

# Management Plan

## **Doris Leeper Spruce Creek Preserve**

**PREPARED FOR:**  
COUNTY OF VOLUSIA  
COMMUNITY SERVICES DEPARTMENT  
PARKS, RECREATION AND CULTURE DIVISION  
GROWTH & RESOURCE MANAGEMENT DEPARTMENT  
ENVIRONMENTAL MANAGEMENT DIVISION

**Prepared By:**  
ZEV COHEN & ASSOCIATES, INC.  
ENVIRONMENTAL SERVICES DEPARTMENT

Draft: October 2010  
Revised: September 2011



*DEP Approved Letter Inserted Here*

# LAND MANAGEMENT PLAN EXECUTIVE SUMMARY

Lead Agency: Volusia County  
 Common Name of Property: Doris Leeper Spruce Creek Preserve (DLSCP)  
 Location: Volusia County, Florida  
 Acreage Total: 1932.20 acres  
 Acreage Breakdown:

Land Cover Classification	Acres	% Area
Blackwater Stream	21.89	1.1
Bottomland Forest	65.46	3.4
Clearing	3.44	0.2
Coastal Hydric Hammock	7.48	0.4
Developed	9.76	0.5
Improved Pasture	4.85	0.3
Impoundment	5.01	0.3
Mangrove Swamp	15.19	0.8
Maritime Hammock	162.79	8.4
Mesic Flatwoods	281.59	14.6
Mesic Hammock	185.70	9.6
Salt Marsh	480.94	24.9
Scrub	280.04	14.5
Scrubby Flatwoods	254.13	13.2
Successional Hardwood Forest	27.50	1.4
Wet Flatwoods	112.83	5.8
Wet Prairie	13.61	0.7
Total	1,932.20	100.0

Lease/Management Agreement No.: 4195

(Appendix A)

Use: Single \_\_\_\_\_  
 Multiple X \_\_\_\_\_

Management Responsibilities:

Agency: Volusia County  
 Responsibilities: Resource restoration, management and protection, law enforcement, user group management

Designated Land Use: Conservation

Sublease (s): None

Encumbrances: None

Type Acquisition: Conservation and Recreation Lands (CARL) Program and Florida Forever Program.

Unique Features: Natural: Contains multiple imperiled habitats and large acreages of imperiled habitats, bluffs, scrub, salt marsh.

Archaeological/Historical: Over 15 documented archaeological/historical sites including two on the National Register of Historic Places.

Management Needs: Habitat restoration and improvement; user group management; hydrological preservation; exotic and invasive species maintenance and control; endangered and imperiled species habitat maintenance, enhancement, and restoration.

Acquisition Needs/Acreage: 2,831 acres in optimal boundary; 2499 has been acquired, 332 acres remaining to be acquired

Surplus Lands/Acreage: None

Public Involvement: ARC/DSL Land Management Review; Management Plan Advisory Group Plan Review; and Public Review.

DO NOT WRITE BELOW THIS LINE (FOR DIVISION OF STATE LANDS USE ONLY)

ARC Approval Date: \_\_\_\_\_ BTIITF Approval Date: \_\_\_\_\_

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Management Plan Compliance Checklist - Natural Resource Lands	
Requirements	Page Numbers
<b>18-2.021 Acquisition and Restoration Council.</b>	
1. Executive Summary (Example #1) <b>This should be included in the packet and should be the first page.</b>	✓
<b>Management Plans. Plans submitted to the division for ARC review under the requirements of Section 253.034 F.S. should be in a form and manner prescribed by rule by the board and in accordance with the provisions of S. 259.032 and should contain where applicable to the management of resources the following:</b>	
2. The common name of the property.	1
3. A map showing the location and boundaries of the property plus any structures or improvements to the property. (Example #2)	2,3 App C
4. The legal description and acreage of the property.	App B
5. The degree of title interest held by the Board, including reservations and encumbrances such as leases.	4, 5, App A
6. The land acquisition program, if any, under which the property was acquired.	4
7. The designated single use or multiple use management for the property, including other managing agencies.	53
8. Proximity of property to other significant State/local/federal land or water resources. (Example #3) <b>May be included in the map in item #2.</b>	5,6
9. A statement as to whether the property is within an Aquatic Preserve or a designated Area of Critical State Concern or an area under study for such designation. If yes, make sure appropriate managing agencies are notified of the plan.	56
10. The location and description of known and reasonably identifiable renewable and non-renewable resources of the property including, but not limited to, the following:	
A. Brief description of soil types, using U. S. D. A. maps when available;	12, 13, 14
B. Archaeological and historical resources*;	48, App H
C. Water resources including the water quality classification for each water body and the identification of any such water body that is designated as an Outstanding Florida Waters;	59
D. Fish and wildlife and their habitat;	35, 62
E. State and federally listed endangered or threatened species and their habitat;	38-44
F. Beaches and dunes;	N/A
G. Swamps, marshes and other wetlands;	18-25
H. Mineral resources, such as oil, gas and phosphate;	12
I. Unique natural features, such as coral reefs, natural springs, caverns, large sinkholes, virgin timber stands, scenic vistas, and natural rivers and streams; and	16, App G
J. Outstanding native landscapes containing relatively unaltered flora, fauna, and geological conditions.	16, App F
11. A description of actions the agency plans, to locate and identify unknown resources such as surveys of unknown archeological and historical resources.	48
12. The identification of resources on the property that are listed in the Florida Natural Areas Inventory. <i>Include letter from FNAI or consultant, where appropriate.</i>	App E
13. A description of past uses, including any unauthorized uses of the property. (Example #4)	49
14. A detailed description of existing and planned use(s) of the property. (Example #5)	51, App K
15. A description of alternative or multiple uses of the property considered by the managing agency and an explanation of why such uses were not adopted.	51-55
16. A detailed assessment of the impact of planned uses on the renewable and non-renewable resources of the property and a detailed description of the specific actions that will be taken to protect, enhance and conserve these resources and to mitigate damage caused by such uses.	52-96, App K
17. A description of management needs and problems for the property.	75-79
18. Identification of adjacent land uses that conflict with the planned use of the property, if any.	78
19. A description of legislative or executive directives that constrain the use of such property.	4
20. A finding regarding whether each planned use complies with the State Lands Management Plan adopted by the Trustees on March 17, 1981, and incorporated herein by reference, particularly whether such uses represent "balanced public utilization", specific agency statutory authority, and other legislative or executive constraints.	52, 92
21. An assessment as to whether the property, or any portion, should be declared surplus.	52
22. 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. <b>Clearly defined map of parcels can be used.</b>	5, 8, 10
23. A description of the management responsibilities of each agency and how such responsibilities will be coordinated, including a provision that requires that the managing agency consult with the Division of Historical Resources before taking actions that may adversely affect archaeological or historic resources. (Example #6)	55
24. A statement concerning the extent of public involvement and local government participation in the development of the plan, if any, including a summary of comments and concerns expressed. (Example #7)	9, App D

<b>Management Plan Compliance Checklist - Natural Resource Lands</b>	
<b>Requirements</b>	<b>Page Numbers</b>
<b>Additional Requirements—Per Trustees</b>	
25. Letter of Compliance of the management plan with the Local Government Comprehensive Plan. Letter from local government saying that the plan is in compliance with local government's comprehensive plan.	App M
<b>253.034 State-Owned Lands; Uses. —Each entity managing conservation lands shall submit to the Division of State Lands a land management plan at least every 10 years in a form and manner prescribed by rule by the Board.</b>	
26. All management plans, whether for single-use or multiple-use properties, shall specifically describe how the managing entity plans to identify, locate, protect and preserve, or otherwise use fragile nonrenewable resources, such as archaeological and historic sites, as well as other fragile resources, including endangered plant and animal species.	66, App H
27. The management plan shall provide for the conservation of soil and water resources and for the control and prevention of soil erosion.	59,94
28. Land management plans submitted by an entity shall include reference to appropriate statutory authority for such use or uses and shall conform to the appropriate polices and guidelines of the state land management plan.	1
29. All land management plans for parcels larger than 1,000 acres shall contain an analysis of the multiple-use potential of the parcel, which analysis shall include the potential of the parcel to generate revenues to enhance the management of the parcel.	53, App J, K
30. Additionally, the land management plan shall contain an analysis of the potential use of private managers to facilitate the restoration or management of these lands.	89
31. A physical description of the land.	1
32. A desired outcome	55,56
33. A quantitative data description of the land which includes an inventory of forest and other natural resources; exotic and invasive plants; hydrological features; infrastructure, including recreational facilities; and other significant land, cultural, or historical features.	Section II; App H, I, J, K
34. A detailed description of each short-term and long-term land management goal, the associated measurable objectives, and the related activities that are to be performed to meet the land management objectives. Each land management objective must be addressed by the land management plan, and where practicable, no land management objective shall be performed to the detriment of the other land management activities.	71-86
35. A schedule of land management activities which contains short-term and long-term land management goals and the related measurable objectives and activities. The schedule shall include for each activity a timeline for completion, quantitative measures, and detailed expense and manpower budgets. The schedule shall provide a management tool that facilitates development of performance measures.	71-86
36. A summary budget for the scheduled land management activities of the land management plan. For state lands containing or anticipated to contain imperiled species habitat, the summary budget shall include any fees anticipated from public or private entities for projects to offset adverse impacts to imperiled species or such habitats, which fees shall be used solely to restore, manage, enhance, repopulate, or acquire imperiled species habitat. The summary budget shall be prepared in such a manner that it facilitates computing an aggregate of land management costs for all state-managed lands using the categories described in s. 259.037(3).	86-88
37. Each management plan shall describe both short-term and long-term management goals, and include measurable objectives to achieve those goals. <i>Short-term and long-term management goals shall include measurable objectives for the following, as appropriate:</i> (A) <i>Habitat restoration and improvement;</i>	71-86
(B) <i>Public access and recreational opportunities;</i>	69, App K
(C) <i>Hydrological preservation and restoration;</i>	59
(D) <i>Sustainable forest management;</i>	60, App J
(E) <i>Exotic and invasive species maintenance and control;</i>	61
(F) <i>Capital facilities and infrastructure;</i>	68, App K
(G) <i>Cultural and historical resources;</i>	66
(H) <i>Imperiled species habitat maintenance, enhancement, restoration, or population restoration</i>	62
<b>253.036 Forest Management. —</b>	
38. For all land management plans for parcels larger than 1,000 acres, the lead agency shall prepare the analysis, which shall contain a component or section prepared by a qualified professional forester which assesses the feasibility of managing timber resources on the parcel for resource conservation and revenue generation purposes through a stewardship ethic that embraces sustainable forest management practices if the lead management agency determines that the timber resource management is not in conflict with the primary management objectives of the parcel. (Example #8)	App J

Management Plan Compliance Checklist - Natural Resource Lands	
Requirements	Page Numbers
<b>259.032 Conservation And Recreation Lands Trust Fund; Purpose. —</b>	
<b>(10)(a) State, regional or local governmental agencies or private entities designated to manage lands under this section shall develop and adopt, with the approval of the Board of Trustees, an individual management plan for each project designed to conserve and protect such lands and their associated natural resources. Private sector involvement in management plan development may be used to expedite the planning process.</b>	
39. Individual management plans required by s. 259.032(10)(b), for parcels over 160 acres, shall be developed with input from an advisory group - <b>Management plan should list advisory group members and affiliations.</b>	App D
40. The advisory group shall conduct at least one public hearing in <b>each</b> county in which the parcel or project is located. <b>Managing agency should provide DSL/OES with documentation showing date and location of public hearing.</b>	App D
41. 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. <b>Managing agency should provide DSL/OES with copy of notice.</b>	App D
42. The management prospectus required pursuant to 259.032 (9)(d) shall be available to the public for a period of 30 days prior to the public hearing.	App D
43. Summary of Advisory Group Meeting should be provided to DSL/OES.	App D
44. Individual management plans shall conform to the appropriate policies and guidelines of the state land management plan and shall include, but not be limited to:	
A. A statement of the purpose for which the lands were acquired, the projected use or uses as defined in s. 253.034, and the statutory authority for such use or uses.	4, App C
B. Key management activities necessary to <b>achieve the desired outcomes, including, but not limited to, providing public access</b> , preserving and protecting natural resources, <b>protecting cultural and historical resources</b> , restoring habitat, <b>protecting threatened and endangered species</b> , controlling the spread of nonnative plants and animals, performing prescribed fire activities, and other appropriate resource management activities.	49-96, App I, J, K
C. A specific description of how the managing agency plans to identify, locate, protect, and preserve, or otherwise use fragile, nonrenewable natural and cultural resources.	App I, J, K, H
D. A priority schedule for conducting management activities, based on the purposes for which the lands were acquired. (Example #10) <b>The schedule must include a goal, an objective, and a time frame for completion.</b>	55-86
E. A cost estimate for conducting priority management activities, to include recommendations for cost-effective methods of accomplishing those activities. <i>Using categories as adopted pursuant to 259.037, F.S., is suggested. These are: (1) Resource Management; (2) Administration; (3) Support; (4) Capital Improvements; (5) Visitor Services/Recreation; and (6) Law Enforcement.</i>	86-88
F. A cost estimate for conducting other management activities which would enhance the natural resource value or public recreation value for which the lands were acquired. The cost estimate shall include recommendations for cost-effective methods of accomplishing those activities. <i>Using categories as adopted pursuant to 259.037, F.S., is suggested. These are: (1) Resource Management; (2) Administration; (3) Support; (4) Capital Improvements; (5) Visitor Services/Recreation; and (6) Law Enforcement. (Example #10) Include approximate monetary cost and cost effective methods. Can be placed in the appendix.</i>	86-88
45. A determination of the public uses and public access that would be consistent with the purposes for which the lands were acquired.	App K
<b>259.036 Management Review Teams.—</b>	
46. The managing agency shall consider the findings and recommendations of the land management review team in finalizing the required 10-year update of its management plan. <i>Can be addressed in the body of the plan or addressed in an appendix. If not in agreement, the managing agency should reply in a statement in the appendix.</i>	89, App L
<b>Other Requirements</b>	
47. This checklist table at front of plan (pursuant to request of ARC and consensus agreement of managing agencies.)	✓
48. Accomplishments (implementation) from last plan (format variable by agency)	7, 48, 86
49. FNAI-based natural community maps (may differ from FNAI in some cases)	27-34, App E
50. Fire management plans (either by inclusion or reference)( 259.032)	App I
51. A statement regarding imcompatible uses [ref. Ch. 253.034 (9)]	53-54
52. Cultural resources, including maps of all sites <u>except Native American sites*</u>	48, App H
53. <b>Arthropod control plan</b>	App N
*While maps of Native American sites should not be included in the body of the management plan, the DSL urges each managing agency to provide such information to the Division of Historical Resources for inclusion in their proprietary database. This information should be available for access to new managers to assist them in developing, implementing and coordinating their management activities.	✓

# Management Plan

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**Appendix O: Holistic Stewardship of Doris Leeper Spruce Creek Preserve (Spring 2012)**

**Appendix P: Restoration Plan (November 2012)**

## **I. GENERAL INFORMATION**

The following updated and revised management plan is submitted for review to the Board of Trustees of the Internal Improvement Trust Fund (BOT) of the State of Florida through the Department of Environmental Protection, Division of State Lands (DSL), in compliance with paragraph eight of Lease No. 4195 (Appendix A). The plan is intended to meet the requirements of Sections 253.034 and 259.032, Florida Statutes, Chapter 18-2, Florida Administrative Code, and intended to be consistent with the State Lands Management Plan. With approval, this management plan will replace the Plan approved by FDEP's Acquisition and Restoration Council (ARC) in March 2002. All development and resource alteration encompassed in this plan is subject to the granting of appropriate permits, easements, licenses, and other required legal instruments. Approval of the management plan does not constitute an exemption from complying with the appropriate local, state or federal agencies. The Plan has been formatted and content were drafted in accordance with ARC requirements for management plans and the model plan outline provided by the staff of DSL.

The Doris Leeper Spruce Creek Preserve contains many parcels that are not under state ownership. The total Preserve lands under public ownership is 2,477 acres. The reader of this Plan should note that the intended (required) purpose is to show that the County is appropriately managing state-owned lands (titles held in fee simple or less than fee simple by the BOT; 1,932 acres) as required by Florida Statutes and Florida Administrative Code. The focus of this Plan is on those particular state-owned parcels, and use of words such as "site" or "property" will refer to the state-owned parcels. It is realized that the Preserve as a whole is larger than these state-owned lands and for the purpose of management, the County considers the entire Preserve as one complete managed area.

### **A. Land Acquisition**

#### **1. Location**

Doris Leeper Spruce Creek Preserve consists of 1,932 acres of state owned land within the Preserve in Volusia County, lying in Sections 22, 23, 25, 28, 29, 33, 34, 35, 36, and 38, Township 16 South, Range 33 East. Other adjacent, non-state owned conservation lands increase the total area to 2,477 acres. DLSCP is approximately 8 miles southeast of Daytona Beach and 43 miles northeast of Orlando. The property lies within three (3) local jurisdictions that include the City of Port Orange, the City of New Smyrna Beach, and Volusia County.

