I		C, S
Ardisia crenata (=*A. crenulata* misapplied)	coral ardisia	I		N, C, S
Ardisia elliptica (=*A. humilis* misapplied)	shoebutton ardisia	I	N	C, S
Asparagus aethiopicus (=*A. sprengeri*; *A. densiflorus* misapplied)	asparagus-fern	I		N, C, S
Bauhinia variegata	orchid tree	I		C, S
Bischofia javanica	bishopwood	I		C, S
Calophyllum antillanum (=*C. calaba* and *C. inophyllum* misapplied)	santa maria (names "mast wood," "Alexandrian laurel" used in cultivation)	I		S
Casuarina equisetifolia	Australian-pine, beach sheoak	I	P, N	N, C, S
Casuarina glauca	suckering Australian-pine, gray sheoak	I	P, N	C, S
Cinnamomum camphora	camphor tree	I		N, C, S
Colocasia esculenta	wild taro	I		N, C, S
Colubrina asiatica	lather leaf	I	N	S
Cupaniopsis anacardioides	carrotwood	I	N	C, S
Dioscorea alata	winged yam	I	N	N, C, S
Dioscorea bulbifera	air-potato	I	N	N, C, S
Eichhornia crassipes	water-hyacinth	I	P	N, C, S
Eugenia uniflora	Surinam cherry	I		C, S
Ficus microcarpa (*F. nitida* and *F. retusa* var. *nitida* misapplied)	laurel fig	I		C, S
Hydrilla verticillata	hydrilla	I	P, U	N, C, S
Hygrophila polysperma	green hygro	I	P, U	N, C, S
Hymenachne amplexicaulis	West Indian marsh grass	I		C, S
Imperata cylindrica (*I. brasiliensis* misapplied)	cogon grass	I	N, U	N, C, S
Ipomoea aquatica	waterspinach	I	P, U	C
Jasminum dichotomum	Gold Coast jasmine	I		C, S
Jasminum fluminense	Brazilian jasmine	I		C, S
Lantana camara	lantana, shrub verbena	I		N, C, S
Ligustrum lucidum	glossy privet	I		N, C
Ligustrum sinense	Chinese privet, hedge privet	I		N, C, S

FLEPPC List Definitions:

Exotic – a species introduced to Florida, purposefully or accidentally, from a natural range outside of Florida.

Native – a species whose natural range included Florida at the time of European contact (1500 AD).

Naturalized exotic – an exotic that sustains itself outside cultivation (it is still exotic; it has not "become" native).

Invasive exotic – an exotic that not only has naturalized, but is expanding on its own in Florida native plant communities.

Abbreviations:

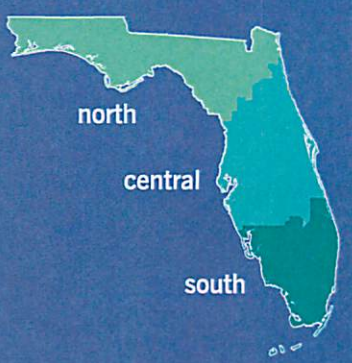
Government List (Gov. List):

P = Prohibited by Florida Department of Environmental Protection;

N = Noxious weed listed by Florida Department of Agriculture & Consumer Services;

U = Noxious weed listed by U.S. Department of Agriculture.

Regional Distribution (Reg. Dist.):
N = north, C = central, S = south, referring to each species' current distribution in general regions of Florida (not its potential range in the state). Please refer to the map below.



Changes to the 2007 List:

Ludwigia peruviana added to list as Category I

Peruvian primrose willow (*Ludwigia peruviana*) is a shrub known from at least 48 Florida counties, from the Panhandle to the Keys. It is also known in the United States from North Carolina, Georgia, Alabama, Mississippi, and Texas. While always known as an aggressive weed in wetlands in Florida, there has been debate about its nativity. After an evaluation of available data, the Committee now agrees that this species was introduced into Florida, probably from South America, by the late 1800s, and has subsequently spread throughout the state and to other states. It can form monospecific stands in both disturbed and undisturbed wetlands, especially river and lake edges, and dramatically change ecosystem structure.

Tradescantia spathacea moved from Category I to Category II

Oyster plant (*Tradescantia spathacea*) is an herb known from at least 12 counties in southern Florida, although many populations have not been documented. A native of tropical America, this species was a very common ornamental plant decades ago, and is still grown occasionally for its green and purple foliage. The species spreads readily, both by vegetation offshoots and by seed. In urban areas, plants often appear on rooftops or on rock walls. It does spread into natural areas, but Committee members are unaware of sites where it has invaded natural areas and displaced native species to the extent of other Category I species. It has been moved to Category II.

Scientific Name	Common Name	FLEPPC Cat.	Gov. List	Reg. Dist.
Lonicera japonica	Japanese honeysuckle	I		N, C, S
Ludwigia peruviana	Peruvian primrosewillow	I		N, C, S
Lygodium japonicum	Japanese climbing fern	I	N	N, C, S
Lygodium microphyllum	Old World climbing fern	I	N	C, S
Macfadyena unguis-cati	cat's claw vine	I		N, C, S
Manilkara zapota	sapodilla	I		S
Melaleuca quinquenervia	melaleuca, paper bark	I	P, N, U	C, S
Mimosa pigra	catclaw mimosa	I	P, N, U	C, S
Nandina domestica	nandina, heavenly bamboo	I		N, C
Nephrolepis cordifolia	sword fern	I		N, C, S
Nephrolepis multiflora	Asian sword fern	I		C, S
Neyraudia reynaudiana	Burma reed, cane grass	I	N	S
Paederia cruddasiana	sewer vine, onion vine	I	N	S
Paederia foetida	skunk vine	I	N	N, C, S
Panicum repens	torpedo grass	I		N, C, S
Pennisetum purpureum	Napier grass	I		N, C, S
Pistia stratiotes	waterlettuce	I	P	N, C, S
Psidium cattleianum (=*P. littorale*)	strawberry guava	I		C, S
Psidium guajava	guava	I		C, S
Pueraria montana var. *lobata* (=*P. lobata*)	kudzu	I	N	N, C, S
Rhodomyrtus tomentosa	downy rose-myrtle	I	N	C, S
Rhynchelytrum repens (=*Melinis repens*)	Natal grass	I		N, C, S
Ruellia tweediana (= *R. brittoniana* , *R. coerulea*)	Mexican petunia	I		N, C, S
Sapium sebiferum (=*Triadica sebifera*)	popcorn tree, Chinese tallow tree	I	N	N, C, S
Scaevola taccada (=*Scaevola sericea, S. frutescens*)	scaevola, half-flower, beach naupaka	I	N	C, S
Schefflera actinophylla (=*Brassaia actinophylla*)	schefflera, Queensland umbrella tree	I		C, S
Schinus terebinthifolius	Brazilian pepper	I	P, N	N, C, S
Senna pendula var. *glabrata* (=*Cassia coluteoides*)	climbing cassia, Christmas cassia, Christmas senna	I		C, S
Solanum tampicense (=*S. houstonii*)	wetland nightshade, aquatic soda apple	I	N, U	C, S
Solanum viarum	tropical soda apple	I	N, U	N, C, S
Syngonium podophyllum	arrowhead vine	I		N, C, S
Syzygium cumini	jambolan plum, Java plum	I		C, S
Tectaria incisa	incised halberd fern	I		S
Thespesia populnea	seaside mahoe	I		C, S
Tradescantia fluminensis	white-flowered wandering jew	I		N, C
Urochloa mutica (= *Brachiaria mutica*)	Para grass	I		C, S

CATEGORY II

Invasive exotics that have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by Category I species. *These species may become ranked Category I, if ecological damage is demonstrated.*

Scientific Name	Common Name	FLEPPC Cat.	Gov. List	Reg. Dist
Adenanthera pavonina	red sandalwood	II		S
Agave sisalana	sisal hemp	II		C, S
Aleurites fordii (=*Vernicia fordii*)	tung oil tree	II		N, C
Alstonia macrophylla	devil tree	II		S
Alternanthera philoxeroides	alligator weed	II	P	N, C, S
Antigonon leptopus	coral vine	II		N, C, S
Aristolochia littoralis	calico flower	II		N, C, S

Scientific Name	Common Name	FLEPPC Cat.	Gov. List	Reg. Dist.
Asystasia gangetica	Ganges primrose	II		C, S
Begonia cucullata	wax begonia	II		N, C, S
Blechum pyramidatum	green shrimp plant, Browne's blechum	II		N, C, S
Broussonetia papyrifera	paper mulberry	II		N, C, S
Callisia fragrans	inch plant, spironema	II		C, S
Casuarina cunninghamiana	river sheoak, Australian-pine	II	P	C, S
Cecropia palmata	trumpet tree	II		S
Cestrum diurnum	day jessamine	II		C, S
Chamaedorea seifrizii	bamboo palm	II		S
Clematis terniflora	Japanese clematis	II		N, C
Cryptostegia madagascariensis	rubber vine	II		C, S
Cyperus involucratus (*C. alternifolius* misapplied)	umbrella plant	II		C, S
Cyperus prolifer	dwarf papyrus	II		C, S
Dalbergia sissoo	Indian rosewood, sissoo	II		C, S
Elaeagnus pungens	silverthorn, thorny olive	II		N, C
Epipremnum pinnatum cv. Aureum	pothos	II		C, S
Ficus altissima	false banyan, council tree	II		S
Flacourtia indica	governor's plum	II		S
Hemarthria altissima	limpo grass	II		C, S
Hibiscus tiliaceus (=*Taliparíti tiliaceum*)	mahoe, sea hibiscus	II		C, S
Ipomoea fistulosa (=*I. carnea* ssp. *fistulosa*)	shrub morning-glory	II	P	C, S
Jasminum sambac	Arabian jasmine	II		S
Kalanchoe pinnata	life plant	II		C, S
Koelreuteria elegans ssp. *formosana* (=*K. formosana*; *K. paniculata* misapplied)	flamegold tree	II		C, S
Leucaena leucocephala	lead tree	II	N	N, C, S
Limnophila sessiliflora	Asian marshweed	II	P, U	N, C, S
Livistona chinensis	Chinese fan palm	II		C, S
Melia azedarach	Chinaberry	II		N, C, S
Melinis minutiflora	Molassesgrass	II		C,S
Merremia tuberosa	wood-rose	II		S
Murraya paniculata	orange-jessamine	II		S
Myriophyllum spicatum	Eurasian water-milfoil	II	P	N, C, S
Nymphoides cristata	snowflake	II		C, S
Panicum maximum	Guinea grass	II		N, C, S
Passiflora biflora	two-flowered passion vine	II		S
Pennisetum setaceum	green fountain grass	II		S
Phoenix reclinata	Senegal date palm	II		C, S
Phyllostachys aurea	golden bamboo	II		N, C
Pittosporum pentandrum	Philippine pittosporum, Taiwanese cheesewood	II		S
Pteris vittata	Chinese brake fern	II		N, C, S
Ptychosperma elegans	solitaire palm	II		S
Rhoeo spathacea (see *Tradescantia spathacea*)				
Ricinus communis	castor bean	II		N, C, S
Rotala rotundifolia	roundleaf toothcup, dwarf Rotala,	II		S
Sansevieria hyacinthoides	bowstring hemp	II		C, S
Scleria lacustris	Wright's nutrush	II		C, S
Sesbania punicea	purple sesban, rattlebox	II		N, C, S
Solanum diphyllum	two-leaf nightshade	II		N, C, S
Solanum jamaicense	Jamaica nightshade	II		C
Solanum torvum	susumber, turkey berry	II	N, U	N, C, S

Changes to the 2007 List:

Melinis minutiflora
added to list as Category II

Molasses grass (*Melinis minutiflora*) is a grass known from at least 6 Florida counties, mostly along the lower eastern coast. It is native to Africa and western Asia and was originally introduced as a forage grass in southern Florida. While it has been known to be established for some time, its populations have been expanding recently into undisturbed natural areas, especially pine rocklands in Miami-Dade County. Once established, it forms locally dense stands and excludes other herbs and graminoids. The strong molasses smell given off by the plants makes it especially easy to identify, particularly when it is stepped on.

Rotala rotundifolia
added to list as Category II

Roundleaf toothcup (*Rotala rotundifolia*) is an aquatic herb known from at least three Florida counties in southern Florida (Broward, Lee, and Palm Beach). It is also introduced in Alabama. It is native to India and Southeast Asia. The species is commonly grown as an aquarium plant and has been introduced after aquarium grown plants were discarded into Florida wetlands. It has become established in canals and along rivers. It reproduces readily through sexual and asexual means and is expected to spread within the state. It is also known as dwarf rotala.

Use of the FLEPPC List

FLEPPC encourages use of the Invasive Species List for prioritizing and implementing management efforts in natural areas, for educating lay audiences about environmental issues, and for supporting voluntary invasive plant removal programs. When a non-native plant species is to be restricted in some way by law, FLEPPC encourages use of the List as a first step in identifying species worth considering for particular types of restriction. For more information on using the FLEPPC List of Invasive Plant Species, see *Wildland Weeds* Summer 2002 issue (Vol. 5, No. 3), pp. 16-17.