DLSCP is generally bordered on the north by Spruce Creek and Rose Bay, on the west by public lands along Interstate 95 on the south by developed and undeveloped private residential lands, and on the east by US Hwy 1, although some parcels do occur east of US 1. Several city and county owned forested properties are contiguous to and abut the DLSCP on several of its boundaries. The Preserve consists of tracts separated by Spruce Creek, Strickland Bay, Turnbull Bay, Murray Creek and US 1. For communication purposes, these tracts are referred to by individual name as shown on the Parcel Identification Map.

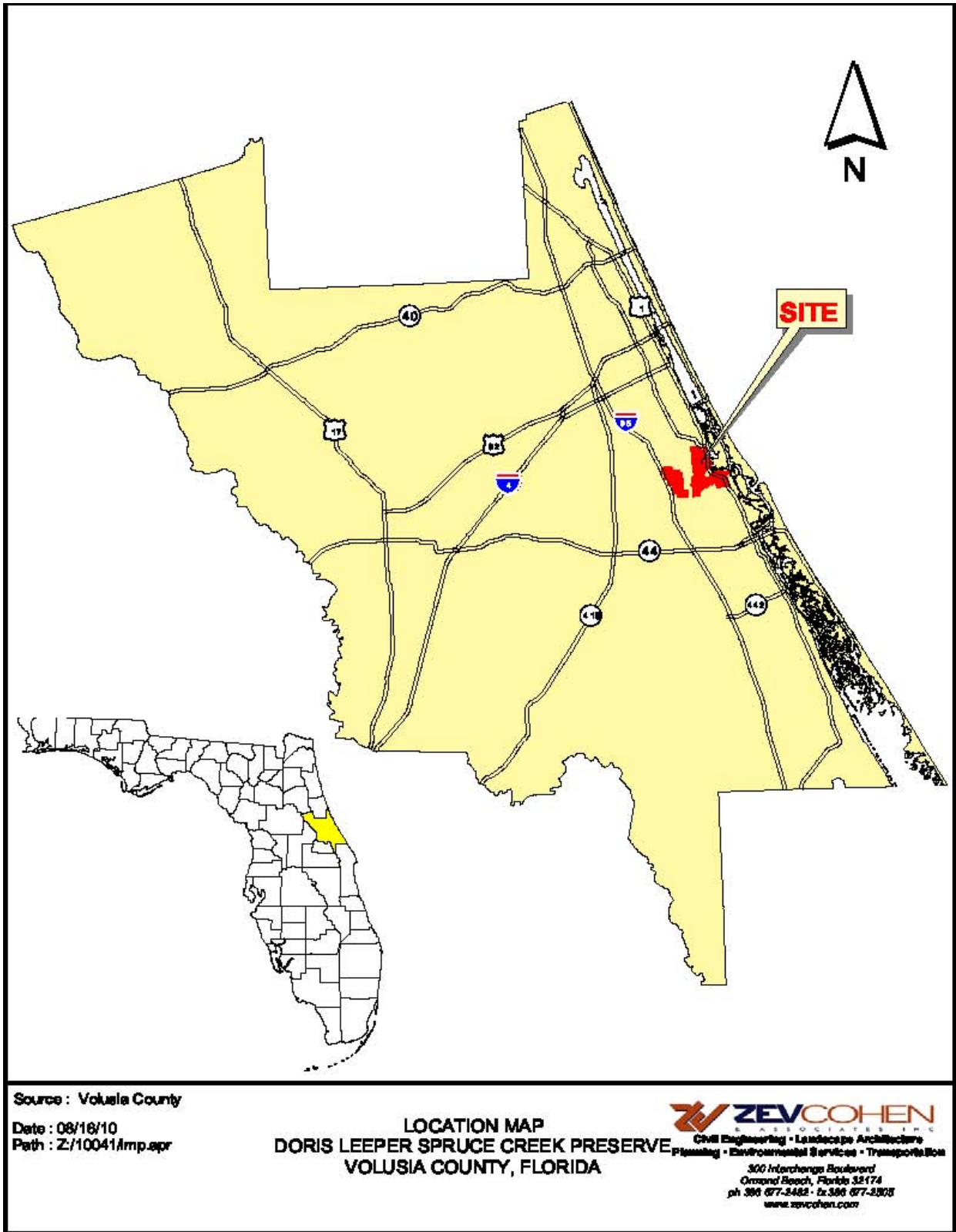


Figure 1. Location Map of the Doris Leeper Spruce Creek Preserve.

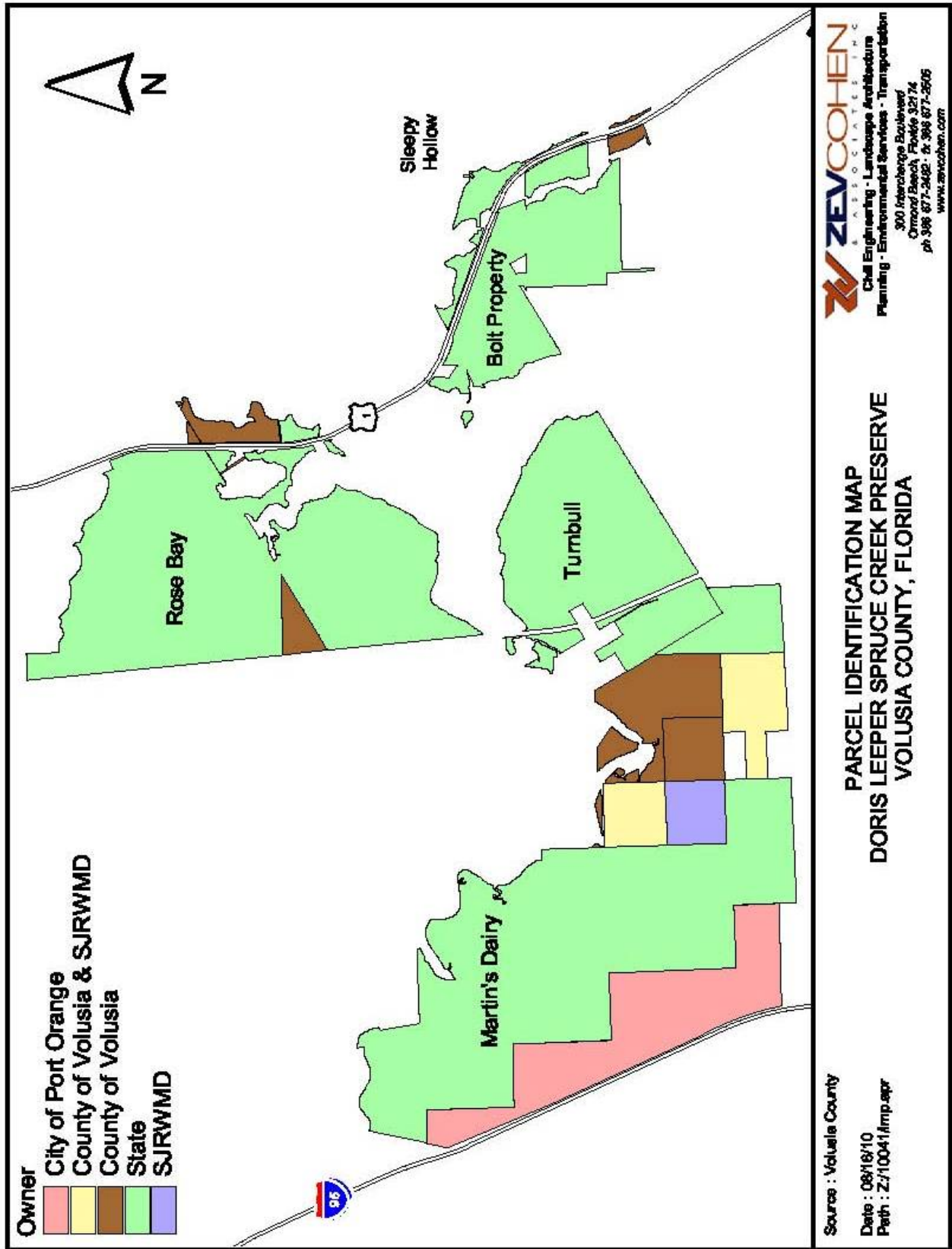


Figure 2. Parcel Identification Map of tracts at Doris Leeper Spruce Creek Preserve.

## **2. Purchase**

The acquisition of DLSCP was begun in the mid-1980's, and involved several individuals, conservancy groups, and state and local governments and agencies. The Preserve was purchased through a joint effort with Volusia County and the State's Conservation and Recreation Lands (CARL) Program. Volusia County manages the land, although the State of Florida owns the property.

The purpose of the acquisition as described is here is summarized from DEP's Management Prospectus (Appendix C). One of the primary reasons for acquisition was to protect one of the largest undeveloped tracts in the region. Undeveloped land is rapidly disappearing due to the expanding development of adjacent urban areas. Additionally, the acquisition was sought to help maintain water quality of the adjacent creeks and bays, and would provide protection to important historical resources, including portions of the Andrew Turnbull plantation.

## **3. Management Authority**

Volusia is the designated lead managing agency for DLSCP under the authority granted by Lease Number 4195.

## **4. Management Directives**

This Management Plan is to guide the appropriate development of facilities that will provide access to the Preserve, while preserving the integrity of its natural and cultural resources. The plan identifies the objectives, criteria and standards that guide preserve development, administration and management and is intended to meet the requirements of Section 253.034, Florida Statutes and Chapter 18-2, Florida Administrative Code.

Florida Statutes, subsection 253.023(11) directs the County to manage the leased premises only for the conservation and protection of natural and historical resources and resource-based, public outdoor recreation which is compatible with the conservation and protection of these public lands.

Thus, the fundamental goal of the County as the managing agency is the protection and preservation of the natural and cultural historic resources of the Preserve and serves as the goal guiding management of the Preserve and its associated uses. In order to accomplish this goal, the County manages the Preserve in a two-tiered approach. The Volusia County Parks, Recreation & Culture Division (lead), in combination with the Environmental Management Division, are responsible for natural resource protection and preservation, including management activities noted within this Plan. The Volusia County Parks, Recreation and Culture Division is responsible for user group management, related to secondary user activities identified in Section III of this Plan. The division managers and individual staff communicate on a regular basis to ensure proper protection and preservation of the natural resources remains the primary goal. This division of labor allows the most equipped staff to handle appropriate management activities, from controlled burns to gate maintenance.

The Management Policy Statement from the Management Prospectus is as follows:

The primary goals of management of the Spruce Creek project are: to conserve, protect, manage, or restore important ecosystems, landscapes, and forests, in order to enhance or protect significant surface water, coastal, recreational, timber, fish or wildlife resources which local or state regulatory programs cannot adequately protect; to provide areas, including recreational trails, for natural-resource-based recreation; and to preserve significant archaeological or historical sites.

## **5. Title Interest and Encumbrances**

Title to DLSCP, as State-owned lands, is held by the Board of Trustees of the Internal Improvement Trust Fund of the State of Florida (Lessor). In January, 2001 the Lessor entered into a lease agreement with Volusia County as lessee and lead manager of DLSCP (Appendix A). The term of this lease is 50 years.

### **B. Proximity to Other Public Properties**

State owned lands within DLSCP are contiguous with a number of publicly owned conservation areas that are managed by Volusia County. The entire conglomerate of publicly owned and managed lands is considered the Preserve. As noted above, the region in which DLSCP located has experienced significant development pressure. As such, DLSCP does not have any direct land connections with other public lands. It does have numerous connections via waterways, including county and city owned parks and managed lands to the east and west. Additionally, numerous parcels that have been placed under Conservation Easements granted to regulatory agencies (primarily the St. Johns River Water Management District) have hydrologic connections via swamps and other watercourses that connect to Spruce Creek.

A map of conservation lands within a 10-mile radius of the Preserve is displayed below in the Public Conservation Lands Map. Volusia County is the managing agency for the publicly owned lands that are adjacent to BOT lands within DLSCP.

Some of the notable lands in the region along with the associated manager / owner include:

- Tiger Bay State Forest (includes Rima Ridge Wildlife Management Area): FL Division of Forestry
- Port Orange Mitigation Bank: City of Port Orange
- Longleaf Pine Preserve: Volusia County
- Gamble Place: Non-Profit Organization
- Ponce Preserve: City of Ponce Inlet
- Lighthouse Point: Volusia County
- Smyrna Dunes Park: Volusia County
- Farmton Mitigation Bank: Mitigation Associates, Inc.
- Turnbull Hummock: CARL Project – St. Johns River Water Management District

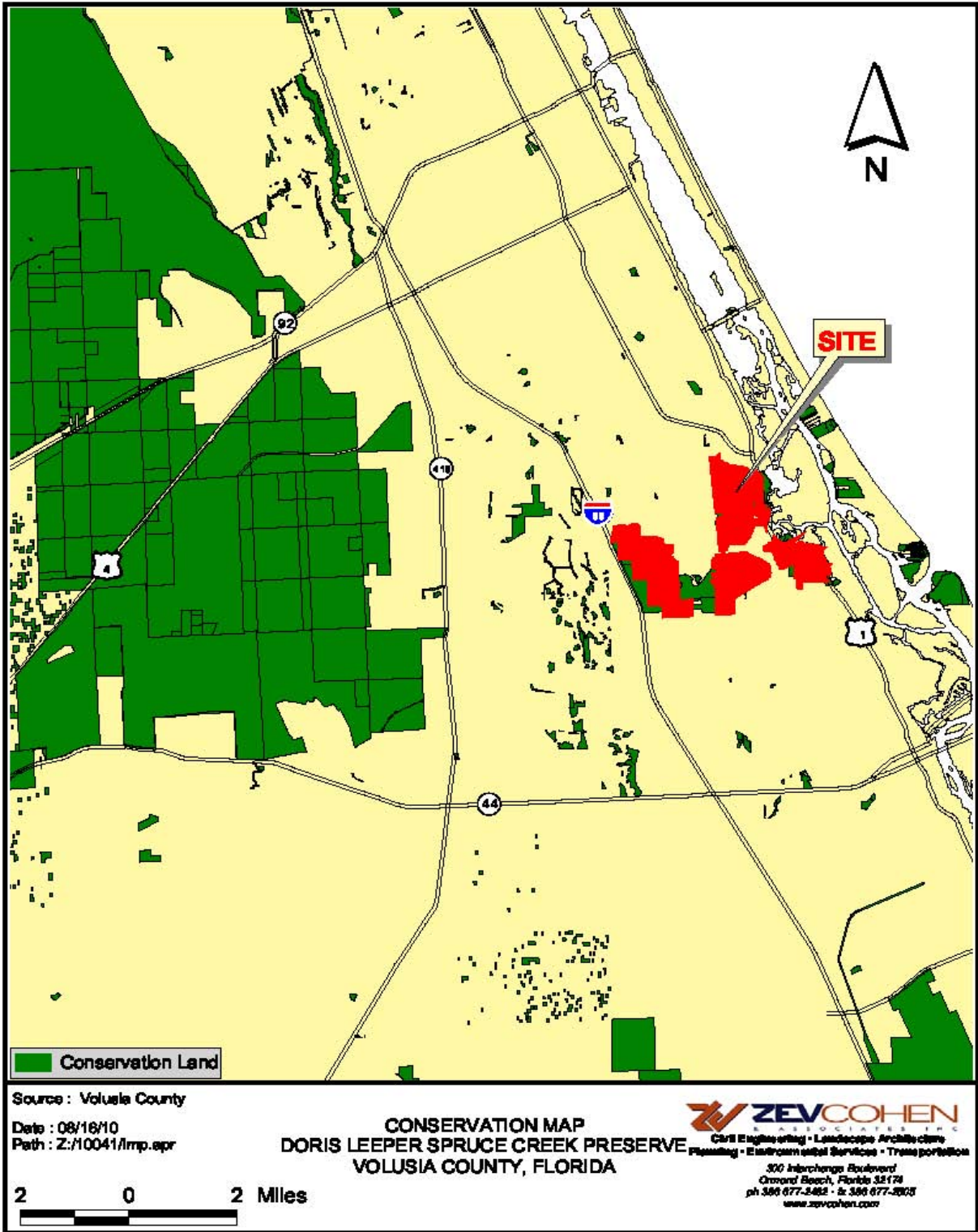


Figure 3. Conservation lands adjacent to and with in a 10-mile vicinity of Doris Leeper Spruce Creek Preserve.

### **C. Optimal Boundary**

The optimum boundary is identified by the black boundary identified as the Florida Forever BOT Project Boundary on the Optimal Boundary Map. This map is from the DEP approved Management Prospectus, which is provided in its entirety in Appendix C. The purpose of the optimal boundary is to guide acquisition of parcels towards those parcels that would promote the Florida Forever goals and the goals listed within this Plan. Adjustments to the boundary and may add or remove parcels depending upon current conditions. If parcels that were formerly within an optimum boundary are developed, they may be removed from essential parcels list. Note that inclusion within this boundary does not equate to ownership. It is a guide to acquiring additional lands for public ownership and management.