NOTE: Not all exotic plants brought into Florida become pest plants in natural areas. The FLEPPC List of Invasive Plant Species represents only about 10% of the 1,300+ exotic species that have been introduced into Florida and subsequently established outside of cultivation. Most escaped exotics usually present only minor problems in highly disturbed areas (such as roadsides). And there are other exotics cultivated in Florida that are "well-behaved" — that is, they don't escape cultivation at all.

www.fleppc.org

Scientific Name	Common Name	FLEPPC Cat.	Gov. List	Reg. Dist.
Sphagneticola trilobata (=*Wedelia trilobata*)	wedelia	II		N, C, S
Stachytarpheta cayennensis (=*S. urticifolia*)	nettle-leaf porterweed	II		S
Syagrus romanzoffiana (=*Arecastrum romanzoffianum*)	queen palm	II		C, S
Syzygium jambos	rose-apple	II		C, S
Terminalia catappa	tropical-almond	II		C, S
Terminalia muelleri	Australian-almond	II		C, S
Tradescantia spathacea (=*Rhoeo spathacea, Rhoeo discolor*)	oyster plant	II		S
Tribulus cistoides	puncture vine, burr-nut	II		N, C, S
Urena lobata	Caesar's weed	II		N, C, S
Vitex trifolia	simple-leaf chaste tree	II		C, S
Washingtonia robusta	Washington fan palm	II		C, S
Wedelia (see *Sphagneticola* above)				
Wisteria sinensis	Chinese wisteria	II		N, C
Xanthosoma sagittifolium	malanga, elephant ear	II		N, C, S

Citation example:
FLEPPC. 2007. List of Florida's Invasive Plant Species. Florida Exotic Pest Plant Council. Internet: http://www.fleppc.org/07list.htm or *Wildland Weeds* Vol. 10(4), Fall 2007.

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FLEPPC Database – The Florida Exotic Pest Plant Database contains over 6,000 sight records of infestations of FLEPPC Category I and Category II species in Florida public lands and waters. 360 species are recorded. Nearly all of the records are from local, state, and federal parks and preserves; a few records document infestations in regularly disturbed public lands such as highway or utility rights-of-way. Natural area managers and other veteran observers of Florida's natural landscapes submit these records, with many supported further by voucher specimens housed in local or regional herbaria for future reference and verification. New and updated observations can be submitted online at www.fleppc.org/EDDMapS/ This database, along with other plant-data resources such as the University of South Florida Atlas of Florida Vascular Plants at www.plantatlas.usf.edu, the Florida Natural Areas Inventory database at www.fnai.org, and The Institute for Regional Conservation Floristic Inventory of South Florida database at www.regionalconservation.org, provides important basic supporting information for the FLEPPC List of Invasive Plant Species.

Images of FLEPPC-listed species may be found at one or more of the following websites: University of South Florida Atlas of Florida Vascular Plants, www.plantatlas.usf.edu; the "Introduced Species" page on the University of Florida Herbarium website, www.flmnh.ufl.edu/herbarium/cat/digitalimagingprojects.htm; at Fairchild Tropical Garden's Virtual Herbarium, www.virtualherbarium.org/vhportal.html, The Robert K. Godfrey Herbarium at FSU, http://herbarium.bio.fsu.edu/index.php; and at the University of Florida's Center for Aquatic and Invasive Plants, http://plants.ifas.ufl.edu. Please note that greater success and accuracy in searching for plant images is likely if you search by scientific name rather than a common name. Common names often vary in cultivation and across regions. For additional information on plants included in this list, see related links and pages at www.fleppc.org.

SS-AGR-52

UF UNIVERSITY of FLORIDA
IFAS Extension

Cogongrass (*Imperata cylindrica* (L.) Beauv.) Biology, Ecology and Management in Florida[1]

G. E. MacDonald, B. J. Brecke, J. F. Gaffney, K. A. Langeland, J. A. Ferrell and B. A. Sellers.[2]

History

Cogongrass is an aggressive, rhizomatous, perennial grass that is distributed throughout the tropical and subtropical regions of the world. It has become established in the southeastern United States within the last fifty years, with Alabama, Mississippi, and Florida having extensive acreage of roadway and pasture infested with cogongrass. Cogongrass first appeared in the area around Grand Bay, Alabama as an escape from Satsuma orange crate packing in 1912. It was intentionally introduced from the Phillippines into Mississippi as a possible forage in 1921. Cogongrass was introduced into Florida in the 1930s and 1940s as a potential forage and for soil stabilization purposes. However, it was revealed that cogongrass was of little economic (forage) benefit and could become a serious pest. Consequently, it was placed on the noxious weed list, which prohibits new plantings. Unfortunately, cogongrass was spread by illegal plantings and inadvertent transport in forage and in soil during roadway construction. It does not survive in cultivated areas but becomes established along roadways, in forests, parks, and mining areas. It is now found throughout Florida from the panhandle region well into south Florida.

Taxonomy

Cogongrass is a perennial grass that varies greatly in appearance. The leaves appear light green, with older leaves becoming orange-brown in color. In areas with killing frosts, the leaves will turn light brown during winter months and present a substantial fire hazard. Cogongrass grows in loose to compact bunches, each 'bunch' containing several leaves arising from a central area along a rhizome. The leaves originate directly from ground level and range from one to four feet in length. Each leaf is 1/2 to 3/4 of an inch wide with a prominent, off-center, white mid-rib. The leaf margins are finely serrated; contributing to the undesirable forage qualities of this grass. Seed production predominately occurs in the spring, with long, fluffy-white seedheads. Sporadic

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seedhead formation can also be induced by mowing, burning or fertilization. Seeds are extremely small and attached to a plume of long hairs. Although the seeds can be carried long distances by wind and animals, the spread of cogongrass by seed is questionable and still under investigation.

Ecology

Cogongrass is native to southeast Asia and infests nearly 500 million acres of plantation and agricultural land worldwide. It is found on every continent, although it does not tolerate cool temperatures. In the United States, cogongrass extends as far north as South Carolina and west to Texas. In Florida, cogongrass infests ditch banks, pastures, road sides/right-of-ways, golf courses, and forests. In central Florida, monocultures of cogongrass have become established on hundreds of acres of reclaimed phosphate mining areas. Cogongrass thrives on fine sand to heavy clay and does well on soils of low fertility. Attempts at finding natural pests of cogongrass have met with limited success. Pathogens have been isolated but none have been developed for effective control. Cogongrass does not tolerate dense shade. In Asian rubber plantations, cogongrass dies back upon canopy formation. However, reports of invasion into old growth forests in Florida suggest that a more shade-tolerant ecotype has developed.

The rhizomes are responsible for the survival and short-distance spread of cogongrass. Established stands may produce over 3 tons of rhizomes per acre. The specialized anatomy of the rhizome allows for water conservation. The rhizome can also penetrate to a depth of 4 feet in the soil, although the majority of rhizomes remain in the top 6 inches. The sheer mass and persistence of rhizomes is not the only factor contributing to the ability of cogongrass to dominate an area. It has also been reported that these rhizomes exude allelopathic substances which inhibit growth of other plants. As the density of cogongrass increases, all other vegetation may be excluded and normal succession of species will not occur.

Forage Value

Cogongrass has been utilized in southeast Asia as a forage due to the fact that it is the dominant vegetation on over 300 million acres. In these areas it was found that only very young shoots should be grazed or cut for hay. At this stage, the leaves lack the sharp points and razor-like leaf margins. Crude protein rarely attained the minimal 7% level needed to sustain cattle. Cogongrass yields are relatively low, even under heavy fertilization, and usually do not exceed 5 tons per acre. Furthermore, the nitrogen, phosphorus, and energy content of cogongrass is very low, making supplementation essential for livestock.

Control

Extensive research has been conducted in Africa, southeast Asia and the United States for the control of cogongrass. Burning, cultivation, cover crops, and herbicides have been used with varying degrees of effectiveness. To eliminate cogongrass, the rhizomes must be destroyed to avoid regrowth. Cultivation and herbicides have been the two control strategies used most often. One of the oldest and most successful methods is to deep plow or disk several times during the dry season to desiccate the rhizomes and exhaust the food reserves. It is essential to cut to a depth of at least 6 inches to ensure that most, if not all the rhizomes have been cut. Results from these practices are evident when observing cogongrass growing up to the edge of a cultivated field with no evidence of spread into the field itself.

The use of herbicides for control of cogongrass began in the 1940s. Today, only a few of the hundreds of herbicides tested are effective against cogongrass. In non-crop areas such as rights-of-way and fence rows, products such as glyphosate and imazapyr (Arsenal) will give excellent control. Imazapyr generally provides more consistent and longer-term control.

Glyphosate has no residual activity in the soil, and can be safely used around desirable vegetation such as trees, shrubs; providing that the glyphosate applications do not contact the foliage or green stem tissue. However, imazapyr has considerable soil residual activity and areas treated with imazapyr will often be devoid of vegetation for 6 months to one

year. In addition, desirable vegetation, especially oaks and other hardwood tree species present within or in close proximity to the treated cogongrass, may be killed or severely injured. This will occur if imazapyr contacts the foliage or is taken up through the roots. Often legume species and certain composite species may colonize the area first, due to their tolerance to imazapyr.

Integrated Management

Although tillage and herbicides will provide some control and suppression of cogongrass, long-term eradication is seldom achieved. It has been shown that an integrated approach that combines burning, tillage (mechanical disturbance) and chemical applications provide the best solution for cogongrass management.

Initially, cogongrass should be burned or mowed to remove excess thatch and older leaves. This initiates regrowth from the rhizomes, thereby reducing rhizome biomass. It also allows herbicides to be applied to only actively growing leaves, maximizing herbicide absorption into the plant. Ideally, burning should take place in the summer. A one-to-four month regrowth period has been shown to provide a sufficient level of leaf biomass for herbicide treatment. This targets herbicide applications to be made in the late summer/early fall - approximately 1 month prior to the average killing frost, depending on area. Once again, the herbicides glyphosate (Roundup, others) or imazapyr (Arsenal, Chopper) have been shown to provide the best control. If tillage can be incorporated, then a discing treatment directly following a burn is the best approach. This will further deplete the rhizome reserve through dessication and increase the number of shoots per given area. A one-to-four month regrowth period before herbicide treatment is also needed with this approach as well.

Once good control of cogongrass has been achieved, it is essential to introduce desirable vegetation as quickly as possible to prevent cogongrass from re-infesting the area. Several species have been shown to colonize rapidly and tolerate the residual affects of imazapyr. A wider range of plant species can be used with glyphosate due to the lack of soil activity. However, cogongrass will eventually begin to re-infest, regardless of control. Therefore, diligence and persistence are essential to remove/treat re-infested areas before this grass regains a foothold. Selective herbicide choices are limited and research is continuing in this area.

Cogongrass continues to be an increasing problem in Florida. Substantial efforts to manage cogongrass have been made in infested areas, but it is important that cogongrass not be allowed to spread into non-infested areas. Allowing cogongrass to grow unchecked ensures its continued spread along roadways and into pastures, mining areas, forest land, parks and other recreation areas. If you have any questions concerning the identification and/or treatment of cogongrass contact your local county Extension personnel.