The County, in partnership with others, has been able to acquire a significant portion of the properties within the Optimal Boundary. The acquisition of these lands is a significant focus of Volusia County's Environmental Management Division. The acquisition of these properties directly promotes the primary objective of the management directive noted above. The remaining properties include lands adjacent to the exterior boundaries of the overall publicly owned lands. As part of the management strategy, adjacent and contiguous lands are continuously reviewed and evaluated for potential incorporation into the Preserve's CARL/Florida Forever boundary. In 2008, with approval by ARC, six privately owned parcels totaling 96.97 acres were removed from the Optimal Boundary. This change reflected which properties should be targeted for acquisition; no parcels have been removed or sold from public ownership. These properties were reviewed by the Office of Environmental Services as part of a study to determine whether properties should be removed from the optimum boundary that have been disturbed by development and no longer desirable for state acquisition. The six parcels were found to contain residential and/or commercial infrastructure and /or buildings. .

The Doris Leeper Spruce Creek has been one of the several priority areas of the county-wide Volusia Forever program. The *Volusia Forever* program provides for the acquisition and management of environmentally sensitive and outdoor recreation lands. The program, created by the county's voters in 2000, is funded through annual ad valorem assessment for a period of twenty years. Potential future acquisitions through this program, which is for willing sellers only, is dependent upon available funding.

The *Volusia Forever* program is administered by the County's Environmental Management Division. The responsibility for final decisions regarding property acquisition resides with the County Council.

## Spruce Creek

**PARCELS PROPOSED FOR REMOVAL FROM FLORIDA FOREVER PROJECT BOUNDARY AUGUST 2009**

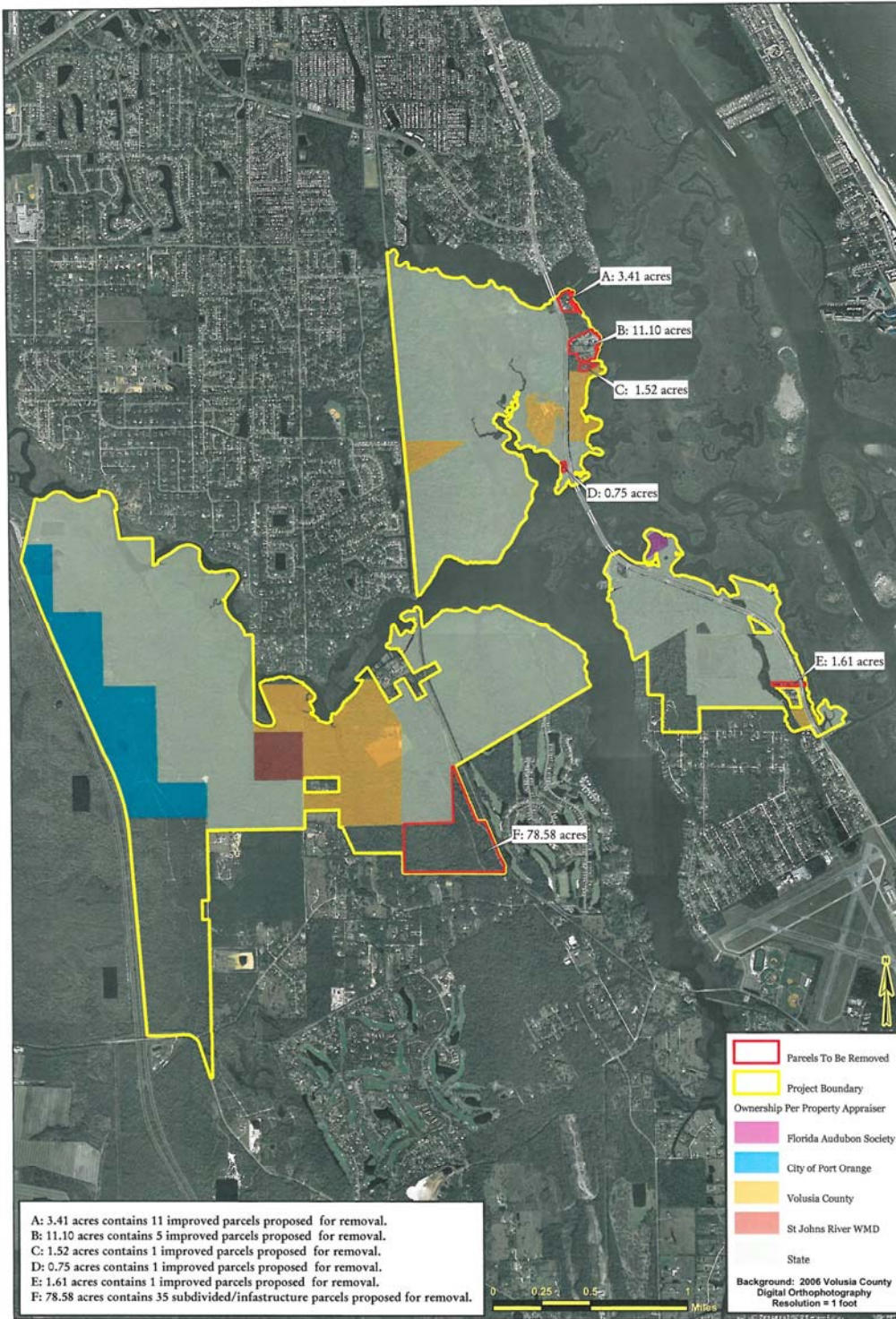


Figure 4. Optimal Boundary (shown in yellow) of the Doris Leeper Spruce Creek Preserve following revisions to the boundary approved in 2008.

## **D. Public Involvement**

A public workshop was held on December 6, 2010. The purpose of this meeting was to present this draft management plan to the public. Comments from public input were considered and where logistical and not contrary to the primary purpose and goals of this Plan, were incorporated. The Florida Statute calls for the minimum of one public hearing.

Following review and input of the Plan at the public workshop, a Management Plan Advisory Group meeting was held on December 8, 2010. The County Council, in accordance with Section 259.032, Florida Statutes, established an advisory group that provided input into this Plan. The advisory group members consisted of representatives from the lead and co-managing agency, a local property owner, the soil and water conservation district, a local conservation organization, and a local elected official. The Council approved the formation of an advisory group for the purpose of reviewing and commenting on the Plan on its October 7, 2010 regularly scheduled public meeting.

## **II. NATURAL AND CULTURAL RESOURCES**

### **A. Physiography**

The following section provides a description and assessment of existing natural and cultural resources found in the Preserve. An Aerial Map and other supporting figures are provided in this section.

#### **1. Topography**

Elevations on this site range from 0 feet NGVD along the margins of Spruce Creek, Strickland Bay, Turnbull Bay and along the mangrove and marsh islands to 40 feet NGVD at the top of the Spruce Creek archeological mound and the bluffs along Spruce Creek. Higher elevations on the project site are associated with scrub, aboriginal shell mound deposits and bluffs along Spruce Creek, while lower elevations on the project site are associated with the margins of Spruce Creek and adjacent salt marsh and mangrove areas.

During the planning of recreational activities slope is a more important concern than actual elevations with regards to minimizing ecological impacts. On the project site, the steepest slopes are associated with the aboriginal shell mound areas and bluff areas in the western portion of the project site. Multi-use trails proposed in proximity to these areas should be field verified to avoid excessively sloped areas. This will minimize sedimentation and erosion problems in the future and protect surface water quality.

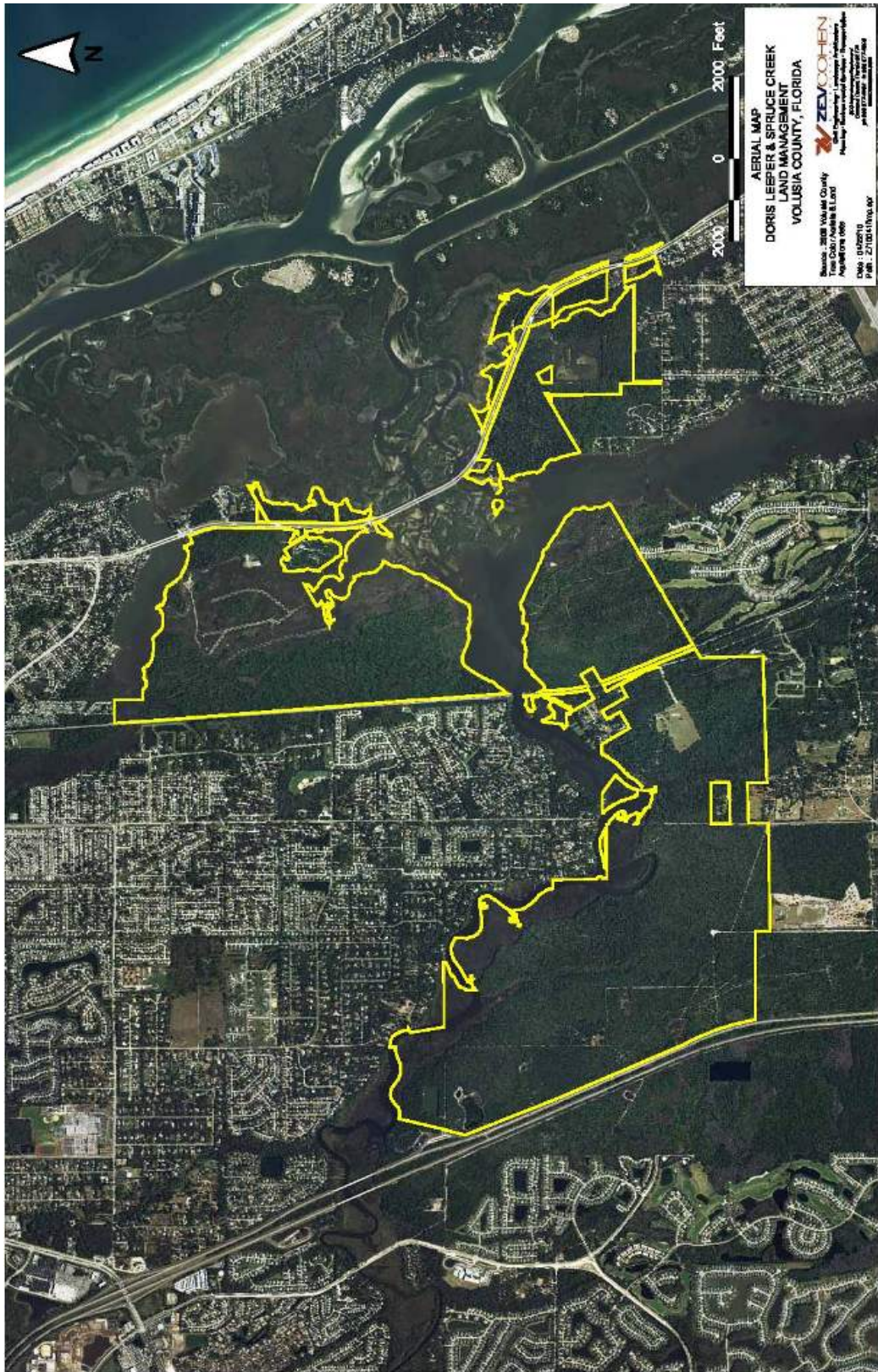


Figure 5. Aerial Map of Doris Leeper Spruce Creek Preserve.

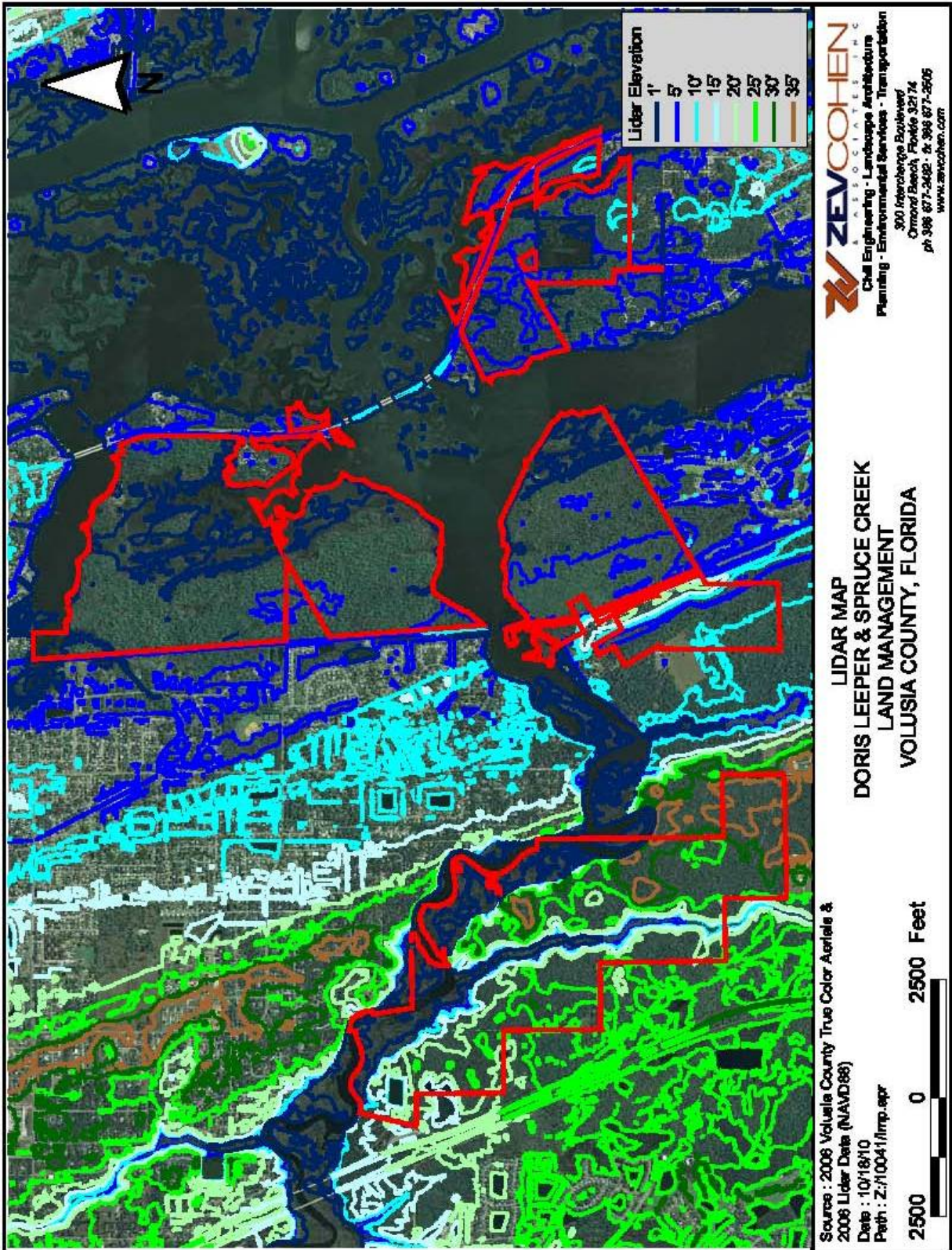


Figure 6. Topography of the Doris Leeper Spruce Creek Preserve as a digital elevation map derived from LIDAR data produced by Volusia County.

## 2. Soils

According to the United States Department of Agriculture (USDA) Soil Conservation Service Soil Survey of Volusia County (1980) (now the Natural Resource Conservation Service – NRCS), there are eighteen (18) soil map units that occur within the Preserve. These soil types, along with a brief description are listed in Table 2.1 below and displayed on the Soils Map. Revenue-generating mineral resources, such as oil, gas and phosphate, are not known to occur within the Preserve.

Soils on the project site provide insight into historic vegetation patterns, potential land uses, and appropriate plant selections for restoration areas. The dominant soil types in the uplands on the eastern portion of the site are Myakka fine sand and Smyrna fine sand, while the soils of the uplands on the western portion of the site are dominated by Paola fine sand, 0-8% slopes and Astatula fine sands, 0-8% slopes. The predominant wetland soil on the site, Turnbull muck, underlies the extensive salt marsh areas adjacent to Spruce Creek.

In the table below, the hydric status of the soil is listed as Component, Inclusion, or Xeric. The purpose of the rating is to understand, relative to the map unit, the extent of the hydric nature of the soil. Hydric component soils are those map units where the majority of the map unit is comprised of a hydric soil. Hydric inclusion soils are those where a minority percentage of the map unit consists of hydric soils. Xeric soils are those that have no hydric soils included within the map unit. These can also be considered in terms of hydric, mesic, and xeric across the landscape. Note that the use of terms *component* and *inclusion* are from terminology appearing in the 3<sup>rd</sup> Edition of the *Hydric Soils of Florida Handbook*, although the actual rating below are based on the 4<sup>th</sup> edition.

**Table 2.1. Soil Types and Descriptions occurring on Doris Leeper Spruce Creek Preserve Project Site, Volusia County, Florida.**

Soil Name and Map Symbol	Brief Soil Description	Seasonal High Water Table		Historic Vegetation	Hydric Status
		Depth (in)	Duration (mo)		
Astatula fine sand, 0-8% slopes (4)	Excessively drained; nearly level to sloping	>80	12	Sand pine, turkey oak, sand live oak, longleaf pine, wiregrass, gopher apple, saw palmetto	Xeric
Basinger fine sand, depressional (8)	Poorly drained, nearly level	At or above the surface	1-3	St. Johns wort. Maidencane, pond pine	Component
Canaveral sand, 0-5% slopes (12)	Moderately well drained to poorly drained; nearly level to gently sloping	10-40	2-4	Saw palmetto, scrub oaks	Xeric

Soil Name and Map Symbol	Brief Soil Description	Seasonal High Water Table		Historic Vegetation	Hydric Status
		Depth (in)	Duration (mo)		
Cassia fine sand (13)	Somewhat poorly drained; nearly level to gently sloping	15-40	6	Slash pine, longleaf pine, sand pine, scrubby oaks, saw palmetto, wiregrass	Xeric
Cocoa sand, 0-5% slopes (15)	Well drained; nearly level to gently sloping	>80	12	Live oak, laurel oak, magnolia, cabbage palm	Xeric
Daytona sand, 0-5% slopes (17)	Moderately well drained; nearly level to gently sloping	40-50	1-4	Sand pine, scrub oak, longleaf pine, rosemary, turkey oak, fetterbush, saw palmetto	Xeric
Fluvaquents (24)	Poorly drained and frequently flooded, nearly level	At or above surface	12	Red maple, cypress, sweetgum, cabbage palm, sedges	Component
Hydraquents (28)	Mangrove islands	Tidally influenced	12	Red mangrove, black mangrove	Component
Immokalee sand (29)	Poorly drained, nearly level	>10	1-2	Slash pine, longleaf pine, saw palmetto, wiregrass, runner oak	Inclusion
Immokalee sand, depressional (30)	Poorly drained, nearly level	<10	>6	Maidencane, St. Johns wort, cordgrass, pickerelweed	Component
Myakka fine sand (32)	Poorly drained, nearly level	<12	6	Slash pine, longleaf pine, saw palmetto, wiregrass	Inclusion
Orsino fine sand, 0-5% slopes (37)	Moderately well drained, nearly level to gently sloping	40-60	3-6	Sand pine, rosemary, saw palmetto	Xeric
Paola fine sand, 0-8% slopes (42)	Excessively drained, nearly level to sloping	>72	12	Sand pine, scrub oak, rosemary, saw palmetto	Xeric
Paola fine sand 8-17% slopes (43)	Excessively drained, strongly sloping to moderately steep	>72	12	Sand pine, scrub oak, rosemary, saw palmetto	Xeric
Pompano fine sand (52)	Poorly drained, nearly level	<10	2-6	Cordgrass, maidencane, St. Johns wort	Inclusion

Soil Name and Map Symbol	Brief Soil Description	Seasonal High Water Table		Historic Vegetation	Hydric Status
		Depth (in)	Duration (mo)		
Smyrna Fine sand (60)	Poorly drained, nearly level	<10	1-4	Slash pine, runner oak, saw palmetto, wiregrass	Inclusion
Turnbull muck (67)	Very poorly drained, nearly level	Tidally influenced	12	Needlegrass rush, smooth cordgrass, sea-oxeye, glasswort, saltgrass	Component
Turnbull variant sand (68)	Dredged material	<40	12	Pricklypear cactus, wax myrtle, cabbage, palm, pickerelweed, glasswort, spartina	Xeric



## B. Natural Communities

The system of classifying natural communities employed in this plan was developed in accordance with the Florida Natural Areas Inventory (FNAI) *Guide to the Natural Communities of Florida – 2010 Edition*. The premise of this system is that physical factors, such as climate, geology, soil, hydrology and fire frequency generally determine the species composition of an area, and that areas which are similar with respect to these factors will tend to have natural communities with similar species compositions. Obvious differences in species composition can occur, despite similar physical conditions. In other instances, physical factors are substantially different, yet the species compositions are quite similar. For example, coastal strand and scrub--two communities with similar species compositions--generally have quite different climatic environments, and these necessitate different management programs.

The Preserve contains 17 communities (see Habitat Maps) including altered cover types. Preserve Specific assessments of the existing natural communities are provided in the narrative below and a summary of the communities and their relative cover and acreages is provided in the following table. The discussions below summarize the generalized condition of the community, followed by details of the specific community occurring within the Preserve. Details such as fire return intervals, timber thinning, and other specific restoration details are provided in separate plans within the Appendices.

Land Cover Classification	Acres	% Area	Fire Interval (yrs)	Fire Interval (yrs)
			Per Plan (typical for habitat)	Per Prescribed Fire Plan
Blackwater Stream	21.89	1.1	--	--
Bottomland Forest	65.46	3.4	--	--
Clearing	3.44	0.2	--	--
Coastal Hydric Hammock	7.48	0.4	--	--
Developed	9.76	0.5	--	--
Improved Pasture	4.85	0.3	--	--
Impoundment	5.01	0.3	--	--
Mangrove Swamp	15.19	0.8	--	--
Maritime Hammock	157.97	8.4	--	--
Mesic Flatwoods	281.59	14.6	2-4	2-4
Mesic Hammock	185.70	9.6	--	--
Salt Marsh	487.17	24.9	--	--
Scrub	280.04	14.5	5; 5-20	5-7
Scrubby Flatwoods	252.72	13.2	5-15	5-15
Successional Hardwood Forest	27.50	1.4		--
Wet Flatwoods	112.83	5.8	5-7	4-7
Wet Prairie	13.61	0.7	2-4	**
Total	1,932.20	100.0		

\*\*Dependent upon adjacent habitats – see Prescribed Burn Plan, Appendix G.

## Hardwood Forested Uplands

## 1. Mesic Hammock

Mesic Hammock – Mesic hammocks are well developed hardwood and/or palm forests on rarely inundated soils. The canopy is typically closed and dominated by live oak (*Quercus virginiana*), cabbage palm (*Sabal palmetto*), southern magnolia (*Magnolia grandiflora*), and pignut hickory (*Carya glabra*).

The mesic hammocks found at the Preserve are dominated by a closed canopy of the trees mentioned above. The understory consists of saw palmetto (*Serenoa repens*), American beautyberry (*Callicarpa americana*), gallberry (*Ilex glabra*), sparkleberry (*Vaccinium arboreum*), yaupon holly (*Ilex vomitoria*) as well as some scrub oak species found in the adjacent xeric habitats (these scrub oaks may be remnants of a historical condition, as described below). The mesic hammocks found on the Preserve, like many throughout central and northeast Florida, are very healthy and functioning at optimum levels. The most common disturbance in this habitat is logging, understory clearing, cattle grazing, and introduction of feral hogs. The disturbances mentioned above have not occurred at the Preserve.

The mesic hammocks located on the Martin's Dairy tract are located along a bluff bordering the bottomland forest / creek systems and also extend east to the bluff along Spruce Creek. These areas are within natural fire shadows and have trended towards a mesic setting. Based on the underlying soil map unit (42, Paola fine sand) the areas above the bluffs may have been historically more xeric in appearance and vegetational composition. Soils within these specific hammocks indicate an intermediate condition of these two communities (xeric vs. mesic). Void of natural processes such as fire, xeric hammocks drift towards mesic hammocks. As the canopy closes, large canopy oaks become resistant to fire, hardwoods like southern magnolia encroach, and the growing layer of leaf litter increase organics and cover open sand patches associated with xeric hammocks. As such, mesic hammocks are not considered fire-adapted communities due to their resistance to fire. Evidence of some hammock in these areas is visible on the 1943 aerials.

Based on these conditions, portions of the mesic hammock on the Martin's Dairy tract may be targeted for timber harvest and scrub restoration. This would be targeted only to those areas above the bluffs along either creek system and would occur along borders adjacent to scrub restoration areas.

## High Pine and Scrub

### 2. Scrub

Scrub – The Scrub is a community composed of evergreen shrubs, with or without a canopy of pines, and is found on dry, infertile, sandy ridges.

Scrub within the Preserve is dominated by myrtle oak (*Quercus myrtifolia*), sand live oak (*Quercus geminata*), Chapman's oak (*Quercus chapmanii*), and rusty lyonia (*Lyonia ferruginea*) within the shrub and subcanopy strata. There are a few remnant stands of sand pine (*Pinus clausa*) in the canopy, but these appear to be declining in abundance. The oaks form a dense cover interspersed

with few patchy openings that consist of bare sand with a sparse cover of herbs, particularly threeawns (*Aristida* spp.), hairsedges (*Bulbostylis* spp.), sandyfield beaksedge (*Rhynchospora megalocarpa*), pinweeds (*Lechea* spp.), and ground lichens (*Cladonia* spp.). Saw palmetto (*Serenoa repens*) is common but not dominant within the scrub. Overall, the majority of all the scrub onsite is overgrown and not in habitat maintenance condition. As a whole, the scrub community requires restoration and will require fire surrogate activities prior to fire implementation.

Florida scrub is home to a multitude of rare animals. This includes the Florida scrub-jay (*Aphelocoma coerulescens coerulescens*), scrub lizard (*Sceloporus woodi*), gopher tortoise (*Gopherus polyphemus*), Florida mouse (*Peromyscus floridanus*), short-tailed snake (*Stilosoma extenuatum*), gopher frog (*Rana capito*), and many other species. Protected species found within the scrub are discussed in Section D, below.

While scrub is a fire-maintained community, it is not easily ignited. Scrub is thought to have burned less frequently than communities with a more easily ignited grassy groundcover, such as sandhill or mesic flatwoods. Scrub oak dominated scrub, as found within the Preserve, likely burned naturally at intervals between 5 and 20 years (based on the habitat requirements of the Florida scrub-jay). Oak height is a critical limiting factor for Florida scrub-jays which have been documented to abandon territories where the oaks reached >3 meters. A minimum five year fire return interval appears to be the time required for re-sprouting oak stems to reach acorn-bearing height, an important food source for jays.

Growth rates of scrub oaks are related to burn history and environmental conditions onsite. Long unburned oak scrub, which is found on the Preserve, may attain heights unsuitable for scrub-jays up to 50 percent faster after fire than regularly burned oak scrub and thus may at first require shorter burn intervals to maintain optimum heights following restoration of burning. In addition, small openings, needed by Florida scrub-jays for caching acorns, may need to be artificially restored in long unburned scrub by piling up fuel to create hotspots that kill the roots of the oaks.

Details on fire return intervals and mechanical harvesting of woody material are provided in the Prescribed Burn Plan and Timber Assessment / Timber Plan, in the Appendices.

## **Pine Flatwoods and Dry Prairie**

### **3. Wet Flatwoods**

Wet Flatwoods – Wet flatwoods are pine forests with a sparse or absent midstory and a dense groundcover of hydrophytic grasses, herbs, and low shrubs.

The wet flatwoods within the Preserve consists of a closed canopy of large slash pine (*Pinus elliottii*) and pond pine (*P. serotina*), with the latter being the dominant species. The subcanopy consists of loblolly bay (*Gordonia lasianthus*), swamp bay (*Persea palustris*), dahoon holly (*Ilex cassine*), and wax myrtle. The shrub layer is dominated by gallberry (*Ilex glabra*), shiny lyonia (*Lyonia lucida*), and saw palmetto (*Serenoa repens*). This habitat has been long unburned and saw palmetto forms a dense thicket and has low plant richness. The herbaceous species are found primarily in breaks in the shrub layer, along field roads or game trails and consists of wiregrass (*Aristida stricta*), blue

maidencane (*Amphicarpum muhlenbergianum*), Carolina redroot (*Lachnanthes carolina*), beaksedges (*Rhynchospora* spp.), and maidencane (*Panicum hemitomom*). Due to this site being fire suppressed the shrub layer is more abundant compared to the herbs. This community is found entirely within the Rose Bay Tract and is not considered to be within habitat maintenance conditions.

Wet flatwoods tend to have a longer fire interval than upland pine flatwoods in the order of 5 to 7 years. If the interval is too long, 7 to 10 years, it can lead to an increase in woody species cover and a decline in grasses and forb cover (or palmetto cover, as evidenced in this habitat on DLSCP). Many factors other than frequency of fire, such as season of fire, pre- and post-fire soil moistures, groundwater levels, weather, plant size or age at the time of fire, can greatly influence tree mortality and vegetation response to fire. Fire in the growing season can reduce the stature of woody vegetation, particularly hardwoods, prevent increases in shrub densities, and promote flowering of herbaceous groundcover.

#### **4. Mesic Flatwoods**

Mesic Flatwoods – Mesic flatwoods are generally characterized by an open canopy of tall pines and dense ground cover including shrubs, grasses, and forbs. Historically this community's canopy was dominated by longleaf pine (*Pinus palustris*). Today the majority of mesic flatwoods found throughout central and northeastern Florida are dominated by dense stands of slash pine due to the pine silviculture industry and furthermore by prolonged periods of fire exclusion.

The canopy found within the mesic flatwoods of the Preserve is comprised primarily of slash pine, however, longleaf pine does occur throughout much of this habitat on DLSCP. The ground cover is dominated by a heavy cover of saw palmetto and gallberry, and has low plant species richness compared to optimal conditions. In its natural state, mesic flatwoods herbaceous cover is dominated by wiregrass, dropseeds (*Sporobolus* spp.), panicgrasses (*Dichantherium* spp.), and broomsedges (*Andropogon* spp.). Limited areas of wiregrass, and these other herbaceous species, are found within the mesic flatwoods of the Preserve due to fire exclusion. The herbaceous species that do occur are found along existing trails or other disturbances that have removed some of the extensive shrub layer. The mesic flatwoods found on the eastern portion of the Turnbull Tract are the closest to maintenance condition, but will still require mechanical treatments prior to fire implementation. The remaining mesic flatwoods are not in maintenance condition due to an overgrown shrub layer and closed canopy.

Mesic flatwoods require frequent fire (2 to 4 year intervals). Longleaf pines have thick bark to protect them from fire and their seeds need the mineral soil and open sunlight that fire provides to germinate. Longleaf pine during the grass stage is fire resistant. Several species require fire to reproduce. Wiregrass requires fire to flower, along with a number of other characteristic herbs.

The need for frequent fire to control hardwoods, shrub thickets and unnaturally dense pine stands has been documented for many years. It is also well documented that fire stimulates flowering in many flatwoods herbs and that frequent fire increases species richness and abundance. Controlled burns in mesic flatwoods also indirectly determine the fire frequency and season for all the adjacent natural communities.

Statistics from lightning caused fires suggest that most areas in Florida would naturally burn at the

beginning of the lightning season. Growing season fires (April to mid-August) are known to be necessary for flowering and seed set in wiregrass.

## **5. Scrubby Flatwoods**

Scrubby Flatwoods – Scrubby flatwoods have an open canopy of widely spaced pine trees and a low, shrubby understory dominated by scrub oaks and saw palmetto. Scrubby flatwoods differ from the aforementioned scrub in the presence of wiregrass, a greater abundance of saw palmetto, and/or the presence of typical flatwoods shrubs such as gallberry and fetterbushes. Structurally it differs from scrub in its lack of a continuous cover of scrubby oaks.

The scrubby flatwoods at the Preserve have a canopy of longleaf pine, slash pine, and sand pine (*Pinus clausa*). The understory consists of a closed cover of sand live oak, myrtle oak, Chapman's oak, saw palmetto, gallberry, rusty Lyonia and fetterbush. Some instances of grasses were found which include wiregrass, broomsedge bluestem (*Andropogon virginicus*), and shiny blueberry (*Vaccinium myrsinites*). The majority of the scrubby flatwoods found within the Preserve has a closed canopy of scrub oaks in the 3 to 4 meter range in height due to the lack of fire. About 10% of the scrubby flatwoods may be considered in a maintenance condition, but these are scattered small pockets, not large enough to map individually. Overall, the scrubby flatwoods will require some fire surrogate activities prior to implementing controlled burns.

Scrubby flatwoods are often associated with scrub and/or mesic flatwoods. Therefore many of the rare species associated with the aforementioned scrub are also likely to inhabit scrubby flatwoods.

Scrubby flatwoods have a more continuous ground cover and more pine needle leaf litter than scrub; therefore historically have burned more readily than scrub. But due to less ground cover grasses, scrubby flatwoods tend to burn less readily than mesic flatwoods. Therefore scrubby flatwoods historically have burned at a frequency intermediate of the two, most likely in the 5 to 15 year range. Light ground fires in the surrounding mesic flatwoods tend to enter scrubby flatwoods and extinguish, leading to a patchwork of recently burned and unburned portions, a situation which has been found to be favorable for scrub-jays. Therefore variability in season and frequency of prescribed fires to produce a mosaic of burned and unburned patches would be the most desirable for maintaining high biotic diversity within this community.

## **Coastal Uplands**

### **6. Maritime Hammock**

Maritime Hammock – Maritime hammock is predominantly evergreen hardwood forest growing on stabilized coastal dunes lying at varying distances from the shore.

The maritime hammocks found within the Preserve have a closed canopy dominated by live oak, cabbage palm, southern magnolia, and pignut hickory. The subcanopy is dominated by red cedar (*Juniperus virginiana*), yaupon holly (*Ilex vomitoria*), saw palmetto, Brazilian pepper, red bay (*Persea borbonia*), wild coffee (*Psychotria nervosa*), wax myrtle, and wild orange (*Citrus* spp.). The invasive exotic Australian pine (*Casuarina equisetifolia*) was also noted within the maritime

hammock communities of the Preserve, although it is limited in occurrence. Aside from continual threat of invasive exotics along the perimeter (especially along U.S. 1 and former field roads which have been closed), this system is considered good quality and in maintenance condition. No large stands of exotics are present and no major restoration activities appear necessary.

Fire is naturally rare in this community. Fire could weaken the canopy trees making them more susceptible to damage by other coastal stresses. Invasion by exotic species such as Brazilian pepper and Australian pine following storm and wind disturbance is an ongoing threat to the community. Also the composition of maritime hammock is in danger to be affected by the Laurel Wilt Disease, which is fatal to red bays over 1 inch in dbh. This disease is caused by an exotic wood-boring beetle (*Xyleborus glabratus*). The loss of red bays within the subcanopy could potentially lead to further invasion by Brazilian pepper.