APPENDIX M

PRESCRIBED BURN PLAN (sample)

Hillsborough County
Parks and Recreation/Resource Management

Prescribed Burn Plan

Date of Burn: _____ Authorization Number: _____ ID: _____

Land Manager: Hillsborough County Parks and Recreation Dept., Resource Mgmt

Address: 10940 McMullen Rd., Riverview, FL 33569-6226 Phone: 813-672-7876

Landowner: Hillsborough County ID# 12830 Address: 601 East Kennedy Blvd., Tampa, FL 33601

Site Name: _____ Unit #: _____

S: _____ T: _____ R: _____ Total Acres: _____

Location: _____

Agencies and Individuals to Notify:

- ☐ FL Division of Forestry 863-648-3160 (request authorization under F.S. 590-0261
- ☐ Environmental Protection Commission Air Management 272-5530
- ☐ Hillsborough County Fire Department 681-9927
- ☐ Fire Chief/Fire Marshall - City of Tampa (if applicable) 989-7061
- ☐ Notify the following people:
  - * Hillsborough Co. Public Information - Mike Foerster (FoersterM) f: 276-8495
  - * County Administrator's Office - Ed Hunzeker (HunzekerE), Pat Bean (BeanP) f: 272-5248
  - * Hillsborough Co. Parks and Rec. - BrillJ, FowlerP, StoneK, MotleyS, SierraB f: 975-2158
  - * Hillsborough Co. Fire Rescue – Don Goff (goffd) AND call 744-5541

Adjacent landowners to notify: _____

Smoke-sensitive areas: _____

Critical smoke-sensitive areas: _____

Nearest Hospital and Directions: _____

Purpose of Burn: Ecological ☐ Fuel reduction ☐ Restoration ☐

Specific Objectives: _____

Plant Community: _____

Last Burn: Month: _____ Year: _____

Crew and Equipment Needed: _____

Prescribed Fire Weather

Weather Factor	Desired Range		Actual	
20ft Wind Direction				
20ft Wind Speed:	Min:	Max:	Min:	Max:
Transport Wind Direction				
Transport Wind Speed:	Min:	Max:		
Relative Humidity (%):	Min:	Max:	Min:	Max:
Temperature (deg F):	Min:	Max:	Min:	Max:
Mixing Height:				
Dispersion Index:	Min:	Max:		
Drought Index*:	Min:	Max:		
Fine Dead Fuel Moisture %	Min:	Max:	Min:	Max:
Days Since Precip:	Min:	Max:		
Precip amount (inches)				
Starting time				

Weather Information:
National Weather Service, Ruskin 645-2323
DOF 863-648-3160
*PM Danger Station information available from DOF at 2:00 PM (valid for 24 hours)

Fire Behavior

Fuel Model #:

Fuel Loading tons/ac (estimated):

Rate of Spread ft/min Heading:

Rate of Spread ft/min Flanking:

Flame length (ft):

Mopup Intensity Required:

Prescription Prepared by:

Signature

Certification Number:

Site Preparation/Survey

Fire Lane Prep: Tree Trimmer ☐ Mow ☐ Rotovate ☐ Disc ☐ Plow ☐

Existing:

Special Prep Needs:

Safety Considerations:

Water Source (suppression):

Understory (%): Palmetto/Shrub: Grass/Forb: Blowy Leaf:

Other:

Overstory (%): Pine: Oak: Mixed Hardwood:

Cypress: Other:

Duff Layer (max inches):

Noteworthy Species:

Environmental Concerns:

Firing Plan

(see attached map)

Firing Plan:

Safe Areas:

Burn Execution

Fire Manager: Burn Date Month: Day: Year:

Certification #: Number in Crew:

Crew Members:

Time Started: Time Finished: Total Hours: Acres Burned:

% Unit Unburned: Number of Spot Overs: Acres of Spot Overs:

Remarks:

Burn Summary:

Second Day Post-Burn Inspection

Done by: Time:

Visible Flames ☐ Smoke in Area ☐

Scorch Height (ft): Duff Consumed (in): Inspection Date:

Inspection Remarks:

One Month Post-Burn Evaluation

Date:

Plant Community Evaluation:

Other Observations:

Twelve Month Evaluation

Date:

Plant Community Evaluation:

Other Observations:

Success in Meeting Objectives:

Recommendations:

APPENDIX N

HILLSBOROUGH COUNTY ORDINANCES

Draft 1a
AGB/WPB
1/6/87

Adopted 7/0 1/7/87

ORDINANCE NO. 87 - 1

AN ORDINANCE RELATED TO TAXES FOR ENVIRONMENTALLY SENSITIVE LANDS, BEACHES AND BEACH ACCESS, PARKS AND RECREATIONAL LANDS; DETERMINING TO LEVY, SUBJECT TO THE REFERENDUM HEREIN AUTHORIZED, HILLSBOROUGH COUNTY AD VALOREM TAXES NOT TO EXCEED 1/4 MILL FOR A PERIOD NOT TO EXCEED FOUR YEARS; PROVIDING FOR THE EXPENDITURE OF SAID AD VALOREM TAX REVENUES; PROVIDING FOR THE PLEDGE OF SAID REVENUES; PROVIDING FOR THE HOLDING OF A TAX REFERENDUM AND BALLOT QUESTION TO AUTHORIZE SAID LEVY ON MARCH 3, 1987; PROVIDING FOR SEVERABILITY; PROVIDING FOR AN EFFECTIVE DATE.

WHEREAS, it is in the public interest to save those environmentally sensitive lands, beaches and beach access, parks and recreational lands located in Hillsborough County which are presently endangered; and

WHEREAS, the Board of County Commissioners of Hillsborough County has determined it to be in the best interest of the citizens of the County to develop a local program to save its environmentally sensitive lands, beaches and beach access, parks and recreational lands through local acquisitions or acquisitions in conjunction with State programs; and

WHEREAS, additional funds are necessary to acquire land within Hillsborough County for the above-referenced purposes; and

WHEREAS, it is the intent of the Hillsborough County Board of County Commissioners to implement and impose by this Ordinance, if approved by a majority vote of the qualified electors of the County voting in a March 3, 1987 referendum, the levy of an additional ad valorem tax not to exceed .25 mill (1/4 mill) for a period not to exceed four years.

NOW, THEREFORE, BE IT ORDAINED BY THE BOARD OF COUNTY COMMISSIONERS OF HILLSBOROUGH COUNTY, FLORIDA:

SECTION 1. Levy

Subject to the approval of a majority of those qualified electors of Hillsborough County voting in the referendum hereinafter provided for, there is hereby levied and imposed an ad valorem tax, not to exceed .25 mill (1/4 mill), for the purpose of acquiring, preserving and protecting endangered and environmentally sensitive lands, beaches and beach access, parks and recreational lands. All territory within the incorporated and unincorporated areas of Hillsborough County, Florida, shall be embraced by the provisions of this Ordinance. The lands which are acquired under this Ordinance shall be held and maintained by the County in perpetuity for the people of Hillsborough County.

SECTION 2. Expenditures

The proceeds of the tax authorized in Section 1 of this Ordinance, as well as any interest or penalties thereon, shall be expended only to provide revenues for acquisition, preservation and protection of endangered and environmentally sensitive lands, beaches and beach access, parks and recreational lands as set forth in Section 1 of this Ordinance.

SECTION 3. Pledge

All of the proceeds derived by the tax hereby levied and imposed may, to the extent permitted by law, be pledged by the Board of County Commissioners to secure and liquidate bonds issued by the County for the purposes set forth in this Ordinance.

SECTION 4. Referendum

(a) The proposed Hillsborough County levy of ad valorem taxes shall be presented to the Hillsborough County electorate by placing the question of whether a .25 mill (1/4 mill) annual levy shall be authorized for a period not to exceed four(4) years at a referendum election held in conjunction with the March 3, 1987 City of Tampa municipal election.

AD VALOREM TAX TO FINANCE ACQUISITION, PRESERVATION AND PROTECTION OF ENDANGERED AND ENVIRONMENTALLY SENSITIVE LANDS.

Shall the Hillsborough County, Florida, Board of County Commissioners be authorized to levy up to .25 mill (1/4 mill) ad valorem tax annually, for a period not to exceed four (4) years, pursuant to Hillsborough County Ordinance No. 87-_____?

These funds are to be expended only for the purpose of acquiring, preserving and protecting endangered and environmentally sensitive lands, beaches and beach access, parks, and recreational lands.

YES_____ (For Approval)

NO_____ (For Rejection)

SECTION 5. Authorization

The Board of County Commissioners, officers, agents and employees of the County are hereby authorized and directed to do all acts and things which may be required of them in order to carry out the provisions of this ordinance.

SECTION 6. Severability.

It is declared to be the intent of the Board of County Commissioners of Hillsborough County, Florida, that if any section, subsection, sentence, clause or provision of this ordinance be held invalid, it shall in no way affect the validity of the remaining portions of this ordinance.

SECTION 7. Effective Date

(a) The levy of ad valorem tax proposed by this Ordinance shall become effective when and only if approved by a "yes" vote by a majority of those voting on the question posed at the March 3, 1987 referendum. If a majority of those voting do not vote "yes" to the question posed, the proposed levy shall not be authorized and shall be of no force and effect.

(b). This Ordinance shall be effective upon receipt of official acknowledgement that it has been duly filed, but shall be of no further effect if the proposed levy is not approved by a majority of those voting at the March 3, 1987 referendum.

STATE OF FLORIDA)

COUNTY OF HILLSBOROUGH)

I, RICHARD AKE, Clerk of the Circuit Court and Ex Officio Clerk of the Board of County Commissioners of Hillsborough County, Florida, do hereby certify that the above and foregoing is a true and correct copy of an Ordinance adopted by the Board at its regular meeting of January 7, 1987, as the same appears of record in Minute Book 128 of the Public Records of Hillsborough County, Florida.

WITNESS my hand and official seal this 9th day of January, 1987.

RICHARD AKE, CLERK

BY: Deputy Clerk

e11335wn

APPROVED BY COUNTY ATTORNEY

BY:

Approved As To Form And Legal Sufficiency.

ORDINANCE NO. 91-2

AN ORDINANCE AMENDING HILLSBOROUGH COUNTY ORDINANCE NUMBER 87-1, TO PROVIDE FOR THE ABILITY OF THE COUNTY TO CONVEY PROPERTY TO OTHER PUBLIC AGENCIES; PROVIDING FOR APPLICATION TO ALL PROPERTY ACQUIRED TO DATE OR TO BE ACQUIRED BY FUNDING PROVIDED BY ORDINANCE 87-1; PROVIDING AN EFFECTIVE DATE.

WHEREAS, the Board of County Commissioners of Hillsborough County, Florida, duly enacted Hillsborough County Ordinance 87-1 on January 7, 1987; that the Ordinance was approved by the voters by a referendum held on March 3, 1987; that the referendum was advisory and not required by Florida Law; and

WHEREAS, Ordinance 87-1 was enacted to provide funding for a local program to save its environmentally sensitive lands, beach and beach access, parks and recreational lands through local acquisitions or acquisitions in conjunction with state programs; and

WHEREAS, all lands acquired under Ordinance 87-1 are required to be held and maintained by the County in perpetuity for the people of Hillsborough County to assure that the property is not sold to a private entity for development at some future date; and

WHEREAS, state efforts such as the Conservation and Recreational Lands (CARL) Program, the Save Our Rivers Program, and the additional funding available through Preservation 2000 have been established with similar objectives as the County's preservation effort; that in order to participate with these programs it is necessary to convey the property to a public agency; that the state programs are not willing to hold title jointly; that "bargain purchases" by the state require conveyance; and

WHEREAS, the voters of Hillsborough County overwhelmingly approved the referendum referenced in Hillsborough County Ordinance number 90-19 for the continuation of the program through the issuance of up to $100 million in bonds; and

WHEREAS, Ordinance 90-19 provides for the requirements for the conveyance of lands to public agencies; and

WHEREAS, in an effort to carry out the determination set forth in Ordinance 87-1 that the County acquire properties in

conjunction with state programs, the Board of County Commissioners of Hillsborough County, Florida finds that it is in the best interest of the citizens of Hillsborough County to amend Ordinance 87-1 to correspond with the requirements of conveyance as stated in Ordinance 90-19.

NOW THEREFORE, BE IT ORDAINED BY THE BOARD OF COUNTY COMMISSIONERS OF HILLSBOROUGH COUNTY, FLORIDA THIS 6th DAY OF February, 1991:

SECTION 1. Section 1 of Hillsborough County Ordinance No. 87-1 is amended to read:

Subject to the approval of a majority of those qualified electors of Hillsborough County voting in the referendum hereinafter provided for, there is hereby levied and imposed an ad valorem tax, not to exceed .25 mill (1/4 mill), for the purpose of acquiring, preserving and protecting endangered and environmentally sensitive lands, beaches and beach access, parks and recreational lands. All territory within the incorporated and unincorporated areas of Hillsborough County shall be embraced by the provisions of this Ordinance. Any property acquired pursuant to this Ordinance may be conveyed, in whole or part, to other public agencies for preservation or recreation purposes, provided that:

(a) Such conveyance is done pursuant to a written agreement between the County and the public agency which will provide that any use of the property by such agency or any other subsequent public agency owner must be consistent with preserving, protecting, managing or restoring the property, subject to the County having the right of first refusal if such other public agency proposes to dispose of such property.

(b) Any proceeds received by the County from such conveyance shall be expended only to provide revenues for acquisition, preservation and protection of endangered and environmentally sensitive lands, beaches and beach access, and parks and recreation lands.

(c) Any property acquired pursuant to this

Ordinance which is not conveyed to another public agency shall be held by Hillsborough County for the purposes specified in Section 1(b) of this amendment.

SECTION 2. This amendment shall apply to all property acquired to date or to be acquired by funding provided by Ordinance 87-1.

SECTION 3. This Ordinance shall become effective upon approval.

STATE OF FLORIDA)
COUNTY OF HILLSBOROUGH)

I, RICHARD L. AKE, Clerk of the Circuit Court and Ex-Officio Clerk of the Board of County Commissioners of Hillsborough County, Florida, do hereby certify that the above and foregoing is a true copy of the Ordinance adopted by the Board in its regular meeting of February 6, 1991 as the same appears of record in Minute Book 177 of the Public Records of Hillsborough County, Florida.

Witness my hand and official seal this 13th day of February, 1991.

RICHARD L. AKE
CLERK OF THE CIRCUIT COURT

BY: Judith M. Nichols
Deputy Clerk

APPROVED BY COUNTY ATTORNEY
BY
Approved As To Form And
Legal Sufficiency.