## **Freshwater Non-Forested Wetlands**

### **7. Wet Prairie**

Wet Prairie – Wet prairie is an herbaceous community found on continuously wet, occasionally inundated, soils on somewhat flat or gentle slopes between lower lying depression marshes, shrub bogs, or dome swamps and within slightly higher wet or mesic flatwoods, or dry prairies.

The wet prairies found within the Preserve are small depressions within wet flatwoods and mesic flatwoods. The groundcover consists primarily of yellow eyed grass (*Xyris* spp.), St. John's wort (*Hypericum fasciculatum*), maidencane, panic and witch grasses (*Panicum* spp, and *Dichanthelium* spp.), beaksedges, and Carolina redroot. Woody / shrubby species such as wax myrtle (*Myrica cerifera*) and Carolina willow are encroaching from perimeter, however the central portions remain open, herbaceous pockets that appear healthy, despite lack of fire.

Natural fires likely entered wet prairies from surrounding pine flatwoods and burned through them when they were dry enough to carry fire. It is estimated that wet prairies found adjacent to pine flatwoods historically had a fire interval of 2 to 4 years. In absence of fire, shrubs and trees invade wet prairie and shade out the light-loving herbaceous species. Further evidence of fire interval is the necessity of many of the dominant grasses that require fire to stimulate flowering. Wet prairies are sensitive to relatively slight physical alterations to the soil surface which can permanently alter the hydrology. Such disturbances include soil rutting by human disturbance or hog rooting. These disturbances can cause major changes in species composition that require expensive restoration to repair.

## **Freshwater Forested Wetlands**

### **8. Coastal Hydric Hammock**

Coastal Hydric Hammock – Coastal 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 a moderate groundcover

of grasses and ferns.

The coastal hydric hammock found within the Preserve has a canopy which is 100% cabbage palm. The subcanopy consists of swamp bay, wax myrtle, and saw palmetto. The herbaceous cover is dominated by Virginia chain fern (*Woodwardia virginica*), cinnamon fern (*Osmunda cinnamomea*), and royal fern (*Osmunda regalis* var. *spectabilis*).

Fire is not considered an important component of coastal hydric hammock dynamics; however they do burn occasionally. Due to this coastal hydric hammock being dominated by old growth cabbage palm fire most likely occurred historically. Cabbage palms are fire tolerant and intense fires favor the species. Feral hogs tend to be the most common cause of disturbance to this habitat. Hog rutting causes soil disturbance which can allow the spread of the exotic Brazilian pepper as it is found directly adjacent to this habitat.

## 9. Bottomland Forest

Bottomland Forest – Bottomland forest is a deciduous, or mixed deciduous/evergreen closed-canopy forest within riverine floodplains and in shallow depressions.

The dominant canopy species found within this community at the Preserve include laurel oak (*Quercus laurifolia*), sweetbay (*Magnolia virginiana*), cabbage palm, swamp tupelo (*Nyssa sylvatica* var. *biflora*), water oak (*Quercus nigra*), sugarberry (*Celtis laevigata*), American elm (*Ulmus americana*), sweetgum (*Liquidambar styraciflua*) and red maple (*Acer rubrum*). The understory consists of blue beech (*Carpinus caroliniana*), swamp dogwood (*Cornus foemina*), dahoon holly (*Ilex cassine*), swamp bay, shiny lyonia (*Lyonia lucida*), buttonbush (*Cephalanthus occidentalis*) and wax myrtle. Common groundcover species include witchgrasses, woodoats (*Chasmanthium* sp.), and cinnamon fern (*Osmunda cinnamomea*). Overall, the bottomland forests within the Preserve are in excellent condition, have closed, mature canopies, do not appear to suffer from hydrologic impacts related to upstream development and have little exotic species present.

There are three bottomland forests occurring within the Preserve, two of which occur within state owned lands (the one not on state-owned land is intermediate in nature between the two described as follows). One of these, located within the Martin's Dairy tract, borders a narrow blackwater creek that extend southward beyond the tract, with a drainage basin extending beyond the limits of the optimal boundary. The bottomland forest here occurs along a minor bluff extending from the creek upwards in elevation to various xeric and mesic habitats. The plant species composition, likewise, extends from more hydrophytic to mesophytic in nature as this increase in elevation occurs. The shrub layer is moderate in abundance as is the groundcover layer. Open ground, covered in leaf litter, is visible throughout much of this habitat.

The community on the Turnbull Tract occurs along a drainage pathway. An ill-defined channel exists throughout the northern two-thirds of this habitat, but does not have the appearance or regular flow of a creek. This forest does not have the same geographic relief, so the transition from hydrophytic to mesophytic vegetation is less notable. The shrub layer is thicker in this system, and the herbaceous groundcover species tend to occur in small depressional pockets. Bottomland forests are a preferred habitat for the Florida black bear (*Ursus americanus floridanus*)

as they roam along the banks of streams and riverine systems.

Bottomland forests are not considered fire-adapted communities. The most common disturbance of bottomland forest is logging and introduction of feral hogs. The bottomland forests found within the Preserve do not appear to have been logged in the past and hog presence was not found. Other disturbances such as man made dikes or dams which do not allow for adequate drainage also can cause considerable damage to bottomland forests. No damming or diking has occurred within the Preserve.

## **Marine and Estuarine Vegetated Wetlands**

### **10. Salt Marsh**

Salt Marsh – Salt marsh is a largely herbaceous community that occurs in the portion of the coastal zone affected by tides and seawater and protected from large waves, either by the broad, gently sloping topography of the shore, by a barrier island, or by location along a bay or estuary.

In the case of the Preserve the salt marshes are protected from wave activity by barrier islands. The dominant species are smooth cordgrass (*Spartina alterniflora*) and needle rush (*Juncus roemerianus*). The landward edge of the marsh consists of sawgrass (*Cladium jamaicense*), saltmeadow cordgrass (*Spartina patens*), marsh elder (*Iva frutescens*), sea oxeye daisy (*Borrchia frutescens*), and christmasberry (*Lycium carolinianum*). The salt marshes within the Preserve also have sporadic black mangroves (*Avicennia germinans*).

Salt marshes, along with mangrove swamps, are some of the most biologically productive natural communities in the world. The base of the food chain is supplied not only by the rooted plant matter, but also by the algae and detritus found of the stems of plants, on the sediment surface, and suspended in the water column of pools and tidal creeks.

Fire is known to occur in salt marshes, although sporadically, either by spreading from adjacent uplands or from lightning strikes in the marsh itself.

The overall quality of the salt marshes through the Preserve is high. There are some impacts that have occurred, however. Ditch/canal features are found in a portion of the salt marshes on the Preserve. The ditching is consistent to what occurred in the area in the 1950's and 1960's which is referred to as dragline ditching. The purpose of the ditches was to interrupt the life cycle of saltmarsh mosquitoes (*Aedes taeniorhynchus*, *A. sollicitans*) by altering their breeding sites. Saltmarsh mosquitoes lay their eggs on moist soils. These eggs hatch in huge numbers when the marsh is flooded by tides or rain. Dragline ditching converts large acreages to ditch and spoil piles while altering the hydrology of the remaining wetland and providing access for mosquito-eating fish. The ditches are mostly open water due to the depth. Nuisance species such as Brazilian pepper, cattail (*Typha* spp.) and Carolina willow (*Salix caroliniana*) may invade along these edges, but this has occurred on a limited basis within the Preserve. Backfilling of these historic mosquito ditches has been a very successful form of salt marsh restoration throughout the state. This effort is occurring on the Preserve as well (refer to Section IV, Hydrologic Preservation and Restoration for additional details). In regards to the exotic species just mentioned, these also continue to invade the upper elevation of these systems along border between the salt marsh and the adjacent

terrestrial community. The most common species is Brazilian pepper. County staff, assisted by their Mosquito Control Program, continues to monitor and treat these areas. The percentage of salt marsh infested by nuisance species is low (ca. <5%).

## **11. Mangrove Swamp**

Mangrove Swamp – Mangrove swamps are dense forests occurring along relatively flat, low wave energy, marine and estuarine shorelines. Four species of mangroves occur in Florida consisting of red mangrove (*Rhizophora mangle*), black mangrove, white mangrove (*Laguncularia racemosa*), and buttonwood (*Conocarpus erectus*). The four species can occur either in mixed stands or often in differentiated, monospecific zones that reflect varying degrees of tidal influence, levels of salinity, and types of substrate. Red mangroves often dominate the lowest (deep water) zone, followed by black mangroves, then white, and finally buttonwoods which are normally found within the transition zone between the upland and wetland limits.

The mangrove swamps on DLSCP are primarily dominated by black mangroves, although both red and white mangroves occur as well. Many of the mangrove systems are bordered by salt marsh on the waterward edge. Some areas, typically near US Hwy 1, continue to be invaded by Brazilian pepper, a topic addressed in later sections of this Plan.

Mangrove swamps often exist with no understory, although in some open areas species such as sea-oxeye daisy, marsh elder, saltwort (*Batis maritima*), and giant leatherfern (*Acrostichum danaeifolium*) may be found. Both conditions exist within DLSCP.

The biological importance of mangrove swamps is well documented as numerous marine and estuarine organisms depend on the swamps for a portion of their life cycle. The continuous shedding of mangrove leaves and other plant components also produce as much as 80 percent of the total organic material available in the aquatic food web. Mangrove swamps are considered one of the most productive forest systems in the world. Mangrove swamps provide important habitat for many rare and endangered flora and fauna and also functions as nursery grounds for many of Florida's commercially and recreationally important fish and shellfish.

Mangroves continue to face survival pressure resulting from oil spills, altered tidal flows, and changes in the quantity, quality, and timing of the fresh water input as a result of development of adjacent uplands. Mangrove swamps are sensitive to colonization by exotic species such as Brazilian pepper (*Schinus terebinthifolius*) and Australian pine (*Casuarina equisetifolia*). Both of the above species have been observed within the Preserve. Management of the mangrove swamps within the Preserve includes the removal of the above exotic species found within the existing mangrove swamps and excluding recreational access to the adjacent open waters through intact mangrove areas.

## **Rivers and Streams (Riverine)**

### **12. Blackwater Stream**

Blackwater Stream - Blackwater streams are flowing waters from their source to the downstream limits of tidal influence and bounded by channel banks.

The open water areas within the Preserve include the waters of Spruce Creek where they cross through property boundaries. There is also a creek on Martin's Dairy tract that is considered a small blackwater stream. These creek systems, due to proximity to the Ponce Inlet, provide extremely valuable habitat for commercial marine species that spend all or part of their life cycle in tidal creeks which include mullet (*Mugil* spp.), spot (*Leiostomus xanthurus*), blue crabs (*Callinectes sapindus*), oysters (*Crassostrea virginica*), and shrimp (*Penaeus* spp.). The smaller minnows and juvenile fish in the tidal creeks provide food for many recreationally important, predatory fish, such as tarpon (*Megalops atlanticus*), snook (*Centropomus undecimalis*), red drum (*Sciaenops ocellatus*), and spotted seatrout (*Cynoscion nebulosus*). In addition to these saltwater species, the creeks provide habitat for numerous common freshwater species as well.

## **Altered Landcover Types**

### **13. Clearing**

Clearing – Clearings are open habitats where vegetation has been removed or eliminated by various natural and unnatural activities.

A portion of the mesic pine flatwoods in the northeast portion of the Preserve on the Rose Bay tract was burned in a recent wildfire. The fire was extremely hot causing all the canopy trees along with the understory to die. As a safety precaution all the trees were removed. The area remains cleared with limited vegetation sprouting in the exposed shell and mineral soil. This area is proposed for wetland creation activities, in conjunction with a grant from the St. Johns River Water Management District.

### **14. Impoundment/Artificial Pond**

Impoundment/Artificial Pond – Impoundments are generally described as areas of water retention or borrow pits.

Two impoundments occur within the Preserve. One is a large human made pond (approximately 35 acres) found on the eastern side of the Preserve. The pond is tidally influenced and appears to be shallow across. Ponds of this nature were created in the past as duck ponds for hunters to use during the duck migrations in the spring and fall. This pond may have also been created in combination with US1 for road fill. This impoundment has been largely colonized by mangrove and salt marsh vegetation. Because of the obvious human-induced shape, and the berm that surrounds it, the entire area has been classified as an impoundment. The open water connection to Murray Creek makes this a highly valuable habitat.

A smaller freshwater borrow pond is located on the western side of the Preserve. This pond was used as a dirt mine in the past for use as fill. The side slopes drop dramatically and only a small littoral shelf is present.

## 15. Improved Pasture

*Improved pasture* – Improved pasture is defined as an area dominated by planted non-native or domesticated native forage species and evidence of current or recent pasture activity and/or cultural treatments (mowing, grazing, burning, fertilizing). Improved pastures have been cleared of their native vegetation. Most improved pastures in Florida are planted with bahiagrass (*Paspalum notatum*) and to a lesser extent with Bermudagrass (*Cynodon dactylon*) or pangolagrass (*Digitaria eriantha*). Weedy native species are often common in improved pastures in Florida and include dogfennel (*Eupatorium capillifolium*), many species of flatsedge (*Cyperus* spp.), carpetgrasses (*Axonopus* spp.), crabgrasses (*Digitaria* spp.), and rustweed (*Polypremum procumbens*) among many others.

A small portion of improved pasture is included within the Preserve. This area consists of primarily bahiagrass (*Paspalum notatum*), although the species noted above do occur here as well. This area is used for public access including vehicular and equestrian trailer parking. This small portion of improved pasture is connected to a larger, square shaped pasture dominated by bahiagrass. A large pavilion is located just west of the state owned boundary. The parking area must be regularly monitored for use by gopher tortoises, especially for signs of any burrows.

## 16. Successional Hardwood Forest

*Successional Hardwood Forest* – Successional hardwood forests are best described as closed-canopied forest dominated by fast growing hardwoods. These forests are either invaded natural habitat 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.

This habitat is found along a canal which was historically draglined through a wetland hardwood forest. The existing vegetation consists of a canopy of laurel oak, slash and longleaf pine, cabbage palm, sugarberry, and southern magnolia. This community is expected to reach a climax community similar to the mesic hammocks described above, through natural succession.

## 17. Developed

*Developed* – Developed can be described in numerous ways but ultimately is defined as parking lots, buildings, maintained lawns (as part of recreational, business, or residential areas), campgrounds, recreational, industrial, and residential areas.

This habitat is found on the north end of the Bolt tract and consists of paved and gravel drives used for access to a single family private residence west of this habitat and to active recreational areas on the northern tip. The other recreational uses provided here include fishing from shore, mowed parking areas and picnic benches.

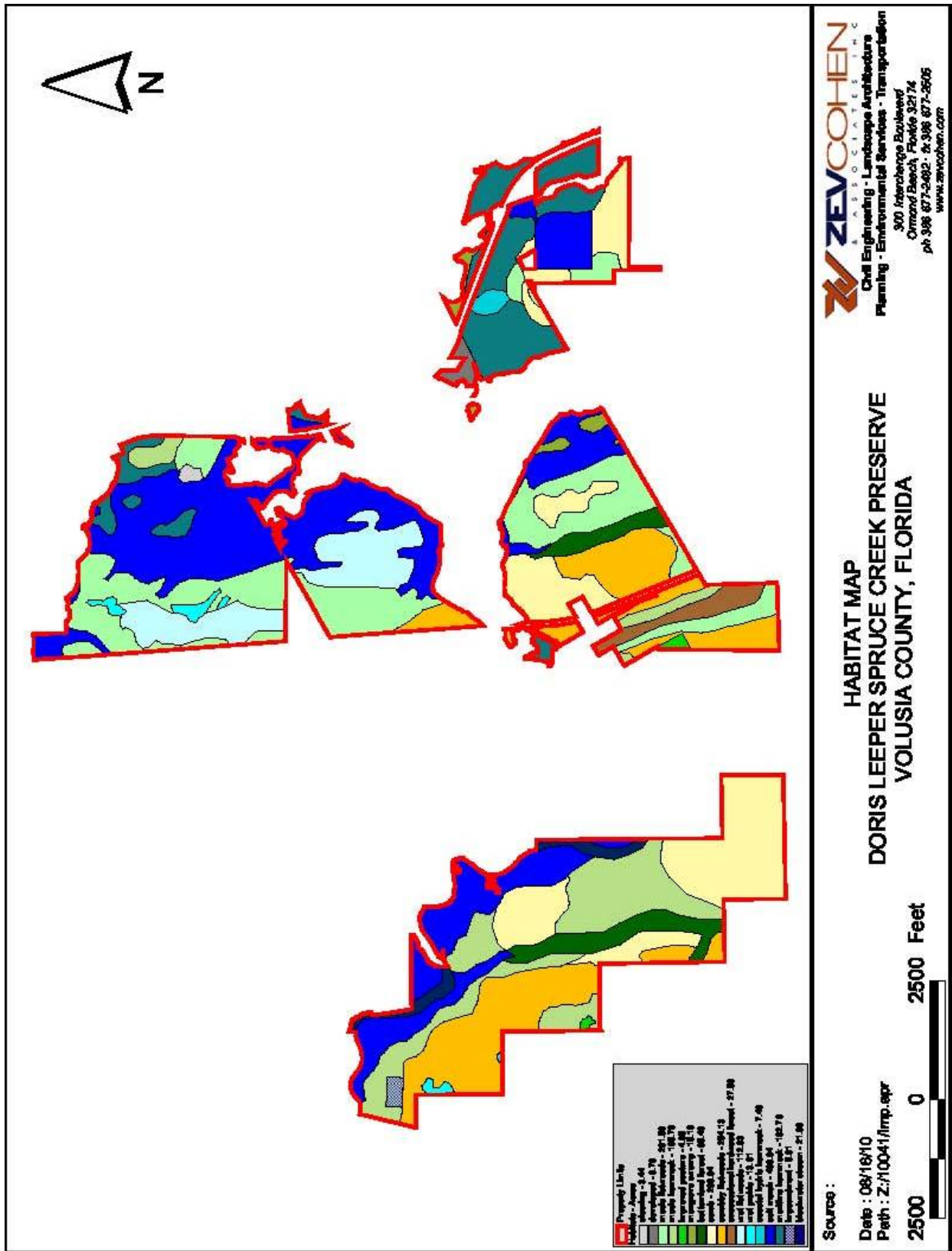


Figure 8.1a. Habitat Map of Doris Leeper Spruce Creek Preserve.