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FINAL
7/14/93
VAM/jk

ORDINANCE NO. 93-15

AN ORDINANCE AMENDING HILLSBOROUGH COUNTY ORDINANCE NO. 87-1, AS AMENDED BY ORDINANCE 91-2, WHICH PROVIDED FOR TAXES FOR ENVIRONMENTALLY SENSITIVE LANDS, BEACHES AND BEACH ACCESS, PARKS AND RECREATIONAL LANDS, SUBJECT TO REFERENDUM THEREIN AUTHORIZED; PROVIDING FOR THE ABILITY TO CONVEY PROPERTY RIGHTS THAT WILL NOT IMPACT THE PRESERVATION OF THE PROPERTY, THE ABILITY TO CONVEY PROPERTY ASSOCIATED WITH SETTLEMENT OF ACTUAL OR POTENTIAL EMINENT DOMAIN PROCEEDINGS, AFFIRMING THE PUBLIC PURPOSE OF THE PROPERTIES ACQUIRED THROUGH FUNDING FROM THIS ORDINANCE; PROVIDING FOR SEVERABILITY; PROVIDING AN EFFECTIVE DATE.

WHEREAS, the Board of County Commissioners of Hillsborough County, Florida duly enacted Hillsborough County Ordinance 87-1 on January 7, 1987 (the "Ordinance"); and,

WHEREAS, the Ordinance, as amended, provided for a referendum on the question of whether Hillsborough County should provide funding for the purpose of acquiring, preserving, protecting, managing and restoring environmentally sensitive lands, beaches and beach access, and parks and recreational lands (the "Property"); and,

WHEREAS, the Ordinance was overwhelmingly approved by the voters on March 3, 1987; and,

WHEREAS, the Ordinance, as amended, requires that all Property acquired under the Ordinance remain in County ownership, for the purposes identified in the Ordinance, unless conveyed to another governmental entity for preservation purposes; and,

WHEREAS, the number of Properties identified in the Environmental Lands Acquisition and Protection Program ("ELAPP")

exceeds current funding; and,

WHEREAS, there are property rights associated with the acquisition of certain Property which do not need to be retained by the County to accomplish the preservation of the Property; and,

WHEREAS, the future sale of these property rights could provide additional funding for ELAPP's acquisition and management; and,

WHEREAS, portions of the Properties acquired through the Ordinance may be needed by other public or quasi-public entities, including utility companies, which have the power of eminent domain to accomplish their service to the public ("Public Entity"); and,

WHEREAS, in order to more effectively serve the needs of the public, the County needs to have the ability to negotiate and accept a settlement of actual or potential eminent domain litigation from a Public Entity provided that the intent of the Ordinance is preserved; and,

WHEREAS, funds are expended in accordance with the Ordinance in order to preserve Property for the benefit of the general public and the protection of these lands is in the best interest of the citizens of Hillsborough County; and,

WHEREAS, in order to help assure that these Properties are preserved, the Board of County Commissioners wishes to affirm, through this Ordinance, that these Properties have a highest public purpose; and,

WHEREAS, the Board of County Commissioners of Hillsborough County, Florida finds that it is in the best interest of the citizens of Hillsborough County to amend the Ordinance to permit the sale of property rights not essential to the preservation of

the Property acquired through ELAPP, have the ability to settle actual or potential eminent domain litigation with a Public Entity having the power of eminent domain provided that the intent of the Ordinance is preserved, and affirm that the preservation of these Properties is a highest public purpose.

NOW THEREFORE, BE IT ORDAINED BY THE BOARD OF COUNTY COMMISSIONERS OF HILLSBOROUGH COUNTY, FLORIDA THIS 14TH DAY OF JULY, 1993:

SECTION 1: The following sections are hereby added to Hillsborough County Ordinance 87-1:

SECTION 8. SALE OF PROPERTY RIGHTS

Any Property Rights, as defined herein, that are associated with land acquired for preservation through this Ordinance that are not necessary for the preservation of the Property may be sold provided that:

a. Staff has advised that it is not necessary for the County to retain the Property Rights in order to preserve the Property.

b. A legally permissible procedure to transfer the Property Rights from the Property acquired for preservation is followed.

c. The Board of County Commissioners authorizes the sale, transfer, or exchange of the Property Rights by one of the following methods:

(1) If the Property Rights are identified prior to the County acquiring title to the Property, and are specifically identified in materials presented to the Board of County Commissioners, said Property

Rights may be sold, exchanged, or transferred to a private party or public agency at the time the Property is acquired, provided that this designation is approved by the Board of County Commissioners as part of the approval of the purchase of the Property. The County may reserve, restrict and/or condition the use of the Property Rights.

(2) If the Property Rights are identified after the Property is acquired by the County or if the Property Rights become legally transferable after the Property has been acquired, the Board of County Commissioners shall hold a public hearing to identify and consider the transfer, sale, or exchange of the Property Rights to a private party or public agency. The County may reserve, restrict and/or condition the use of the Property Rights.

d. Any proceeds received from the transfer, sale, or exchange of Property Rights shall only be used for the purposes specified in Section 2 of this Ordinance, or to retire bonds issued pursuant to this Ordinance as directed by the Board at the time the transfer, sale, or exchange is approved.

For the purposes of this section the term "Property Rights" shall include, but is not limited to, density credits, water use permits, or similar water related permits or approvals, and capacity fees associated with water, wastewater, or other utility service prepaid fees.

SECTION 9. SETTLEMENT OF ACTUAL OR POTENTIAL EMINENT DOMAIN LITIGATION WITH A PUBLIC AGENCY OR QUASI-PUBLIC ENTITY

The Board of County Commissioners is authorized to negotiate and accept the settlement of actual or potential eminent domain litigation from the Public Entity that has been granted the power of eminent domain to accomplish a project or service for the public and transfer the requested property interest provided that:

(1) The Public Entity provides evidence that the use of the requested property interest is essential to the project or service and the Public Entity can show that there is no feasible alternative to utilize other property.

(2) The Public Entity will sufficiently address concerns of the Board of County Commissioners and incorporate, to the Board of County Commissioners' satisfaction, into the design, engineering, and construction for its project or service, the preservation and management of natural habitats in a manner that minimizes the impact that the project or service may have on the Property and will address any other environmental issues as required by the County.

(3) Any proceeds received from the conveyance of the fee simple or other interest in the Property as part of the settlement of actual or potential eminent domain litigation shall only be used for the purposes specified in Section 2 of this

Ordinance, or to retire bonds issued pursuant to this Ordinance as directed by the Board of County Commissioners at the time the conveyance is approved.

SECTION 10. AFFIRMATION OF PUBLIC PURPOSE

The voters of Hillsborough County have approved by referendum the assessment described in this Ordinance to provide funding for the acquisition and management of environmentally sensitive lands. The expenditure of these funds is for the purpose of achieving preservation of lands for the benefit of the public. In recognition of the benefits to the public of preserving these lands, the Board of County Commissioners of Hillsborough County hereby affirms that the acquisition of property for preservation through ELAPP as funded by this Ordinance is a highest public purpose for those properties and that the Board of County Commissioners is responsible for assuring that the properties acquired for preservation will be protected.

SECTION 2: This amendment shall apply to all Property acquired by funding provided by Ordinance 87-1, as amended.

SECTION 3: If any section, sentence, clause, part or provision of this ordinance amendment is held to be invalid by a court of competent jurisdiction, the remainder of this ordinance amendment shall not be affected thereby, but shall remain in full force and effect.

SECTION 4: This Ordinance shall become effective upon receipt of official acknowledgement from the Department of State that said Ordinance has been filed.

STATE OF FLORIDA)

COUNTY OF HILLSBOROUGH)

I, RICHARD AKE, Clerk of the Circuit Court and Ex-Officio Clerk of the Board of County Commissioners of Hillsborough County, Florida, do hereby certify that the above and foregoing is a true copy of an Ordinance adopted by the Board in its regular meeting of July 14, 1993 as the same appears of record in Minute Book 206 of the Public Records of Hillsborough County, Florida.

Witness my hand and official seal this 16th day of July, 1993.

RICHARD AKE
CLERK OF CIRCUIT COURT

By: Judith M. Nichols
Deputy Clerk

APPROVED BY COUNTY ATTORNEY
BY
Approved As To Form And
Legal Sufficiency.

ELAPP ORDINANCES

FOR

SECOND REFERENDUM

ORDINANCE NO. 90-19

AN ORDINANCE PROVIDING FOR THE ISSUANCE OF GENERAL OBLIGATION BONDS, IN AN AGGREGATE PRINCIPAL AMOUNT NOT TO EXCEED $100 MILLION DOLLARS, FOR THE PURPOSE OF ACQUIRING, PRESERVING, PROTECTING, MANAGING AND RESTORING ENVIRONMENTALLY SENSITIVE LANDS, BEACHES AND BEACH ACCESS, PARKS AND RECREATIONAL LANDS, SUBJECT TO APPROVAL AT THE REFERENDUM HEREIN AUTHORIZED; PROVIDING FOR THE LEVY OF AD VALOREM TAXES NOT TO EXCEED A QUARTER OF A MILL IN ANY ONE YEAR FOR A PERIOD NOT TO EXCEED 20 YEARS FROM THE FIRST LEVY TO RETIRE ANY SUCH BONDS ISSUED; PROVIDING FOR THE EXPENDITURE OF THE PROCEEDS FROM THE SALE OF SUCH BONDS; PROVIDING FOR THE CONVEYANCE OF ANY LANDS ACQUIRED TO OTHER PUBLIC AGENCIES UNDER CERTAIN SPECIFIED CONDITIONS; PROVIDING FOR THE HOLDING OF A REFERENDUM ON SEPTEMBER 4, 1990, AND A BALLOT QUESTION TO BE SUBMITTED TO THE ELECTORATE TO AUTHORIZE THE ISSUANCE OF SUCH BONDS AND A TAX LEVY NOT TO EXCEED A QUARTER OF A MILL IN ANY ONE YEAR TO RETIRE SUCH BONDS; PROVIDING FOR SEVERABILITY; PROVIDING AN EFFECTIVE DATE.

WHEREAS, Hillsborough County Ordinance No. 87-1 provided for the levy of an ad valorem tax not to exceed .25 mill for a period not to exceed four years for the purpose of acquiring environmentally sensitive lands within Hillsborough County, and said ordinance was approved at a referendum by a majority vote of the electorate; and

WHEREAS, the Board of County Commissioners has determined that it would be in the best interest of the Citizens of the County to continue a program for the preservation of such environmentally sensitive lands, beaches and beach access, and parks and recreational lands through local acquisitions, or acquisitions in connection with State programs through other public agencies; and

WHEREAS, in order to continue such a program it is necessary to provide a source of funds sufficient to make such acquisitions, and to provide for site management and restoration of lands acquired, and

WHEREAS, since the number of tracts of land which are worthy of preservation and their anticipated costs are in excess of any

other available funding source, it is necessary that such funds be made available through the issuance of bonds for such purposes; and

WHEREAS, it is the intent of the Hillsborough County Board of County Commissioners to issue, if approved by a majority vote of the qualified electors of the County voting in a September 4, 1990 referendum, general obligation bonds in an aggregate principal amount not to exceed $100 Million Dollars that would be retired by the levy of ad valorem taxes not to exceed .25 mill in any one year for a period not to exceed 20 years from the first levy, to designate a portion of such funding for site restoration and management, and to permit the conveyance of such lands acquired to other public agencies for the purpose of preservation, provided that the proceeds from any such conveyance be used only to acquire additional land or to retire bonds.

NOW, THEREFORE, BE IT ORDAINED BY THE BOARD OF COUNTY COMMISSIONERS OF HILLSBOROUGH COUNTY, FLORIDA:

SECTION 1. Authorization of Bonds.

Subject to the approval of a majority of those qualified electors of Hillsborough County voting in the referendum hereinafter provided for, general obligation bonds of Hillsborough County are authorized to be issued in one or more series in an aggregate principal amount not to exceed One Hundred Million Dollars ($100,000,000) to acquire, preserve, protect, manage and restore environmentally sensitive lands, beaches and beach access, and parks and recreational lands.

SECTION 2. Authorization of Millage.

Such general obligation bonds shall be payable from ad valorem taxes levied on all taxable property in Hillsborough County at a rate not exceeding .25 mill in any one year for a period not to exceed 20 years from the first levy. Such bonds shall bear interest at such rate or rates not exceeding the maximum rate permitted by law at the time of the sale of the bonds, the actual rate to be determined upon the sale of the bonds to

the bidder whose bid produces the lowest net interest cost to the County.

SECTION 3. Expenditure of Bond Proceeds.

The proceeds received from the sale of such general obligation bonds shall be expended to acquire, preserve, protect, manage and restore environmentally sensitive lands, beaches and beach access, and parks and recreational lands. Expenditures for site management shall not exceed two percent (2%) of the bond proceeds or additional funding received from other public agencies. "Site management" includes site security, exotic plant control, maintenance of natural systems, and any activities incidental to such purposes. Expenditures for site restoration shall not exceed three percent (3%) of the purchase price of such site, and shall not be transferable to another site. Any funds designated for restoration but not expended shall be used for acquisition of additional lands or to retire bonds. Properties purchased through this ordinance may be used for recreational purposes provided that such uses will not disturb or degrade the environmental quality of the site.