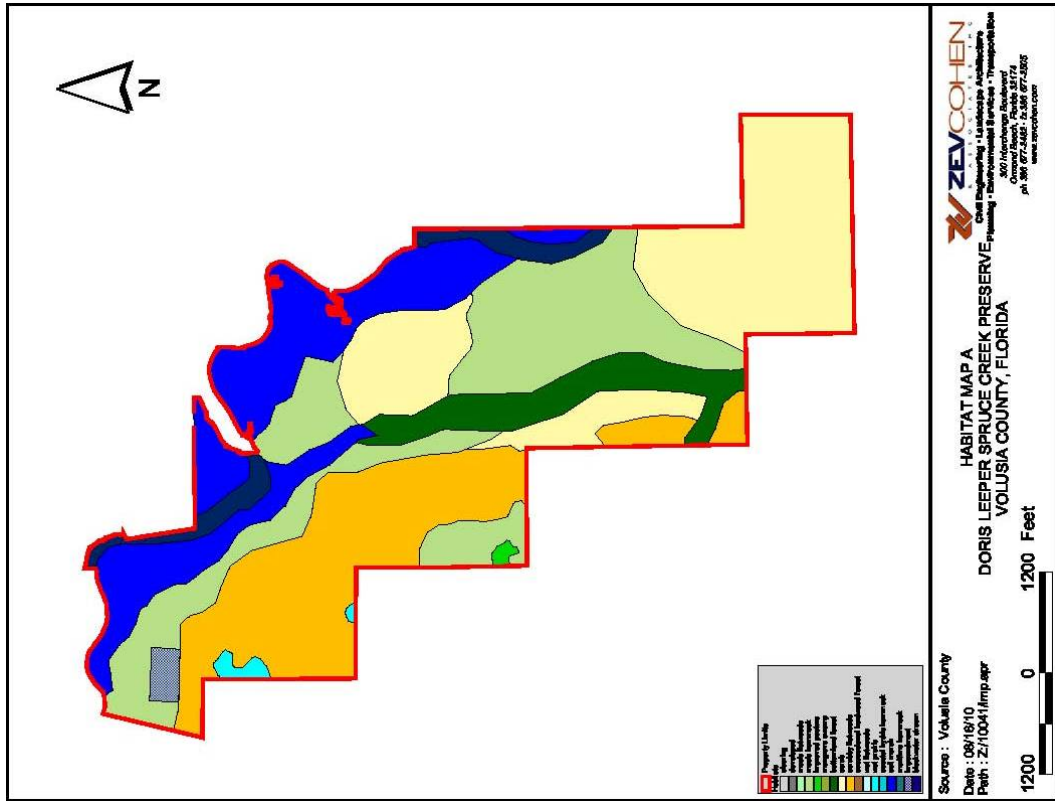


Figure 8.2a. Habitat Map A of Doris Leeper Spruce Creek Preserve.

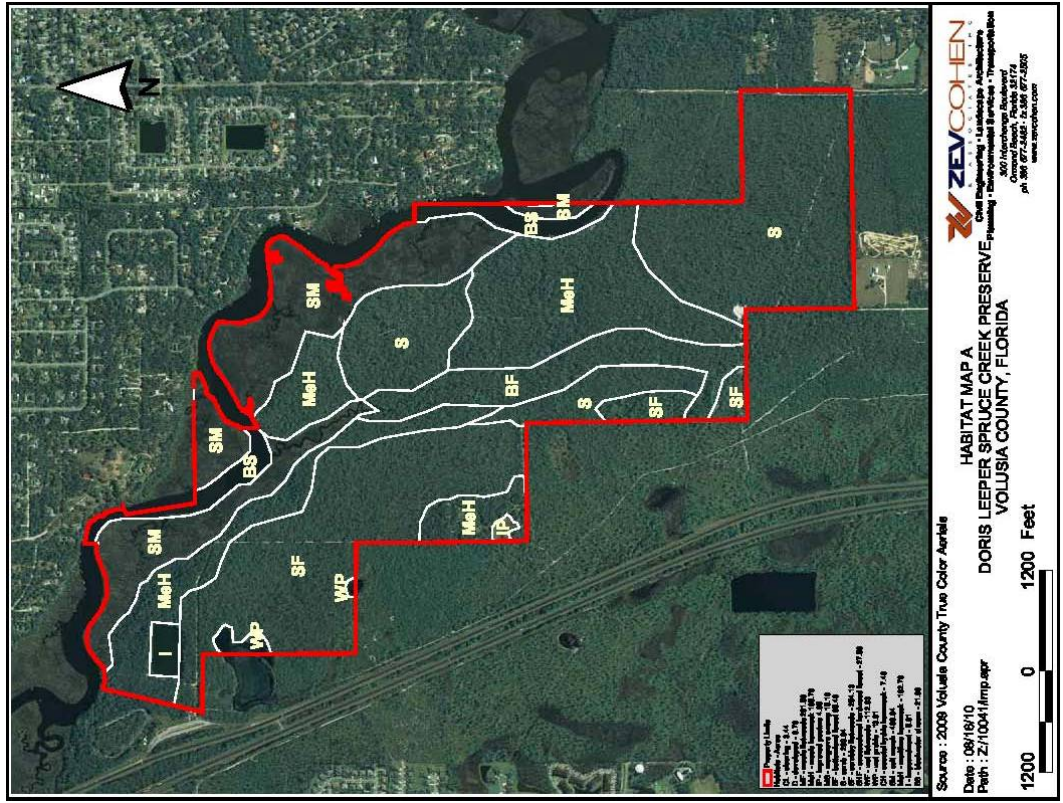


Figure 8.2b. Habitat Map A of Doris Leeper Spruce Creek Preserve over aerial.

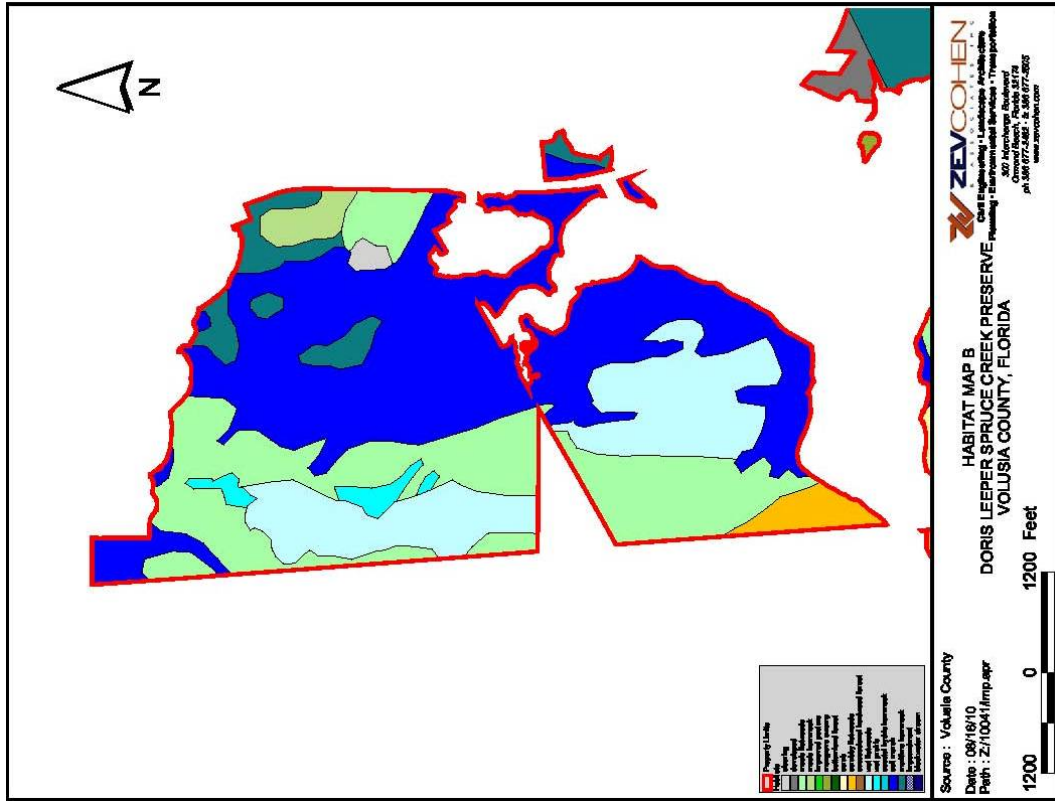


Figure 8.3a. Habitat Map B of Doris Leeper Spruce Creek Preserve.

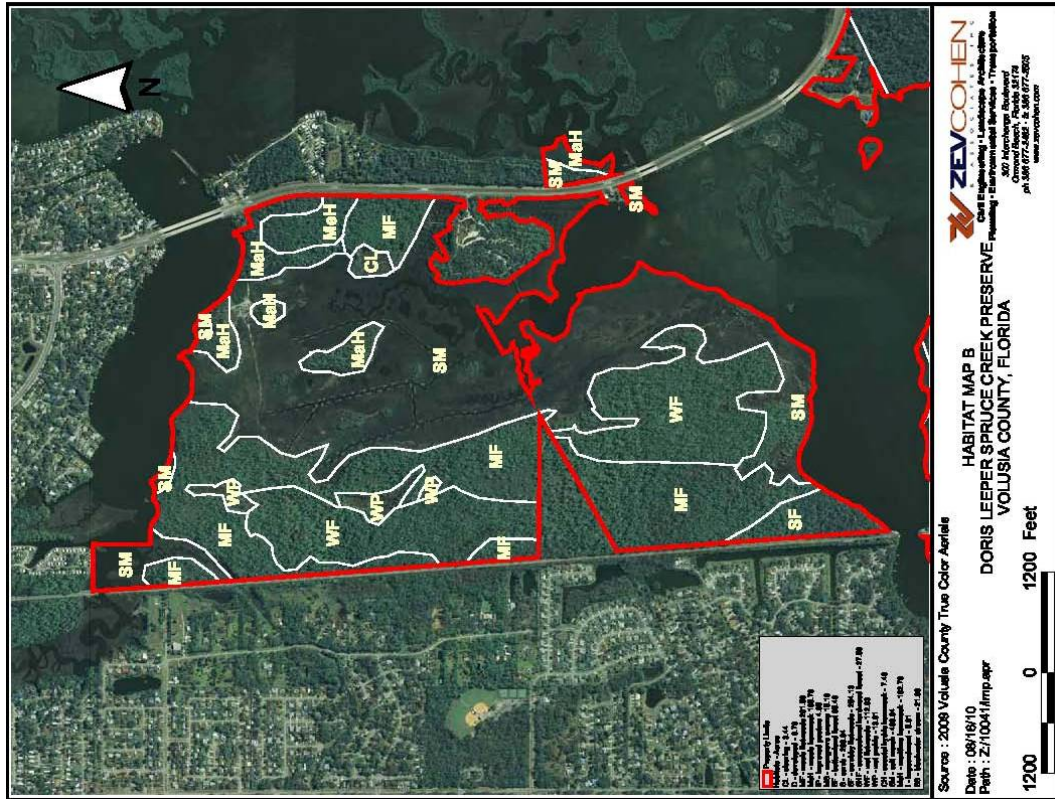


Figure 8.3b. Habitat Map B of Doris Leeper Spruce Creek Preserve over aerial.



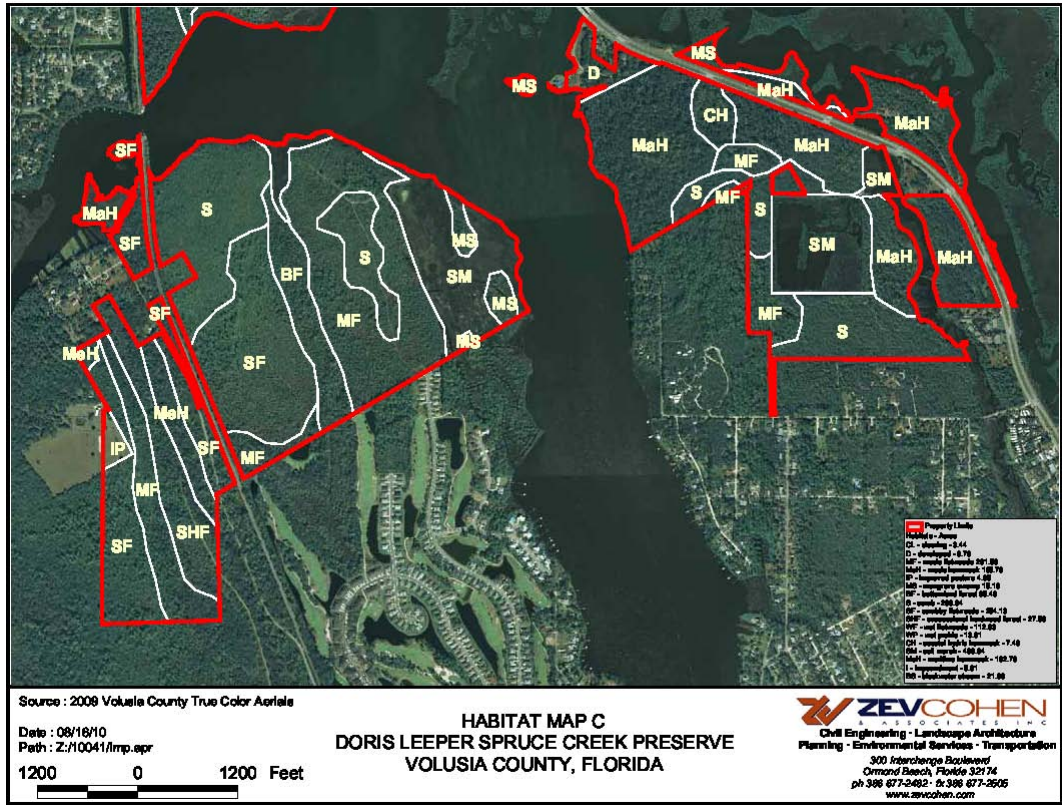


Figure 8.4b. Habitat Map C of Doris Leeper Spruce Creek Preserve over aerial.

## C. Fish and Wildlife

Wildlife observations, both direct and indirect (indirect observations of their presence include remnants, tracks, burrows, calls, scat, etc.), are made by management staff during regular visit. The list provided in this section is comprised primarily of species observed during the course of the site investigations by ZCA and Volusia County staff and FNPS volunteers during the update of this Plan in 2010. Pedestrian transects were traversed along existing field trails, as well as along vegetational community boundaries. A list of species observed is provided in Table C.1. Table C.2 includes fish species as provided by the Legacy Program.

Table C.1 Wildlife species observed on the Doris Leeper Spruce Creek Preserve in Volusia County, Florida.

Taxa	Common Name	Scientific Name	Listed Species*
Reptiles/Amphibians			
	Eastern indigo snake	<i>Drymarchon corais couperi</i>	Yes
	Green anole	<i>Anolis carolinensis</i>	No
	Five-lined skink	<i>Eumeces fasciatus</i>	No
	Southern toad	<i>Anaxyrus terrestris</i>	No
	Green tree frog	<i>Hyla cinerea</i>	No
	Southern black racer	<i>Coluber constrictor priapus</i>	No
	Florida box turtle	<i>Terrapene carolina bauri</i>	No
	Gopher tortoise	<i>Gopherus polyphemus</i>	Yes
	Florida softshell turtle	<i>Apalone ferox</i>	No
	American alligator	<i>Alligator mississippiensis</i>	Yes
Birds			
	Anhinga	<i>Anhinga anhinga</i>	No
	Wood stork	<i>Mycteria americana</i>	Yes
	Brown pelican	<i>Pelecanus occidentalis</i>	Yes
	Osprey	<i>Pandion haliaetus</i>	Yes
	Roseate spoonbill	<i>Ajaia ajaja</i>	Yes
	Tricolored heron	<i>Egretta tricolor</i>	Yes
	White ibis	<i>Eudocimus albus</i>	Yes
	Cattle egret	<i>Bubulcus ibis</i>	No
	Great blue heron	<i>Ardea herodias</i>	No
	Great egret	<i>Ardea alba</i>	No
	Mottled duck	<i>Anas fulvigula</i>	No
	Belted kingfisher	<i>Ceryle alcyon</i>	No
	Ruby-throated hummingbird	<i>Archilochus colubris</i>	No
	Carolina chickadee	<i>Poecile carolinensis</i>	No
	Carolina wren	<i>Thryothorus ludovicianus</i>	No
	Grey catbird	<i>Dumetella carolinensis</i>	No
	Downy woodpecker	<i>Picoides pubescens</i>	No
	Pileated woodpecker	<i>Dryocopus pileatus</i>	No
	Red bellied woodpecker	<i>Melanerpes carolinus</i>	No
	Blue jay	<i>Cyanocitta cristata</i>	No
	Florida scrub-jay	<i>Aphelocoma coerulescens</i>	Yes
	Mockingbird	<i>Mimus polyglottos</i>	No
	Loggerhead shrike	<i>Lanius ludovicianus</i>	No
	Red-winged blackbird	<i>Agelaius phoeniceus</i>	No
	Eastern towhee	<i>Pipilo erythrophthalmus</i>	No
	Tufted titmouse	<i>Baeolophus bicolor</i>	No

	White-eyed vireo	<i>Vireo griseus</i>	No
	Brown thrasher	<i>Toxostoma rufum</i>	No
	Northern cardinal	<i>Cardinalis cardinalis</i>	No
	Common ground dove	<i>Columbina passerine</i>	No
	Mourning dove	<i>Zenaida macroura</i>	No
	Wild turkey	<i>Meleagris gallopavo</i>	No
	American crow	<i>Corvus brachyrhynchos</i>	No
	Boat-tailed grackle	<i>Quiscalus major</i>	No
	Black vulture	<i>Coragyps atratus</i>	No
	Red-shouldered hawk	<i>Buteo jamaicensis</i>	No
	Bald Eagle	<i>Haliaeetus leucocephalus</i>	Yes
Mammals			
	Nine-banded armadillo	<i>Dasyus novemcinctus</i>	No, non-native
	Southeastern pocket gopher	<i>Geomys pinetis</i>	No
	Raccoon	<i>Procyon lotor</i>	No
	Florida manatee	<i>Trichechus manatus</i>	Yes
	Bobcat	<i>Felis rufus</i>	No
	Grey squirrel	<i>Sciurus carolinensis</i>	No
	White-tailed deer	<i>Odocoileus virginianus</i>	No
	Feral hog	<i>Sus scrofa</i>	No, Exotic nuisance

\*Refer to Section D below for details.

Feral hog is a common local nuisance species throughout the region. While acorns are their favorite food, they will eat almost anything, including dead animals. When natural foods are scarce or inaccessible, hogs will forage on tree seeds, seedlings, and herbaceous vegetation, causing significant damage in forests and marsh systems. In Florida and the Southeast, this may be a problem in regenerating long-leaf pine forests. In addition to the effects of consuming, knocking down and trampling large amounts of native vegetation, the rooting behavior of wild hogs causes significant damage. Rooting, digging for foods below the surface of the ground, destabilizes the soil surface, uprooting or weakening native vegetation, damaging systems and causing erosion. Wallowing destroys pond and stream banks, which may affect water quality.

Eradication efforts have been underway since management activities commenced. The hog population on the Preserve is fairly low, and they are not causing major harm in any known locations. Because hogs are prolific breeders, having up to 3 litters per year and due to the extent of forests, dense vegetation, and abundant water in the area, there is no way to completely eliminate them. Therefore, regular efforts to monitor and trap hogs continue, in a manner similar to that of monitoring and removal of exotic nuisance plant species.

The following list of species was provided by the County's Legacy Program (see Section IV for additional details on this educational program).

Table C.2 Fish survey results from Legacy Program, Volusia County Schools Environmental Education

ADOPT-AN-ESTUARY FISH SURVEY			
COMMON NAME	GROUP	COMMON NAME	GROUP
Bay Anchovy	Anchovies	Mosquitofish	Livebearers
Striped Anchovy	Anchovies	Sailfin Molly	Livebearers
Great Barracuda	Barracudas	Inshore Lizardfish	Lizardfish

Hairy Blenny	Blennies	Spanish Mackerel	Mackerel
Bluefish	Bluefish	Irish Pompano	Mojarra
Gafftopsail Catfish	Catfish	Silver Jenny	Mojarra
Hardhead Catfish	Catfish	Spotfinned Mojarra	Mojarra
Skillet Fish	Clingfishes	Striped Mojarra	Mojarra
Atlantic Cutlass fish	Cutlassfish	Striped Mullet	Mullet
Atlantic Croaker	Drum	White Mullet	Mullet
Black Drum	Drum	Atlantic Needlefish	Needlefish
Red Drum (Redfish)	Drum	Redfin Needlefish	Needlefish
Silver Perch	Drum	Lined Seahorse	Pipefish and Seahorses
Spot	Drum	Pipefish spp	Pipefish and Seahorses
Spotted Seatrout	Drum	Pinfish	Porgy
Star Drum	Drum	Sheepshead	Porgy
American Eel	Eels	Spottail Pinfish	Porgy
Planehead Filefish	Filefish	Checkered Puffer	Puffers
Bay Whiff	Flat Fish	Southern Puffer	Puffers
Blackcheek Tonguefish	Flat Fish	Striped Burrfish	Puffers
Gulf Flounder	Flat Fish	Atlantic Stingray	Ray
Hogchoker	Flat Fish	Smooth butterfly Ray	Ray
Southern Flounder	Flat Fish	Southern Stingray	Ray
COMMON NAME	GROUP	COMMON NAME	GROUP
Freshwater Goby	Goby	Bighead Searobin	Searobins
Frill Finned Goby	Goby	Atlantic Sharp Nose Shark	Shark
Goby spp	Goby	Bonnet Head Shark	Shark
Naked Goby	Goby	Lemon Shark	Shark
Black Sea Bass	Grouper	Atlantic Silverside	Silversides
Pigfish	Grunt	Lane Snapper	Snapper
Atlantic Menhaden	Herrings	Mangrove Snapper	Snapper
Atlantic Thread Herring	Herrings	Common Snook	Snook
Atlantic Bumper	Jack	Atlantic Spadefish	Spadefish
Crevalle Jack	Jack	Southern Stargazer	Stargazers
Florida Pompano	Jack	Ladyfish	Tarpon
Leather Jacket	Jack	Oyster Toadfish	Toadfish
Lookdown	Jack	Sea Grape	Tunicates and Sea Squirts
Permit	Jack	Sea Pork	Tunicates and Sea Squirts
Gulf Killifish	Killifish	Sea Squirt	Tunicates and Sea Squirts
Marsh Killifish	Killifish	Whiting spp	
Mummichog	Killifish		
Sheepshead Minnow	Killifish		
Striped Killifish	Killifish		

## D. Listed Resources

A background literature search was conducted to compile a list of state and federally protected animal and plant species that could occur on-site. The four primary sources of literature reviewed include the Florida Fish and Wildlife Conservation Commission's (FWC) *Florida's Endangered Species, Threatened Species, And Species of Special Concern*, the United States Fish and Wildlife Service's (FWS) Threatened and Endangered Species System (TESS) database, the Florida Natural Areas Inventory (FNAI), and the Florida Department of Agriculture and Consumer Services (FDACS), Division of Plant Industry's (DPI) *Notes on Florida's Endangered and Threatened Plants*. During the site reconnaissance, observations or evidence of protected species and the likelihood of occurrence of each protected species were noted. Further review was completed following the habitat mapping and descriptions. The County is also working with the local chapter of the Florida Native Plant Society to increase the extant plant list, including review for observations and locations of protected plant species likely to occur within the Preserve.

In addition to the assessment conducted by the consultant, Florida Natural Areas Inventory was queried for a list of elemental occurrences on or near the Preserve. FNAI's provided their findings in a letter report which is provided in Appendix E.

### 1. Endangered, Threatened and Species of Special Concern

#### Listed Wildlife Species

The listed animal species with at least some likelihood of occurrence are listed in Table D.1.1, below. The estimated likelihood of occurrence of each species is noted in the table and those species with at least a moderate likelihood of occurrence are discussed following the table.

Table D.1.1: Listed animal species with the potential to occur on the Doris Leeper Spruce Creek Preserve in Volusia County, Florida.

Scientific Name	Common Name	FWC	FWS/NMFS	FNAI Rank	Likelihood of Occurrence
<i>Accipiter cooperii</i>	Cooper's hawk	N	N	G5/S3	High
<i>Aimophila aestivalis</i>	Bachman's Sparrow	N	N	G3/S3	Low
<i>Ajaia ajaja</i>	Roseate spoonbill	SSC	N	G5/S2	Observed
<i>Alligator mississippiensis</i>	American alligator	SSC	T(S/A)	G5/S4	Observed
<i>Aphelocoma coerulescens</i>	Florida scrub-jay	T	T	G2/S2	Observed
<i>Aramus guarana</i>	Limpkin	SSC	N	G5/S3	Moderate
<i>Ardea alba</i>	Great egret	N	N	G5/S4	Observed
<i>Buteo brachyurus</i>	Short-tailed hawk	N	N	G4/S1	Low
<i>Caretta caretta</i>	Atlantic loggerhead turtle	T	T	G3/S3	Low
<i>Charadrius melodus</i>	Piping plover	T	T	G3/S2	Moderate
<i>Chelonia mydas mydas</i>	Atlantic green turtle	E	E	G3/S2	Low
<i>Crotalus adamanteus</i>	Eastern diamondback rattlesnake	N	N	G4/S3	Observed
<i>Dendroica kirtlandii</i>	Kirtland's warbler	E	E	G1/S1	Low
<i>Dermochelys coriacea</i>	Leatherback turtle	E	E	G2/S2	Low
<i>Drymarchon corais couperi</i>	Eastern indigo snake	T	T	G3/S3	Observed

<i>Egretta caerulea</i>	Little blue heron	SSC	N	G5/S4	High
<i>Egretta rufescens</i>	Reddish egret	SSC	N	G4/S2	High
<i>Egretta thula</i>	Snowy egret	SSC	N	G5/S3	High
<i>Egretta tricolor</i>	Tricolored heron	SSC	N	G5/S4	Observed
<i>Elanoides forficatus</i>	Swallow-tailed kite	N	N	G5/S3	Observed
<i>Eretmochelys imbricata imbricata</i>	Atlantic hawksbill turtle	E	E	G3/S1	Low
<i>Eudocimus albus</i>	White ibis	SSC	N	G5/S4	Observed
<i>Falco columbarius</i>	Merlin	N	N	G5/S2	Moderate
<i>Falco peregrinus</i>	Peregrine falcon	N	N	G4/S2	Moderate
<i>Falco sparverius paulus</i>	Southeastern American kestrel	T	N	G5T4/S3	Moderate
<i>Gopherus polyphemus</i>	Gopher tortoise	T	N	G3/S3	Observed
<i>Grus canadensis pratensis</i>	Florida sandhill crane	T	N	G5T2/S2	Moderate
<i>Haematopus palliatus</i>	American oystercatcher	SSC	N	G5/S2	Moderate
<i>Haliaeetus leucocephalus</i>	Southern bald eagle	N	N	G5/S3	Observed
<i>Ixobrychus exilis</i>	Least bittern	N	N	G5/S4	Moderate
<i>Laterallus jamaicensis</i>	Black rail	N	N	G4/S2	Moderate
<i>Lampropeltis getula</i>	Common kingsnake	N	N	G5/S2	High
<i>Lepidochelys kempii</i>	Atlantic (Kemp's) ridley turtle	E	E	G1/S1	Low
<i>Lithobates capito</i>	Gopher frog	SSC	N	G3/S3	Moderate
<i>Mycteria americana</i>	Wood stork	E	E	G4/S2	Observed
<i>Nyctanassa violacea</i>	Yellow-crowned night-heron	N	N	G5/S3	High
<i>Nycticorax nycticorax</i>	Black-crowned night-heron	N	N	G5/S3	High
<i>Nerodia clarkii taeniata</i>	Atlantic salt marsh snake	T	T	G4T1/S1	High
<i>Pandion haliaetus</i>	Osprey	N	N	G5/S4	Observed
<i>Pelecanus occidentalis carolinensis</i>	Eastern brown pelican	SSC	N	G4/S3	Observed
<i>Peromyscus polionotus niveiventris</i>	Southeastern beach mouse	T	T	G5/T1	Low
<i>Picoides borealis</i>	Red-cockaded woodpecker	T	E	G3/S2	Low
<i>Picoides villosus</i>	Hairy woodpecker	N	N	G5/S3	Observed
<i>Pituophis melanoleucus mugitus</i>	Florida pine snake	SSC	N	G4T3/S3	Moderate
<i>Plegadis falcinellus</i>	Glossy Ibis	N	N	G5/S3	Moderate
<i>Podomys floridanus</i>	Florida mouse	SSC	N	G3/S3	High
<i>Rynchops niger</i>	Black skimmer	SSC	N	G5/S3	Moderate
<i>Sciurus niger shermani</i>	Sherman's fox squirrel	SSC	N	G5T3/S3	Low
<i>Sterna antillarum</i>	Least tern	T	N	G4/S3	Moderate
<i>Sterna caspia</i>	Caspian tern	N	N	G5/S2	Moderate
<i>Sterna maxima</i>	Royal tern	N	N	G5/S3	Moderate
<i>Sterna sandvicensis</i>	Sandwich tern	N	N	G5/S2	Moderate
<i>Trichechus manatus</i>	Florida manatee	E	E	G2/S2	Observed
<i>Ursus americanus floridanus</i>	Florida black bear	T	N	G2/S2	High
<i>Vireo altiloquus</i>	Black-whiskered vireo	N	N	G5/S3	Moderate

Abbreviations:

**SSC:** Species of Special Concern

**T:** Threatened

**E:** Endangered

**N:** Not Listed

**FNAI 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 man-made 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 man-made 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

**G#T#:** Rank of a taxonomic subgroup such as a subspecies or variety; the G portion of the rank refers to the entire species and the T portion refers to the specific subgroup; numbers have same definition as above (e.g., G3T1).

**S1:** Critically imperiled in Florida 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 man-made factor.

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**S4:** Apparently secure in Florida (may be rare in parts of range).

**S5:** Demonstrably secure in Florida.

Those species listed as having a moderate likelihood of occurrence or higher in Table D.1.1 are listed as such due to presence of suitable habitat. Based on the results of the database search described above, there were 44 possible listed animal species that have at least a moderate likelihood of occurrence. Several of these species were considered to have a moderate to high likelihood of occurrence and 16 have been observed by ZCA or County staff. The listed species that have at least a moderate likelihood of occurrence are discussed below and grouped into categories according to similar life histories.

The American alligator (*Alligator mississippiensis*) is listed as Threatened by the FWS and as a Species of Special Concern by the FWC. The American alligator was observed in the pond found in the northwest corner of the Preserve. American alligators are known to move into the brackish waters of tidally influenced creek systems for forage and also during the mating season. The habitat quality in the Preserve utilized by the American alligator is suitable and this species presents little management implications by its presence.

Gopher tortoise (*Gopherus polyphemus*) burrows were identified on the subject property. Multiple gopher tortoises were observed foraging on the subject property. The gopher tortoise, listed as Threatened by the FWC, is a key component in the determination of habitat suitability for other protected species because of the large number of other animals that will use tortoise burrows for one or more of their life requisites. The density of gopher tortoises within the Preserve in suitable habitat appears to be low and is likely due to fire suppression within the mesic flatwoods, scrubby flatwoods, and scrub habitats. Prescribed fire within the above habitats is essential to re-establish these as optimum gopher tortoise habitats. As described in Section IV, habitats that are too overgrown to successfully carry a safe fire, will be thinned mechanically. Any activity promoting thinning of woody vegetation, an increase in open space and herbaceous vegetation in the upland habitats will be critical to the long term population of gopher tortoises onsite.

The presence of the gopher frog (*Lithobates capito*), listed as a Species of Special Concern by FWC, is related to the presence of gopher tortoises for use of the burrows, however this species can also be found in stumpholes and tunnels in upland habitats. This species requires wetlands within

approximately one mile that are generally dry during some portion of the year. These conditions are present within the Preserve. The primary locations where these conditions exist include the Turnbull and Rose Bay tracts.

Four listed snake species has the potential to utilize the habitats found within the Preserve and two others have been observed within the Preserve. The Florida pine snake (*Pituophis melanoleucus mugitus*), listed as a Species of Special Concern by FWC, is known to occupy pine flatwoods and old fields. During low water conditions pine snakes seek open habitats with adjacent wetlands. The Florida pine snake is also a gopher tortoise commensal species and has been documented to utilize both tortoise burrows and the tunnels of southeastern pocket gophers, both of which occur in the Preserve.

The eastern indigo snake (*Drymarchon corais couperi*) is also a gopher tortoise commensal species and is listed as Threatened by the FWS and FWC. Indigo's have a broad range of habitats, from scrub and sandhill to wet prairies and mangrove swamps. In northern part of range, they often winter in gopher tortoise burrows in sandy uplands but forage in more hydric habitats. They require very large tracts to survive. This species has been observed on various tracts within the Preserve and up to six individuals were observed by County staff on the Turnbull tract.