SECTION 4. Conveyances of Lands Acquired to Other Public Agencies.

Any property acquired pursuant to this ordinance may be conveyed, in whole or in part, to other public agencies for preservation or recreation purposes, provided that:

(a) Such conveyance is done pursuant to a written agreement between the County and the public agency which will provide that any use of the property by such agency or any other subsequent public agency owner must be consistent with preserving, protecting, managing or restoring the property, subject to the County having the right of first refusal if such other public agencies propose to dispose of such property.

(b) Any proceeds received by the County from such conveyance shall only be used for the purposes specified in

Section 3. of this ordinance, or to retire any bonds issued pursuant to this ordinance.

Any property acquired pursuant to this ordinance which is not conveyed to another public agency shall be held by Hillsborough County for the purposes specified in Section 3. of this Ordinance.

SECTION 5. Referendum and Ballot Question.

(a) An election of qualified electors residing in the County is hereby called to be held on September 4, 1990, to determine if the County shall issue General Obligation Bonds in an amount not to exceed $100 million, principal amount, for the purpose of acquiring, preserving, protecting, managing and restoring environmentally sensitive lands, beaches and beach access, and parks and recreational lands. All qualified electors residing in the County shall be entitled and permitted to vote in such bond election. The places and hours of voting and the inspectors and clerks for the bond election shall be the same as for the primary election to be held in the County on the same date.

(b) The form of ballot shall be in substantially the following form:

ISSUANCE OF BONDS NOT TO EXCEED
$100 MILLION FOR PURCHASE OF
ENVIRONMENTALLY SENSITIVE LAND

Shall Hillsborough County, Florida, issue not exceeding $100 million of General Obligation Bonds bearing interest at not exceeding the maximum legal rate at the time of issuance, payable from a twenty year ad valorem tax at a rate not exceeding .25 mill per year, for the purpose of acquiring, preserving, protecting, managing, and restoring environmentally sensitive lands, beaches and beach access, parks and recreational lands, as provided in Ordinance #90-19 .

_____ For Bonds

_____ Against Bonds

SECTION 6. Severability.

If any section, sentence, clause, part or provision of this ordinance is held to be invalid by a count of competent jurisdiction, the remainder of this ordinance shall not be affected thereby, but shall remain in full force and effect.

SECTION 7. Effective Date.

(a) This ordinance shall be effective upon receipt of official acknowledgment from the Department of State that said ordinance has been filed.

(b) The authority to issue general obligation bonds and to levy ad valorem taxes to retire such bonds as proposed in this ordinance shall become effective when, and only if, approved by a majority of those voting on the question posed at the September 4, 1990 referendum. If a majority of those voting on the question posed do not vote "for bonds," the proposed bonds and tax levy shall not be authorized, and this ordinance shall be of no force and effect.

STATE OF FLORIDA)
)
COUNTY OF HILLSBOROUGH)

I, RICHARD AKE, Clerk of the Circuit Court and Ex Officio Clerk of the Board of County Commissioners of Hillsborough County, Florida, do hereby certify that the above and foregoing is a true and correct copy of an ordinance adopted by the Board at its regular meeting of June 20, 1990, as the same appears of record in Minute Book 169 of the Public Records of Hillsborough County, Florida.

WITNESS my hand and official seal this 25th day of June, 1990.

RICHARD AKE, CLERK

By: Mirla Iris Bishop
Deputy Clerk

APPROVED BY COUNTY ATTORNEY

By: L. Lewis
Assistant County Attorney

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FINAL
JDW
8/28/90

ORDINANCE NO. 90-31E

AN ORDINANCE AMENDING HILLSBOROUGH COUNTY ORDINANCE NO. 90-19, WHICH PROVIDED FOR THE ISSUANCE OF GENERAL OBLIGATION BONDS, IN AN AGGREGATE PRINCIPAL AMOUNT NOT TO EXCEED $100 MILLION DOLLARS, FOR THE PURPOSE OF ACQUIRING, PRESERVING, PROTECTING, MANAGING AND RESTORING ENVIRONMENTALLY SENSITIVE LANDS, BEACHES AND BEACH ACCESS, PARKS AND RECREATIONAL LANDS, SUBJECT TO APPROVAL AT A REFERENDUM THEREIN AUTHORIZED; PROVIDING FOR CHANGING THE REFERENDUM DATE FROM SEPTEMBER 4, 1990 TO OCTOBER 2, 1990; PROVIDING FOR SEVERABILITY; PROVIDING AN EFFECTIVE DATE.

WHEREAS, the Board of County Commissioners of Hillsborough County, Florida, duly enacted Hillsborough County Ordinance 90-19 on June 20, 1990; and

WHEREAS, that ordinance called for a referendum on September 4, 1990 on the question of whether Hillsborough County should issue general obligation bonds not to exceed $100 million for the purpose of acquiring, preserving, protecting, managing and restoring environmentally sensitive lands, beaches and beach access, and parks and recreational lands; and

WHEREAS, due to a misunderstanding, the notice of such referendum election as required by law was not published within the time required; and

WHEREAS, it is in keeping with the will of the people as made known to the Board of County Commissioners to reschedule such referendum election to the earliest possible date; and

WHEREAS, the inability to hold the referendum as originally scheduled has raised significant public concern; and

WHEREAS, substantial sums have been expended by various citizen groups in anticipation of this issue being presented to the electorate in an expeditious manner; and

WHEREAS, the continuing development of Hillsborough County creates an urgency with respect to the preservation of our remaining environmentally sensitive lands; and

WHEREAS, the ballot for the November general election is crowded and will not afford this issue the prominence which the

Board of County Commissioners and the public intended it to have when it was originally scheduled for September 4, 1990; and

WHEREAS, the Board of County Commissioners of Hillsborough County, Florida, finds that it is in the best interest of the citizens of Hillsborough County to present this issue to the electorate at the next available election date, which is October 2, 1990; and

WHEREAS, a position on the October 2, 1990 primary election ballot is in keeping with the Board's intent and with the urgency of protecting environmentally sensitive lands; and

WHEREAS, in light of the foregoing, the Board has declared by a four-fifths vote of its membership that an emergency exists with regard to rescheduling a date for the referendum election, waiving the Notice requirements, and that the immediate enactment of this ordinance is necessary;

NOW, THEREFORE, BE IT ORDAINED BY THE BOARD OF COUNTY COMMISSIONERS OF HILLSBOROUGH COUNTY, FLORIDA, THIS 28th DAY OF August, 1990:

SECTION 1. The fifth whereas clause of Hillsborough County Ordinance No. 90-19 is amended to read:

WHEREAS, it is the intent of the Hillsborough County Board of County Commissioners to issue, if approved by a majority vote of the qualified electors of the County voting in an ~~September 4~~ October 2, 1990 referendum, general obligation bonds in an aggregate principal amount not to exceed $100 Million Dollars that would be retired by the levy of ad valorem taxes not to exceed .25 mill in any one year for a period not to exceed 20 years from the first levy, to designate a portion of such funding for site restoration and management, and to permit the conveyance of such lands acquired to other public agencies for the purpose of preservation, provided that the proceeds from any such conveyance be used only to acquire additional land or to retire bonds.

SECTION 2. Paragraphs 5(a) and (b) of Hillsborough County Ordinance No. 90-19 are amended to read:

(a) An election of qualified electors residing in the County is hereby called to be held on ~~September 4~~ October 2, 1990, to determine if the County shall issue General Obligation Bonds in an amount not to exceed $100 million, principal amount, for the purpose of acquiring, preserving, protecting, managing and restoring environmentally sensitive lands, beaches and beach access, and parks and recreational lands. All qualified electors residing in the County shall be entitled and permitted to vote in such bond election. The places and hours of voting and the inspectors and clerks for the bond election shall be the same as for the primary election to be held in the County on the same date.

(b) The form of ballot shall be in substantially the following form:

ISSUANCE OF BONDS NOT TO EXCEED $100 MILLION FOR PURCHASE OF ENVIRONMENTALLY SENSITIVE LAND

Shall Hillsborough County, Florida, issue not exceeding $100 million of General Obligation Bonds bearing interest at not exceeding the maximum legal rate at the time of issuance, payable from a twenty year ad valorem tax at a rate not exceeding .25 mill per year, for the purpose of acquiring, preserving, protecting, managing, and restoring environmentally sensitive lands, beaches and beach access, parks and recreational lands, as provided in Ordinance #90-19, as amended.

_____ For Bonds

_____ Against Bonds

SECTION 3. Paragraph 7(b) of Hillsborough County Ordinance No. 90-19 is amended to read:

(b) The authority to issue general obligation bonds and to levy ad valorem taxes to retire such bonds as proposed in this ordinance shall become effective when, and only if, approved by a majority of those voting on the question posed at the ~~September 4~~ October 2, 1990 referendum. If a majority of those voting on the question posed do not vote "for bonds," the proposed bonds and

tax levy shall not be authorized, and this ordinance shall be of no force and effect.

SECTION 4. If any section, sentence, clause, part or provision of this ordinance is held to be invalid by a count of competent jurisdiction, the remainder of this ordinance shall not be affected thereby, but shall remain in full force and effect.

SECTION 5. This ordinance shall become effective when a copy has been accepted by the postal authorities of the Government of the United States for special delivery, by registered mail to the Department of State.

STATE OF FLORIDA)
COUNTY OF HILLSBOROUGH)

I, RICHARD AKE, Clerk of the Circuit Court and Ex officio Clerk of the Board of County Commissioners of Hillsborough County, Florida, do hereby certify that the above and foregoing is a true and correct copy of an ordinance adopted by the Board of County Commissioners of Hillsborough County, Florida at its regular meeting of August 28, 1990, as the same appears of record in Minute Book 171 of the Public Records of Hillsborough County, Florida.

WITNESS my hand and official seal this 28th day of August, 1990.

RICHARD AKE, CLERK

By Judith M. Nichols
Deputy Clerk

APPROVED BY COUNTY ATTORNEY

By: John Dyson
Assistant County Attorney

JDW
9/19/90

ORDINANCE NO. 90-33

AN ORDINANCE AMENDING HILLSBOROUGH COUNTY ORDINANCE NO. 90-19, WHICH PROVIDED FOR THE ISSUANCE OF GENERAL OBLIGATION BONDS, IN AN AGGREGATE PRINCIPAL AMOUNT NOT TO EXCEED $100 MILLION DOLLARS, FOR THE PURPOSE OF ACQUIRING, PRESERVING, PROTECTING, MANAGING AND RESTORING ENVIRONMENTALLY SENSITIVE LANDS, BEACHES AND BEACH ACCESS, PARKS AND RECREATIONAL LANDS, SUBJECT TO APPROVAL AT A REFERENDUM THEREIN AUTHORIZED; PROVIDING FOR CHANGING THE REFERENDUM DATE FROM SEPTEMBER 4, 1990 TO OCTOBER 2, 1990; PROVIDING FOR SEVERABILITY; PROVIDING AN EFFECTIVE DATE.

WHEREAS, the Board of County Commissioners of Hillsborough County, Florida, duly enacted Hillsborough County Ordinance 90-19 on June 20, 1990; and

WHEREAS, that ordinance called for a referendum on September 4, 1990 on the question of whether Hillsborough County should issue general obligation bonds not to exceed $100 million for the purpose of acquiring, preserving, protecting, managing and restoring environmentally sensitive lands, beaches and beach access, and parks and recreational lands; and

WHEREAS, due to a misunderstanding, the notice of such referendum election as required by law was not published within the time required; and

WHEREAS, it is in keeping with the will of the people as made known to the Board of County Commissioners to reschedule such referendum election to the earliest possible date; and

WHEREAS, the inability to hold the referendum as originally scheduled has raised significant public concern; and

WHEREAS, substantial sums have been expended by various citizen groups in anticipation of this issue being presented to the electorate in an expeditious manner; and

WHEREAS, the continuing development of Hillsborough County creates an urgency with respect to the preservation of our remaining environmentally sensitive lands; and

WHEREAS, the ballot for the November general election is crowded and will not afford this issue the prominence which the

Board of County Commissioners and the public intended it to have when it was originally scheduled for September 4, 1990; and

WHEREAS, the Board of County Commissioners of Hillsborough County, Florida, finds that it is in the best interest of the citizens of Hillsborough County to present this issue to the electorate at the next available election date, which is October 2, 1990; and

WHEREAS, a position on the October 2, 1990 primary election ballot is in keeping with the Board's intent and with the urgency of protecting environmentally sensitive lands.

NOW, THEREFORE, BE IT ORDAINED BY THE BOARD OF COUNTY COMMISSIONERS OF HILLSBOROUGH COUNTY, FLORIDA, THIS 19th DAY OF September, 1990:

SECTION 1. The fifth whereas clause of Hillsborough County Ordinance No. 90-19 is amended to read:

WHEREAS, it is the intent of the Hillsborough County Board of County Commissioners to issue, if approved by a majority vote of the qualified electors of the County voting in an ~~September 4~~ October 2, 1990 referendum, general obligation bonds in an aggregate principal amount not to exceed $100 Million Dollars that would be retired by the levy of ad valorem taxes not to exceed .25 mill in any one year for a period not to exceed 20 years from the first levy, to designate a portion of such funding for site restoration and management, and to permit the conveyance of such lands acquired to other public agencies for the purpose of preservation, provided that the proceeds from any such conveyance be used only to acquire additional land or to retire bonds.

SECTION 2. Paragraphs 5(a) and (b) of Hillsborough County Ordinance No. 90-19 are amended to read:

(a) An election of qualified electors residing in the County is hereby called to be held on ~~September 4~~ October 2, 1990, to determine if the County shall issue General Obligation Bonds in an amount not to exceed $100 million, principal amount, for the purpose of acquiring, preserving, protecting, managing and restoring environmentally sensitive lands, beaches and beach

access, and parks and recreational lands. All qualified electors residing in the County shall be entitled and permitted to vote in such bond election. The places and hours of voting and the inspectors and clerks for the bond election shall be the same as for the primary election to be held in the County on the same date.

(b) The form of ballot shall be in substantially the following form:

ISSUANCE OF BONDS NOT TO EXCEED $100 MILLION FOR PURCHASE OF ENVIRONMENTALLY SENSITIVE LAND

Shall Hillsborough County, Florida, issue not exceeding $100 million of General Obligation Bonds bearing interest at not exceeding the maximum legal rate at the time of issuance, payable from a twenty year ad valorem tax at a rate not exceeding .25 mill per year, for the purpose of acquiring, preserving, protecting, managing, and restoring environmentally sensitive lands, beaches and beach access, parks and recreational lands, as provided in Ordinance #90-19, as amended.

_____ For Bonds

_____ Against Bonds

SECTION 3. Paragraph 7(b) of Hillsborough County Ordinance No. 90-19 is amended to read:

(b) The authority to issue general obligation bonds and to levy ad valorem taxes to retire such bonds as proposed in this ordinance shall become effective when, and only if, approved by a majority of those voting on the question posed at the September 4 October 2, 1990 referendum. If a majority of those voting on the question posed do not vote "for bonds," the proposed bonds and tax levy shall not be authorized, and this ordinance shall be of no force and effect.

SECTION 4. If any section, sentence, clause, part or provision of this ordinance is held to be invalid by a court of competent jurisdiction, the remainder of this ordinance shall not be affected thereby, but shall remain in full force and effect.

SECTION 5. This ordinance shall become effective upon receipt of official acknowledgment from the Secretary of State that said ordinance has been filed.

STATE OF FLORIDA)

COUNTY OF HILLSBOROUGH)

I, RICHARD AKE, Clerk of the Circuit Court and Ex Officio Clerk of the Board of County Commissioners of Hillsborough County, Florida, do hereby certify that the above and foregoing is a true and correct copy of an ordinance adopted by the Board of County Commissioners of Hillsborough County, Florida at its regular meeting of September 19, 1990, as the same appears of record in Minute Book 172 of the Public Records of Hillsborough County, Florida.

WITNESS my hand and official seal this 25th day of September, 1990.

RICHARD AKE, CLERK

By Judith M. Nichols
Deputy Clerk

APPROVED BY COUNTY ATTORNEY

By: [signature]
Assistant County Attorney

FINAL
7/14/93
VAM/jk

ORDINANCE NO. 93-16

AN ORDINANCE AMENDING HILLSBOROUGH COUNTY ORDINANCE NO. 90-19, AS AMENDED BY ORDINANCES 90-31E AND 90-33, WHICH PROVIDED FOR THE ISSUANCE OF GENERAL OBLIGATION BONDS, IN AN AGGREGATE PRINCIPAL AMOUNT NOT TO EXCEED $100 MILLION DOLLARS, FOR THE PURPOSE OF ACQUIRING, PRESERVING, PROTECTING, MANAGING AND RESTORING ENVIRONMENTALLY SENSITIVE LANDS, BEACHES AND BEACH ACCESS, PARKS AND RECREATIONAL LANDS, SUBJECT TO APPROVAL AT A REFERENDUM THEREIN AUTHORIZED; PROVIDING FOR THE ABILITY OF THE COUNTY TO SELL PROPERTY IDENTIFIED AS AN ACQUISITION OF CONVENIENCE, THE ABILITY TO CONVEY PROPERTY RIGETS THAT WILL NOT IMPACT THE PRESERVATION OF THE PROPERTY, THE ABILITY TO CONVEY PROPERTY ASSOCIATED WITH SETTLEMENT OF ACTUAL OR POTENTIAL EMINENT DOMAIN PROCEEDINGS, AFFIRMING THE PUBLIC PURPOSE OF THE PROPERTIES ACQUIRED THROUGH FUNDING FROM THIS ORDINANCE; PROVIDING FOR SEVERABILITY; PROVIDING AN EFFECTIVE DATE.

WHEREAS, the Board of County Commissioners of Hillsborough County, Florida duly enacted Hillsborough County Ordinance 90-19 on June 20, 1990 (the "Ordinance"); and,

WHEREAS, the Ordinance, as amended, provided for a referendum on the question of whether Hillsborough County should issue general obligation bonds not to exceed $100 million for the purpose of acquiring, preserving, protecting, managing and restoring environmentally sensitive lands, beaches and beach access, and parks and recreational lands (the "Property"); and,

WHEREAS, the Ordinance was overwhelmingly approved by the voters on October 2, 1990; and,

WHEREAS, the Ordinance requires that all Property acquired under the Ordinance remain in County ownership, for the purposes identified in the Ordinance, unless conveyed to another

governmental entity for preservation purposes; and,

WHEREAS, the number of Properties identified in the Environmental Lands Acquisition and Protection Program ("ELAPP") exceeds current funding; and,

WHEREAS, ELAPP has identified Properties in which the acquisition of only a portion of the Property under one ownership was essential to the preservation effort; and,

WHEREAS, if the County is restricted from the sale of properties not essential to the preservation effort, which are acquired in conjunction with an acquisition of those areas which are necessary to accomplish preservation, ELAPP will not be able to perform as effectively; and,

WHEREAS, there are property rights associated with the acquisition of certain Property which do not need to be retained by the County to accomplish the preservation of the Property; and,

WHEREAS, the future sale of these property rights could provide additional funding for ELAPP's acquisition and management; and,

WHEREAS, portions of the Properties acquired through the Ordinance may be needed by other public or quasi-public entities, including utility companies, which have the power of eminent domain to accomplish their service to the public ("Public Entity"); and,

WHEREAS, in order to more effectively serve the needs of the public, the County needs to have the ability to negotiate and accept a settlement of actual or potential eminent domain litigation from a Public Entity provided that the intent of the Ordinance is preserved; and,

WHEREAS, funds are expended in accordance with the Ordinance

in order to preserve Property for the benefit of the general public and the protection of these lands is in the best interest of the citizens of Hillsborough County; and,

WHEREAS, in order to help assure that these Properties are preserved, the Board of County Commissioners wishes to affirm, through this Ordinance, that these Properties have a highest public purpose; and,

WHEREAS, the Board of County Commissioners of Hillsborough County, Florida finds that it is in the best interest of the citizens of Hillsborough County to amend the Ordinance to permit the sale of certain properties specifically identified for future sale that are not essential to accomplishing preservation objectives, permit the sale of property rights not essential to the preservation of the Property acquired through ELAPP, have the ability to settle actual or potential eminent domain litigation with a Public Entity having the power of eminent domain provided that the intent of the Ordinance is preserved, and affirm that the preservation of these Properties is a highest public purpose.

NOW THEREFORE, BE IT ORDAINED BY THE BOARD OF COUNTY COMMISSIONERS OF HILLSBOROUGH COUNTY, FLORIDA THIS 14TH DAY OF JULY, 1993:

SECTION 1: Section 4 of Hillsborough County Ordinance 90-19 is amended to read:

SECTION 4. Convevances of Lands Acquired to other Public Agencies and the Sale of Properties Not Essential to the Preservation Effort.

a. Any Property acquired pursuant to this ordinance may be conveyed, in whole or in part, to other public agencies for preservation or recreational purposes, provided that:

(1) Such conveyance is done pursuant to a written agreement between the County and the public agency which will provide that any use of the Property by such agency or any other subsequent public agency owner must be consistent with preserving, protecting, managing or restoring the Property, subject to the County having the right of first refusal if such other public agencies propose to dispose of such Property.

(2) Any proceeds received by the County from such conveyance shall only be used for the purposes specified in Section 3. of this Ordinance, or to retire any bonds issued pursuant to this Ordinance.

b. Portions of Properties acquired pursuant to this Ordinance may be sold to a private party or a public agency (including Hillsborough County or associated agency) for purposes other than preservation provided that:

(1) A portion of Property held under one ownership has been identified for preservation in accordance with the purposes of this Ordinance.

(2) It is not possible to acquire only that portion of the Property identified for preservation due to at least one of the following:

(a) The owner(s) have indicated that they are not willing or able to sell only the portion of the Property targeted for preservation.

(b) Staff has advised that it is not practical or possible to acquire only a portion of the Property due to the Property's configuration, nature of the ownership, size or access of the Property not necessary for preservation, or other real estate related factors.

(c) Staff recommends that it is not in the best interest of the County to separate the portion of the Property not essential for preservation at the time of acquisition.

(3) Prior to the County acquiring title to the Property, the area that is to be considered for future sale to a private party or public agency for purposes other than preservation is specifically identified in materials presented to the Board of County Commissioners as an "Acquisition of Convenience", and that this designation requires the express approval of the Board of County Commissioners as part of the approval of the purchase of the Property. The County, with the review and comment of the ELAPP General Committee, or other appropriate Committee as determined by the Board of County Commissioners, may reserve or restrict the use of the property being sold and may convey fee simple or any other interest in said

property as it deems appropriate.

(4) Any proceeds received from the conveyance of the fee simple or other property interest in an "Acquisition of Convenience" shall only be used for the purposes specified in Section 3 of this Ordinance, or to retire bonds issued pursuant to this Ordinance as directed by the Board at the time the sale is approved.

Any Property acquired pursuant to this Ordinance which is not conveyed to another public agency for preservation in accordance with Subsection a. or has not been designated as an "Acquisition of Convenience" in accordance with Subsection b. of this Ordinance, shall be held by Hillsborough County for the purposes specified in Section 3 of this Ordinance.

SECTION 2: The following sections are hereby added to Hillsborough County Ordinance 90-19:

SECTION 8. SALE OF PROPERTY RIGHTS

Any Property Rights, as defined herein, that are associated with land acquired for preservation through this Ordinance that are not necessary for the preservation of the Property may be sold provided that:

a. Staff has advised that it is not necessary for the County to retain the Property Rights in order to preserve the Property.

b. A legally permissible procedure to transfer the Property Rights from the Property acquired for preservation is followed.

c. The Board of County Commissioners authorizes the sale,

transfer, or exchange of the Property Rights by one of the following methods:

(1) If the Property Rights are identified prior to the County acquiring title to the Property, and are specifically identified in materials presented to the Board of County Commissioners, said Property Rights may be sold, exchanged, or transferred to a private party or public agency at the time the Property is acquired, provided that this designation is approved by the Board of County Commissioners as part of the approval of the purchase of the Property. The County may reserve, restrict and/or condition the use of the Property Rights.

(2) If the Property Rights are identified after the Property is acquired by the County or if the Property Rights become legally transferable after the Property has been acquired, the Board of County Commissioners shall hold a public hearing to identify and consider the transfer, sale, or exchange of the Property Rights to a private party or public agency. The County may reserve, restrict and/or condition the use of the Property Rights.

d. Any proceeds received from the transfer, sale, or exchange of Property Rights shall only be used for the purposes specified in Section 3 of this Ordinance, or to retire bonds issued pursuant to this Ordinance as directed by the Board at the time the transfer, sale, or

exchange is approved.

For the purposes of this section the term "Property Rights" shall include, but is not limited to, density credits, water use permits, or similar water related permits or approvals, and capacity fees associated with water, wastewater, or other utility service prepaid fees.

SECTION 9. SETTLEMENT OF ACTUAL OR POTENTIAL EMINENT DOMAIN LITIGATION WITH A PUBLIC AGENCY OR QUASI-PUBLIC ENTITY

The Board of County Commissioners is authorized to negotiate and accept the settlement of actual or potential eminent domain litigation from the Public Entity that has been granted the power of eminent domain to accomplish a project or service for the public and transfer the requested property interest provided that:

(1) The Public Entity provides evidence that the use of the requested property interest is essential to the project or service and the Public Entity can show that there is no feasible alternative to utilize other property.

(2) The Public Entity will sufficiently address concerns of the Board of County Commissioners and incorporate, to the Board of County Commissioners' satisfaction, into the design, engineering, and construction for its project or service, the preservation and management of natural habitats in a manner that minimizes the impact that the project or service may have on the Property and will address any other environmental issues as required

by the County.

(3) Any proceeds received from the conveyance of the fee simple or other interest in the Property as part of the settlement of actual or potential eminent domain litigation shall only be used for the purposes specified in Section 3 of this Ordinance, or to retire bonds issued pursuant to this Ordinance as directed by the Board of County Commissioners at the time the conveyance is approved.

(4) Any interest in Property conveyed in conjunction with this Section will not be required to be designated an as "Acquisition of Convenience" as described in Section 4 of this Ordinance.

SECTION 10. AFFIRMATION OF PUBLIC PURPOSE

The voters of Hillsborough County have approved by referendum the assessment described in this Ordinance to provide funding for the acquisition and management of environmentally sensitive lands. The expenditure of these funds is for the purpose of achieving preservation of lands for the benefit of the public. In recognition of the benefits to the public of preserving these lands, the Board of County Commissioners of Hillsborough County hereby affirms that the acquisition of Property for preservation through ELAPP as funded by this Ordinance is a highest public purpose for those Properties and that the Board of County Commissioners is responsible for assuring that the Properties acquired for preservation will be protected.

SECTION 3: This amendment shall apply retroactively to all Property acquired to date and to all property to be acquired by funding provided by Ordinance 90-19, as amended.

SECTION 4: If any section, sentence, clause, part or provision of this ordinance amendment is held to be invalid by a court of competent jurisdiction, the remainder of this ordinance amendment shall not be affected thereby, but shall remain in full force and effect.

SECTION 5: This Ordinance shall become effective upon receipt of official acknowledgement from the Department of State that said Ordinance has been filed.

STATE OF FLORIDA)
COUNTY OF HILLSBOROUGH)

I, RICHARD AKE, Clerk of the Circuit Court and Ex-Officio Clerk of the Board of County Commissioners of Hillsborough County, Florida, do hereby certify that the above and foregoing is a true copy of an Ordinance adopted by the Board in its regular meeting of July 14, 1993 as the same appears of record in Minute Book 206 of the Public Records of Hillsborough County, Florida.

Witness my hand and official seal this 16th day of July, 1993.

APPROVED BY COUNTY ATTORNEY
BY _____
Approved As To Form And
Legal Sufficiency.

RICHARD AKE
CLERK OF CIRCUIT COURT

By: Judith M. Nichols
Deputy Clerk

FINAL
11/5/97
SJV

ORDINANCE NO. 97-14

AN ORDINANCE RELATED TO HILLSBOROUGH COUNTY PARKS; PROVIDING DEFINITIONS; REPEALING HILLSBOROUGH COUNTY ORDINANCE 78-8; PROVIDING FOR REGULATION OF VEHICLES WITHIN PARKS; PROVIDING FOR PRESERVATION OF PARK PROPERTY; PROVIDING FOR PROTECTION AND PRESERVATION OF PLANT AND WILDLIFE; PROVIDING FOR REGULATION OF RECREATIONAL ACTIVITIES; PROVIDING FOR REGULATION OF BOATING, FISHING, FIREARMS, PICNIC AREAS, HORSEBACK RIDING, AND ANIMALS; PROHIBITING TOY FIREARMS, FIREWORKS, AND EXPLOSIVES, AND POLLUTION OF WATERS; PROVIDING REGULATION OF REFUSE AND TRASH; PROVIDING OPERATING HOURS AND EXCEPTIONS; PROVIDING REGULATIONS OF MERCHANDISING, VENDING, PEDDLING, ADVERTISING, PUBLIC DEMONSTRATIONS, PUBLIC PERFORMANCES, CAMPING, AND SHOOTING AND ARCHERY RANGES; PROVIDING AUTHORITY OF SHERIFF DEPUTIES AND PARK OFFICIALS; PROVIDING PENALTIES; PROVIDING FOR LIBERAL CONSTRUCTION, SEVERABILITY AND EFFECTIVE DATE.

WHEREAS, the Board of County Commissioners, pursuant to Section 125.01, Florida Statutes, is authorized to provide parks, preserves, playgrounds and recreation areas and other recreational facilities for the welfare of its citizens; and

WHEREAS, the Board of County Commissioners adopted Ordinance 78-8 which governs the operation of Hillsborough County parks; and

WHEREAS, it is necessary to repeal Ordinance 78-8 to conform with federal and state law and to provide for more efficient and effective operations of Hillsborough County parks and recreation areas.

NOW, THEREFORE, BE IT ORDAINED BY THE BOARD OF COUNTY COMMISSIONERS OF HILLSBOROUGH COUNTY, FLORIDA:

SECTION 1. DEFINITIONS.

The following terms when used in this Ordinance shall have the meanings ascribed to them in this section.

(a) "Park" shall include "parkways", "recreational areas", "preserves", "natural areas", "marinas", and "other areas operated and maintained by the Hillsborough County Parks and Recreation Department" and shall mean parks, wayside parks, parkways, playgrounds, recreation fields, open green spaces, community centers, museums, auditoriums, ranges and buildings, lakes, streams, canals, lagoons, waterways, pools, water areas and beaches therein, and all public service facilities conducted on the grounds, water areas, buildings and structures in Hillsborough County which are under the control of or assigned for upkeep, maintenance or operation by the Parks and Recreation Department of Hillsborough County.

(b) "Park property" shall mean all areas, grounds, buildings, locations and facilities described in paragraph (a), above.

(c) "County" shall mean Hillsborough County, a political subdivision of the State of Florida.

(d) "Department" shall mean the Hillsborough County Parks and Recreation Department.

(e) "Director" shall mean the Director of the Hillsborough County Parks and Recreation Department.

(f) "Park official" shall mean the Department managers, their assistants, and any and all individuals employed by the Department.

(g) "Parking area" shall mean any part of any park road, drive, or area that is designated for the standing or stationing of any vehicles.

(h) "Permit" shall mean a document or certificate provided by the Department granting permission for use of reserved park/facility areas and/or to conduct and/or take part in a specific activity at a specific location and which sets forth terms and conditions applicable thereto.

(i) "Person" shall mean any natural person, firm, association, joint venture, partnership, estate, trust, business trust, fiduciary, corporation, and all other groups and combinations.

(j) "Vehicle" shall mean any wheeled conveyance (except a baby carriage or wheelchair) for transportation of persons or materials whether: (1) powered or drawn by motor such as an automobile, truck, motorcycle, scooter, minibike, or recreational vehicle; (2) animal-drawn such as carriage, wagon, or cart; (3) any self-propelled vehicle such as a bicycle, tricycle, or skateboard; or (4) any trailer in tow of any size, kind or description. The term "vehicle" does not include any recreational or park transportation service operated or authorized by the Department.

(k) "Vessel" is synonymous with boat as referenced in s.1(b), Art VII of the State Constitution and includes every description of watercraft, barge, and air boat, other than a seaplane on the water, used or capable of being used as a means of transportation on water.

SECTION 2. REPEAL.

Hillsborough County Ordinance 78-8 is hereby repealed in its entirety.

SECTION 3. REGULATION OF VEHICLES WITHIN PARKS.

All persons in or on parks or park property shall follow all applicable vehicle laws. All

applicable vehicle laws are enforceable within park property. The following additional regulations shall also apply:

(a) The speed limit in parks and park property is 15 m.p.h. or as otherwise posted.

(b) All law enforcement officers and such park personnel as are authorized and designated by the Director shall direct traffic whenever needed within park property in accordance with rules and regulations as may be set forth by the Department.

(c) The Director shall determine and all persons shall carefully observe and obey all traffic signs indicating speed, direction, caution, stopping or parking and all other signs posted for proper control and the safeguarding of life and property.

(d) Any person driving, operating, controlling or propelling any vehicle shall operate such vehicle only on designated paved or improved park roads or driveways, except when otherwise directed by any law enforcement officer or park official.

(e) No driver or operator of any vehicle shall obstruct traffic or park or stop on any road or driveway except at places designated for parking or stopping or in the event of any emergency beyond the control of the driver or operator. At designated places a vehicle may be stopped for no more than 15 minutes in order for the occupants to view scenic features.

(f) No person shall operate any truck, commercial vehicle or bus of any type on any restricted park road or property without prior authorization from the Department for the purpose of performing park maintenance or engaging in other authorized activities. Trucks and buses used solely to transport persons to any park or park property for recreational purposes shall be allowed to use park roads and parking areas for ingress and egress in the same manner as provided for conventional passenger vehicles.

(g) Any person who rides, drives, or propels any bicycle, tricycle, motorcycle, scooter or similar vehicle, whether motor propelled or self-propelled, shall do so only on roads designated

for vehicular traffic and/or other areas designated for the specific class of vehicle.

(h) Any person who parks a vehicle shall do so only in areas or facilities designated for that particular type of vehicle unless otherwise directed by any law enforcement officer, or park official, to park in other areas designated for parking. Any vehicle parked in an unauthorized area may be towed away at the owner's expense.

(i) The designated bicycle trails shall be used only by pedestrians and bicycles and other vehicles propelled by human power unless otherwise authorized by the Director. No person shall deviate from compliance with all applicable vehicle laws and regulations governing the operations of the above vehicles while on park property.

(j) No person shall tow another vehicle or wheeled device on park roads except when the towed vehicle is used in transporting authorized recreational vehicles, horse trailers, or small boats into designated areas, or when necessary to remove a disabled vehicle.

(k) No person shall operate any vehicles for hire in any parks, except those authorized by the Department and those legally authorized to carry passengers for hire or for fare.

(l) No person shall change any parts, repair, or grease any vehicle on any park roadway, parkway, driveway, parking lot or other park property unless authorized to do so by a park official.

(m) No driver of a vehicle using gasoline or any other explosive mixture as a source of power shall at any time fail to use a muffler or other sound deadening device.

SECTION 4. PRESERVATION OF PARK PROPERTY.

(a) No person shall willfully mark, deface, injure in any way, displace, remove or tamper with, any park buildings, bridges, tables, benches, fireplaces, railings, paving, water lines,

or other public utilities or parts or appurtenances thereof, park signs, notices, or placards, whether temporary or permanent, monuments, stakes, posts or other boundary markers or other structures or equipment, facilities or park property or appurtenances whatsoever, whether real or personal.

(b) No person shall damage or remove plants or plant materials, trees or parts thereof or any flowers or nuts or seeds whatsoever from any park property. Park officials may make such removals and the Director may issue specimen collecting permits to scientists, students of botany and other similarly situated individuals authorizing such removals.

(c) No person shall make any excavation by tool, equipment, blasting or other means.

(d) No person shall construct or erect any building or structure of whatever kind, whether permanent or temporary or run or string any public utility into, upon, across or over any park or recreation lands or affix any materials to any park property except with the prior written approval of the Director.

(e) No person shall build or attempt to build any fire or fires against or adjacent to any park building, structure, tree or plant, or any park property whatsoever, or against or on any property of others or in any area of any park except in areas specifically designated for fire building and in accordance with such regulations as are or may be specifically set forth by the Director. No person shall drop, throw, or otherwise deposit by any means, lighted matches, burning tobacco products or any other flammable material within any park area or any highway, road or street abutting or contiguous thereto.

(f) No person shall damage or remove any cultural, historical or archaeological artifacts from any park property.

SECTION 5. PROTECTION AND PRESERVATION OF PLANT AND WILDLIFE.

(a) Within any park, no person shall cut, carve, or injure the bark or break off limbs or branches, or pick the flowers or seeds of any tree, plant, or shrub, nor shall any person dig in or otherwise disturb grass areas or install any vegetation or in any other way injure or impair the natural beauty or usefulness of any area, nor shall any person pile debris or material of any kind on or about any tree or plant, or attach any rope, wire, or other contrivance thereto, whether temporary or permanent in character or use, without prior approval of the Director. No person shall tie or hitch any animal to any tree or plant within any park property.

(b) No person shall molest, harm, frighten, kill, net, trap, snare, hunt, chase, shoot, throw or propel any missiles by any means at any wildlife creature be it mammal, bird, amphibian, or reptile roaming free about a park or in captivity in any zoo cage. No person shall remove or possess the young of any wild animal or the nest or eggs of any reptile or bird.

(c) No person shall feed any zoo animals, birds or reptiles which are on restricted diets when posted signs or other notice prohibits such feeding.

(d) No person shall place, dump, abandon or leave any mammal, reptile, amphibian, fish or bird, either wild or domestic on the grounds of any zoo or park.

SECTION 6. RECREATIONAL ACTIVITIES IN PARK AREAS.

(a) No person, regardless of age, sex, or manner of dress, shall swim, or wade in any beach, water area or pool within any park except at places designated for such activities. Any person engaging in such activities shall comply with the rules established for these areas, including, but not limited to, hours of use and safety limitations for such uses.

(b) No person shall engage in recreational or other activities other than in areas designated for those activities. Swimming is prohibited in all park areas designated for boating. Boating is prohibited in all park areas designated for swimming.

(c) In areas designated for swimming and wading, all persons shall be so covered with clothing or a bathing suit so as to prevent any indecent exposure of the person. No person shall dress or undress on any park property except in bathing houses, or other structures as may be provided and maintained by the Department for that purpose. No person shall dress or undress in any vehicle, toilet, rest room, beach, or other park area, except as provided above.

(d) No person shall erect or cause to be erected any tent, shelter or structure on or in any beach, or water area in such a manner that requires guy wire, rope, extension, brace or support connected or fastened from any such tent, shelter or structure to any other structure, stake, rock or other object.

(e) No person shall enter or be in the water at any bathing or swimming area wearing, carrying, pushing, or towing any inflated inner tube, raft, rubber boat, or other similar device. Use of such devices shall be limited to certain areas which may, from time to time, be specifically designated for use of such devices by posted signs.

(f) Park officials shall regulate activities in picnic areas to prevent congestion and to secure the maximum use of park facilities for all. If any such facilities are crowded, persons holding picnics in such areas shall not occupy such facilities to the exclusion of others for an unreasonable time. The determination of unreasonable time shall be in the sole discretion of a park official. Use of individual fireplaces or other cooking areas together with adjacent tables and benches shall be on a first come, first served basis.

(g) No person shall conduct raffles, bingo games, card games for money, or hold drawings for prizes, or participate in any other forms of gambling on any park property. However, upon approval by the Director, charitable organizations may conduct raffles provided that participants are members and/or guests of the charitable organization and the raffle is otherwise conducted in compliance with all federal, state and local laws.

(h) No person shall conduct any activity or utilize any park or park area in a manner which will result in financial gain without prior approval of the Director.

(i) No person shall engage in any activity in any park or park area which is or may be dangerous to the health, safety and welfare of himself and/or others. No person shall engage in any activity in any park or park area which interferes with the use and enjoyment of the parks by others.

SECTION 7. BOATING.

In addition to the provisions set forth in Chapter 327, Florida Statutes, the following regulations shall apply to recreational water areas within parks:

(a) No person shall bring in to, launch or operate any vessel on any park property, watercourses, bays, lagoons, lakes, canals, rivers, ponds, or sloughs except at such places as are or may be designated by the Department for such use or purpose. Any person operating such vessels shall comply with Department boating regulations and all other federal, state and local laws related to boating.

SECTION 8. FISHING.

No person shall fish in park waters, either fresh or salt, by use of hook and line, seine, net, trap, spear, gig, or other device except at such places and in such areas as have been designated by the Department for such use.

SECTION 9. FIREARMS.

(a) No person, except law enforcement officers, shall carry, possess, or use firearms of any type, air rifles, pistols, spring guns, or any other form of weapon or trapping device which

is or may be on or in any park property except in areas designated for such uses or for events approved by the Department. Bows and arrows may be used at designated areas provided that such use is in compliance with rules and regulations established by the department and all applicable federal, state and local laws.

(b) No person shall hunt, trap or pursue any wildlife by any means or method except with prior written approval of the Director and in areas designated for such activities. Any such activities shall be in compliance with rules and regulations established by the Department and all applicable federal, state and local laws.

SECTION 10. PICNIC AREAS.

(a) No person shall picnic or cook in any park area not specifically designated for and regulated by the Department for such activities.

(b) No person shall build, light or cause to be lighted any fire upon the ground or other object in any park area except in an approved grill, stove, fireplace or other similar container. Any person who builds lights or causes to be lighted any fire as provided above, shall extinguish the fire before leaving the immediate area.

(c) No person shall use a grill, stove, fireplace or other similar device in such a manner as to burn, char, mar, blemish or otherwise damage any bench, table or other object of park property.

SECTION 11. HORSEBACK RIDING.

No person shall engage in horseback riding within any park property except in areas designated for such activities by clearly marked bridle paths, trails, and other necessary features. In areas designated for horseback riding, horses must be thoroughly broken, properly restrained

and prevented from grazing and straying unattended. All riders must carry proof of their horse's negative Coggins test.

SECTION 12. ANIMALS.

(a) Except in specified areas, domesticated animals are permitted within park property. All such animals must be restrained at all times at a distance not greater than six (6) feet in length from their handler. No such animals, except seeing eye dogs, shall be allowed on boardwalks or narrow passageways. All such animals shall wear up-to-date tags indicating that they have had rabies vaccinations.

(b) No person shall bring into any park property any non-domesticated animals including but not limited to, cattle, mules, swine, sheep, goats, fowl, or reptiles, except where in conjunction with projects sponsored by County Departments or upon permit from the Director.

(c) Dangerous dogs as defined in Chapter 767, Florida Statutes are prohibited from park property.

(d) In conjunction with projects sponsored by County Departments or upon permit from Director, animals may be allowed in designated areas of the parks at specified times without restraint.

SECTION 13. TOY FIREARMS, FIREWORKS, AND EXPLOSIVES.

(a) No person shall bring into, or have in his possession, or set off or otherwise cause to explode or discharge or burn, in any park area any firecrackers, torpedoes, rockets, toy firearms, cannons, or other fireworks or explosives of or containing flammable material or any substance, compound, mixture, or article which in conjunction with any other substance or compound, may explode, discharge or burn, unless he first obtains a written permit from the

director.

(b) Parents and/or guardians shall be held responsible and accountable for the actions of minors in regards to the prohibitions in the foregoing paragraph as provided by law.

SECTION 14. POLLUTION OF WATERS.

No person shall throw, discharge, or otherwise place or cause to be placed in the waters of any fountain, pond, lake, stream, bay or any other body of water within park property, any substance, matter, or thing, liquid or solid, which would or may result in the pollution of said waters.

SECTION 15. REFUSE AND TRASH.

No person shall take into, dump, deposit, drop, or place any bottles, broken glass, ashes, paper, boxes, cans, dirt, rubbish, waste, garbage, tobacco products, containers or foil, refuse or other trash upon any park property except in the receptacles provided for trash disposal; where receptacles are not provided, same shall be carried away from park property by the person or persons responsible for its presence and properly disposed of elsewhere. Park refuse and trash receptacles shall only be used by those persons using the park area for recreational and park activity.

SECTION 16. OPERATING HOURS, EXCEPTIONS, ACTIVITY.

(a) No person shall be or remain in any part of any park which is fenced in or provided with gates between the closing of the gates at night and their re-opening on the following day. No person shall be or remain in any park not fenced in or provided with gates, between sunset and sunrise of the following day, except in areas designated as twenty-four (24)

hour launching areas, or unless lighting is provided for a specific activity after sunset whereby such persons and vehicles may pass through such parks, without stopping, on the most direct walk or driveway leading from their point of entrance to the exit nearest to their point of destination. The provisions of this Section shall not apply to law enforcement officers or employees of the Department while in the discharge of their duties nor to persons having a written permit issued by the Department allowing them to be or remain in any part of any park between such times. The Director may establish exceptions to the operating hours as set forth above for certain uses and when it is otherwise in the interest of the public health, safety or welfare. Any such exceptions shall be posted at the park entrance and obeyed accordingly.

(b) No person shall park or permit to remain parked any vehicle on any driveway, parkway, parking area or other park property between sunset and sunrise on the following day or as otherwise posted, except for areas designated as twenty-four (24) hour launching areas.

SECTION 17. UNFINISHED OR WITHHELD PARKS.

No person, except as authorized by the Department, shall enter upon any part of any park which is in an unfinished condition or under construction or withheld from general public usage in the interest of public safety, health and/or welfare.

SECTION 18. MERCHANDISING, VENDING, PEDDLING, ETC.

No person, other than the Department or regularly licensed concessionaires acting by and under the authority of the County, shall expose or offer for sale, rent or trade, any article or thing, or station, or place any stand, cart, or vehicle, for the transportation, sale or display of any article or merchandise within the limits of any park or recreation area.

SECTION 19. ADVERTISING, PUBLICITY AND SIGNS.

(a) No person shall advertise or obtain publicity through any means whatsoever within or upon any park property.

(b) No person shall park or station on any park property any vehicle displaying a sign or notice with the intent of offering said vehicle for sale or exchange.

(c) No person shall distribute, display, or affix any printed materials or advertisements to or within any park property. Exceptions to this provision are printed materials or advertisements permanently affixed on vehicles or on clothing; distribution of printed handbills or leaflets, the purpose of which is not solely commercial; announcements of park sponsored or sanctioned events; authorized signs located entirely within concession structures, and signs and distribution of printed materials in conjunction with a permitted use of reserved park/facility area.

SECTION 20. PUBLIC DEMONSTRATIONS, GATHERINGS, PERFORMANCES, SPEECHES, ETC.

(a) Any band, procession, military company, or any company or group with flags, banners, or transparencies, may be allowed upon any park or parkway or within any park, subject to reasonable regulations of time, place and manner of such activities as established by the Director.

(b) No entertainment or exhibition shall be given in any park or recreation area except entertainment given under the direction and authority of the Department.

(c) Any public meeting of any kind or any public speeches by any person, representatives of any political party, social club or society, political aspirant, religious sect, theatrical or circus group, act, rite or ceremony, or other public exhibition may be held in any

park, parkway, playground or other recreational area, subject to reasonable regulations of time, place and manner of such gatherings as established by the Director.

SECTION 21. ALCOHOLIC BEVERAGES

(a) The sale, consumption, and possession of alcoholic beverages as defined in Section 561.01(4), Florida Statutes, is hereby prohibited.

SECTION 22. PROPER USE OF FACILITIES.

No person shall loiter in or around any park department rest room, dressing room, or bath house nor shall any person engage in any lewd and lascivious behavior as defined in Chapters 798 and 800, Florida Statutes (1995) or any amended or successor Statute.

SECTION 23. AUTHORITY OF SHERIFF DEPUTIES AND PARK OFFICIALS.

(a) It shall be the duty and responsibility of Sheriff Officers, Special Deputies, and Park Officials to enforce all provisions of permits issued by the Department.

(b) It shall be unlawful for any person to do any act forbidden or fail to perform any act required by any permit issued by the Department in furtherance of the mandates and provisions of this Ordinance.

(c) Besides the rules and regulations as set out in this Ordinance, park officials shall have the authority to establish further rules and regulations for regulation of park use pursuant to the preservation of health, safety, and/or welfare of the public in furtherance of the mandates and provisions of this Ordinance.

(d) Any violation of the provisions of this Ordinance, or any violation of any rules and regulations set forth by the Department pursuant to this Ordinance, shall authorize any park

official to remove the violator from the park area; said removal shall be effectuated by the park official requesting the violator to remove himself from the park area. Failure of any person violating the provisions of this Ordinance and/or the rules of the Department, to remove himself from the park area after direction and request has been made by a park official, shall constitute a trespass.

SECTION 24. CAMPING.

No person shall camp within any park property except in areas designated by the Department for such purpose. The Department may establish rules and regulations for designated camping areas within park property.

Camping in permanent cabins constructed by the Department or in privately owned trailer units or tents erected under Department permit and use by groups of persons under adequate supervision are the only types of overnight camping that shall be allowed in the parks; the bringing into a park and using for overnight occupancy any house trailer, camp trailer, camp wagon, or any other form of movable structure or special vehicle, except in areas designated for that purpose by the Department, is prohibited.

SECTION 25. SHOOTING AND ARCHERY RANGES.

All persons using any park range facilities including shooting and archery ranges shall abide by the Department's regulations governing range activities; copies of which regulations shall be furnished at each such range.

SECTION 26. PENALTIES.

Any person who violates this Ordinance shall be prosecuted in the name of the State in

the same manner as misdemeanors are prosecuted and, upon conviction, shall be subject to a fine not to exceed $500 or by imprisonment in the County Jail not to exceed 60 days or by both such fine and imprisonment.

SECTION 27. LIBERAL CONSTRUCTION.

This Ordinance shall be liberally construed in order to effectively carry out the purposes hereof which are deemed to be in the best interest of the public health, safety, and welfare of the citizens and residents of Hillsborough County, Florida. The provisions of this Ordinance shall supersede any existing provisions of the Code of Laws and Ordinances of Hillsborough County, Florida, which conflict with any provisions as set forth herein.

SECTION 28. SEVERABILITY.

If any section, subsection, sentence, clause, phrase, or provision of this Ordinance is held invalid or unconstitutional by any Count of competent jurisdiction, such invalidity or unconstitutionality shall not be so construed as to render invalid or unconstitutional the remaining provisions of this Ordinance.

SECTION 29. EFFECTIVE DATE.

This Ordinance shall take effect upon filing of this Ordinance with the Secretary of State, State of Florida.

STATE OF FLORIDA)
)
COUNTY OF HILLSBOROUGH)

I, RICHARD AKE, Clerk of the Circuit Court and Ex Officio Clerk of the Board of County Commissioners of Hillsborough County, Florida, do hereby certify that the above and foregoing is a true and correct copy of an Ordinance adopted by the Board at its meeting of November 5, 1997, as the same appears of record in Minute Book 258, of the Public Records of Hillsborough County, Florida.

WITNESS my hand and official seal this 12th day of November, 1997.

RICHARD AKE, CLERK OF CIRCUIT COURT

FLORIDA SEAL

BY: Gary J. Klunk
Deputy Clerk/ Gary J. Klunk

APPROVED BY COUNTY ATTORNEY

By: Approved as to form and legal sufficiency