The eastern diamondback rattlesnake (*Crotalus adamanteus*), which is not listed by FWC or FWS, but is ranked by FNAI, has been observed by County staff within the Preserve. The occurrence of this species is relatively common within coastal upland habitats such as those found on the Preserve.

The Atlantic salt marsh snake (*Nerodia clarkii taeniata*), which is listed as Threatened by FWS and FWC, is restricted to coastal Volusia County in its range. The Atlantic salt marsh snake is further restricted by habitat only being observed in estuarine habitats which include coastal salt marshes, mangrove swamps, tidal creeks, pools, and ditches. Protection of salt marshes, mangrove swamps, and tidal creeks and rivers of Volusia County, such as those found within the Preserve, from drainage, ditching, impoundment, and pollution are the most valuable forms of conservation for this species. The Preserve contains extensive amounts of high quality, suitable saltmarsh for this species. In addition, the County is working with other government agencies to remove existing mosquito ditching and conduct wetland restoration and enhancement projects where feasible. This activity and the maintenance of the saltmarsh habitat, especially through the continued control of exotic invasive species like Brazilian pepper (*Schinus terebinthifolius*) will continue to promote the long term likelihood of occurrence and success of this species.

While the listed sea turtle species have a low likelihood of occurrence within the Preserve, they are likely to utilize the open waters that dissect and are adjacent to the several tracts of the Preserve. The Atlantic loggerhead sea turtle (*Caretta caretta*) is listed as Threatened by both the FWS and the FWC. Atlantic green sea turtles (*Chelonia mydas mydas*) are listed as Endangered by both the FWS and the FWC. Juvenile loggerhead and green sea turtles are known to use the estuary systems of Florida for forage and protection from larger predators. The other listed sea turtle species are less likely to utilize these interior coastal waters, however, Atlantic hawksbill sea turtles (*Eretmochelys imbricata imbricata*) have been observed in the Intracoastal Waterway near inlets open to the Atlantic Ocean (namely Sebastian Inlet, about 90 miles south of Ponce Inlet). The nearest edge of the Preserve to the nearest open ocean inlet, Ponce Inlet, is about 3.7 miles. Continued management of

the Preserve to protect water quality and quantity and management of user groups are important elements to the protection of adjacent estuarine waters.

Several listed wading birds species utilize the saltmarsh and other wetland habitats onsite. Those known to be present and considered to have at least a moderate likelihood of occurrence on the Preserve are listed below and management goals of the property assumes their presence. .

The little blue heron (*Egretta caerulea*), snowy egret (*Egretta thula*), tricolored heron (*Egretta tricolor*), roseate spoonbill (*Ajaia ajaja*), great egret (*Ardea alba*), reddish egret (*Egretta rufescens*), glossy ibis (*Plegadis falcinellus*), least bittern (*Ixobrychus exilis*), limpkin (*Aramus guarana*), yellow-crowned night-heron (*Nyctanassa violacea*), black-crowned night-heron (*Nycticorax nycticorax*), and white ibis (*Eudocimus albus*) may utilize the impoundments, saltmarshes, and shoreline for foraging and potentially use the forested areas for roosting. No nesting rookeries are known to occur on the Preserve. Available rookery database information provided in the *Florida Atlas of Breeding Sites for Herons and Their Allies, Updated 1986 – 89* shows that there were no known rookeries in the area at the time of publication. The nearest known rookery occurs 3 miles north of the Preserve on a spoil island along the ICWW just south of the Dunlawton Avenue Bridge. The least bittern nests in marsh habitats, not in breeding rookeries as many of the other listed species.

Wood storks (*Mycteria americana*), listed as Endangered by FWS and FWC, were observed within the Preserve and wood storks have been observed routinely throughout the area. Wood storks forage mainly in shallow water in freshwater marshes, swamps, lagoons, ponds, tidal creeks, flooded pastures and ditches, where they are attracted to falling water levels that concentrate food sources (mainly fish). No wood stork nesting rookeries were observed or are listed by FWS within the Preserve. The Preserve is also not located within a FWS Core Foraging Area.

The black rail (*Laterallus jamaicensis*) is a ranked species by FNAI. The black rail is a secretive, year-round resident of marshes along much of the upper Gulf and Atlantic Coasts. They also winter in south Florida and migrants may be encountered statewide. The Preserve provides optimum habitat for the black rail within the salt marshes found on the property.

The American oystercatcher (*Haematopus palliatus*), black skimmer (*Rynchops niger*), piping plover (*Charadrius melodus*), least tern (*Sterna antillarum*), caspian tern (*Sterna caspia*), royal tern (*Sterna maxima*), and sandwich tern (*Sterna sandvicensis*) are each closely tied to coastal habitats. They nest on beaches and coastal islands and feed on small marine vertebrates and invertebrates.

The eastern brown pelican (*Pelecanus occidentalis carolinensis*), listed as a Species of Special Concern by FWC, utilizes the open waters adjacent to the Preserve. The preferred habitat of the brown pelican mainly consists of the coastal zone, feeding in shallow estuarine waters, and (less often) far offshore. Pelicans make extensive use of sand spits, sand bars, and islets for nocturnal roosting and daily loafing. They nest principally on small islands in bays and estuaries, in small bushes or trees, or on ground. Mangrove islands are used frequently for roosting and nesting in central and southern Florida. No eastern brown pelican rookeries were identified within the Preserve.

The implications of these listed bird species is in the management of saltmarshes, adjacent shorelines and wetland habitats in regards to protection and preservation, as discussed in detail in Section IV.

The Florida sandhill crane (*Grus canadensis pratensis*) has a moderate likelihood of occurrence at the Preserve. The Florida sandhill crane is listed as Threatened by the FWC. The Florida sandhill crane's preferred habitats are prairies, freshwater marshes, and pasture lands. They will frequent agricultural areas like feed lots and crop fields, and also golf courses and other open lawns, especially in winter and early spring. Nesting occurs in marshy depression ponds with herbaceous wetland vegetation. No Florida sandhill cranes or nests were observed during site visits to the Preserve. Preferred habitat is limited on the Preserve. This species has been observed nesting within one mile of the Preserve in suboptimal (cleared scrub) habitat. The limited presence of suitable habitat results in minimal implication for management strategies; however, the anomaly of nesting in scrub nearby requires regular observation for this species.

The bald eagle (*Haliaeetus leucocephalus*) has been removed from the FWC and FWS protected species lists, but is still listed by FNAI and is protected by the Bald and Golden Eagle Protection Act (BGEPA). Two active bald eagle nests are located within the Preserve and two are in close proximity. Bald eagle habitat most commonly includes areas close to coastal areas, bays, rivers, lakes, or other bodies of water that provide concentrations of food sources, including fish, waterfowl, and wading birds. They usually nest in tall trees, mostly live pines that provide clear views of the surrounding area. The nest located on the Turnbull tract is within a flatwoods community and has implication when proposing burning in this area. The nest on the Bolt tract is within maritime hammock where fire is not a proposed management tool.

The osprey (*Pandion haliaetus*) and swallow-tailed kite (*Elanoides forficatus*) are both ranked species by FNAI. The osprey was observed utilizing the open waters of the Preserve. No nests have been recorded within the Preserve. The swallow-tailed kite is a common migrant of the area and has been observed flying over the Preserve. No swallow-tailed kite nesting areas were observed during the site investigations.

The southeastern American kestrel (*Falco sparverius paulus*), listed as Threatened by the FWC, has a moderate potential to inhabit the Preserve. The southeastern American kestrel is normally found in open pine habitats, woodland edges, prairies, and pastures throughout much of Florida. Availability of suitable nesting sites is key during breeding season. Nest sites include tall dead trees or utility poles generally with an unobstructed view of surroundings. Sandhill habitats seem to be preferred, but may also occur in flatwoods settings. Open patches of grass or bare ground are needed in flatwoods settings, since thick palmettos prevent detection of prey. Although the species has not been observed, snags should be left standing where feasible.

The peregrine falcon (*Falco peregrinus*), short-tailed hawk (*Buteo brachyurus*), merlin (*Falco columbarius*), and Cooper's hawk (*Accipiter cooperii*), all ranked by FNAI, have a moderate potential to inhabit the Preserve. No particular management strategies are connected to the potential presence of these species.

The Florida scrub-jay (*Aphelocoma coerulescens coerulescens*), listed as Threatened by FWC and FWS, was observed within the Preserve at the southern border and occurrences have been documented on the Martin's Dairy Tract and to the south of the property. The Florida scrub-jay inhabits fire dominated, low-growing, oak scrub habitat found on well-drained sandy soils. They may persist in areas with sparser oaks or scrub areas that are overgrown, but at much lower densities

and with reduced survivorship. The mesic flatwoods, scrubby flatwoods, and scrub found within the Preserve provide the potential for valuable acreage which could be utilized by local scrub-jay families and offspring. Canopy and mid-story biomass reduction within the above habitats is essential to re-establish these areas as optimum Florida scrub-jay habitats. A discussion on the restoration of these habitats is presented in Sections IV and V below.

ZCA and Volusia County staff conducted a Florida scrub-jay survey in July 2010 in accordance with guidelines provided by the FWS North Florida Field Office, in their document, *Scrub-Jay Survey Guidelines*, which was adapted from Fitzpatrick *et. al.*, (1991). The one scrub-jay observed flew from south of the property to the southern boundary to respond to a voice recording. It then flew back offsite and did not return. No scrub-jays were documented throughout the remainder of the Preserve during the five-day survey.

The Florida black bear (*Ursus americanus floridanus*), which is listed as Threatened by FWC, is known to inhabit the area. The Florida black bear uses a wide variety of forested communities which is necessary to support the varied seasonal diet of black bears. Forested wetlands are particularly important for diurnal cover and the ecotone along the creek within Martin’s Dairy provides a corridor for movement through the area.

The Sherman’s fox squirrel (*Sciurus niger shermani*), listed as a Species of Special Concern by FWC, is the largest of the three fox squirrels that occur in Florida. The Sherman’s fox squirrel utilizes xeric habitats such as long-leaf pine and turkey oak sandhills, although they can be found in mesic forests as well. No fox squirrels have been observed onsite due to a lack of suitable habitat.

The Florida manatee (*Trichechus manatus latirostris*), listed as Endangered by FWC and FWS, is an aquatic mammal that utilizes the adjacent brackish habitats of the Preserve. The manatee winters in warm springs and other warm water outfalls along the central and southern Florida coasts. Manatees also are known to traverse the shallow waters of the ocean along our entire coastline. Management strategies as listed for the sea turtles above apply to this management of this species.

Listed Plant Species

The listed plant species with some potential to occur on the subject property are listed in Table D.1.2, below.

Table D.1.2: Listed plant species with the potential to occur on the Doris Leeper Spruce Creek Preserve in Volusia County, Florida.

<b>Scientific Name</b>	<b>Common Name</b>	<b>FDACS</b>	<b>FWS</b>	<b>FNAI Rank</b>	<b>Likelihood of Occurrence</b>
<i>Acrostichum danaeifolium</i>	Giant leather fern	CE	N	N	Observed
<i>Asplenium dentatum</i>	American toothed spleenwort	E	N	G5/S1S2	Low
<i>Asplenium erosum</i>	Auricled spleenwort	E	N	G5/S2	Low
<i>Asplenium serratum</i>	Bird's-nest spleenwort	E	N	G4/S1	Low
<i>Calamintha ashei</i>	Ashe's savory	T	N	G3/S3	Low
<i>Calamovilfa curtissii</i>	Curtiss' reedgrass	T	N	G3/S3	Low
<i>Calopogon barbatus</i>	Bearded grass pink	T	N	N	Low

<i>Calopogon multiflorus</i>	Many-flowered grass pink	E	N	G2G3/S2S3	Low
<i>Campyloneurum phyllitidis</i>	Strap fern	E	N	N	Low
<i>Centrosema arenicola</i>	Sand butterfly pea	E	N	G2/S2	Moderate
<i>Chamaesyce cumulicola</i>	Sand dune spurge	E	N	G2/S2	Moderate
<i>Conradina grandiflora</i>	Large-flowered rosemary	E	N	G3/S3	High
<i>Deeringothamnus rugelii</i>	Rugel's pawpaw	E	E	G1/S1	Low
<i>Encyclia tampensis</i>	Butterfly orchid	CE	N	N	High
<i>Epidendrum conopseum</i>	Greenfly orchid	CE	N	N	High
<i>Garberia heterophylla</i>	Garberia	T	N	N	High
<i>Glandularia maritima</i>	Coastal vervain	E	N	G3/S3	Moderate
<i>Glandularia tampensis</i>	Tampa vervain	E	N	G2/S2	Moderate
<i>Harrisella porrecta</i>	Threadroot orchid	T	N	N	Low
<i>Hartwrightia floridana</i>	Florida hartwrightia	T	N	G2/S2	Low
<i>Helianthus carnosus</i>	Lakeside sunflower	E	N	G1G2/S1S2	Low
<i>Hexalectris spicata</i>	Crested coralroot	E	N	N	Low
<i>Illicium parviflorum</i>	Yellow star anise	E	N	G2/S2	Low
<i>Lechea cernua</i>	Nodding pinweed	T	N	G3/S3	Moderate
<i>Lechea divaricata</i>	Spreading pinweed; pine pinweed	E	N	G2/S2	Moderate
<i>Lilium catesbaei</i>	Catesby's lily	T	N	N	Moderate
<i>Listera australis</i>	Southern twayblade	T	N	N	Low
<i>Lycopodiella cernua</i>	Nodding clubmoss	CE	N	N	Low
<i>Matelea floridana</i>	Florida milkweed; panhandle anglepod	E	N	G2/S2	Moderate
<i>Monotropsis reynoldsiae</i>	Pigmy-pipes; sweet pinesap	E	N	G1Q/S2	Low
<i>Myrcianthes fragrans</i>	Simpson's ironwood; Simpson's stopper	T	N	N	High
<i>Nemastylis floridana</i>	Fall-flowering ixia; celestial lily	E	N	G2/S2	Moderate
<i>Nolina atopocarpa</i>	Florida beargrass	T	N	G3/S3	Observed by FNAI
<i>Ophioglossum palmatum</i>	Hand adder's tongue fern	E	N	G4/S2	Low
<i>Osmunda cinnamomea</i>	Cinnamon fern	CE	N	N	Observed
<i>Osmunda regalis</i>	Royal fern	CE	N	N	Observed
<i>Opuntia stricta</i>	Shellmound pricklypear	T	N	G2/S2	High
<i>Pecluma dispersa</i>	Polypody fern	T	N	G5/S2	Low
<i>Pecluma plumula</i>	Polypody fern	E	N	G5/S2	Low
<i>Pecluma ptilodon</i>	Swamp plume polypody	E	N	G5/S2	Low
<i>Peperomia humilis</i>	Terrestrial peperomia; pepper	E	N	G5/S2	Low
<i>Pinguicula caerulea</i>	Blue butterwort	T	N	N	Low
<i>Platanthera blephariglottis</i>	Large white fringed orchid	T	N	N	Low
<i>Platanthera cristata</i>	Golden fringed orchid	T	N	N	Low
<i>Platanthera flava</i>	Southern tubercled orchid; gypsy-spikes	T	N	N	Low
<i>Platanthera nivea</i>	Snowy orchid; bog torch	T	N	N	Low
<i>Pogonia ophioglossoides</i>	Rose pogonia	T	N	N	Low

<i>Pteroglossaspis ecristata</i>	Wild coco; giant orchid	T	N	G2G3/S2	Moderate
<i>Rhapidophyllum hystrix</i>	Needle palm	CE	N	N	Moderate
<i>Rhododendron canescens</i>	Pink azalea	CE	N	N	Low
<i>Sarracenia minor</i>	Hooded pitcherplant	T	N	N	Moderate
<i>Scaevola plumieri</i>	Inkberry	T	N	N	Low
<i>Schwalbaea americana</i>	American chaffseed	E	E	G2G3/S1	Low
<i>Spiranthes brevilabris</i> var. <i>floridana</i>	Florida ladies' tresses	E	N	G1/S1	Low
<i>Spiranthes laciniata</i>	Lace-lip ladies' tresses	T	N	N	Low
<i>Tillandsia utriculata</i>	Giant wild pine	E	N	N	Low
<i>Zamia pumila</i>	Florida coontie	CE	N	N	Observed
<i>Zephyranthes atamasca</i> var. <i>treatiae</i>	Treat's rain lily	T	N	N	Low
<i>Zephyranthes simpsonii</i>	Simpson's zephyr lily	T	N	G2G3/S2S3	Low

Abbreviations:

CE: Commercially Exploited

T: Threatened

E: Endangered

N: Not Listed

FNAI 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 man-made 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 man-made factor.

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**G4:** Apparently secure globally (may be rare in parts of range).

**G5:** Demonstrably secure globally

**G#T#:** Rank of a taxonomic subgroup such as a subspecies or variety; the G portion of the rank refers to the entire species and the T portion refers to the specific subgroup; numbers have same definition as above (e.g., G3T1).

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**S4:** Apparently secure in Florida (may be rare in parts of range).

**S5:** Demonstrably secure in Florida.

The large expanses of xeric uplands that occur in the Preserve make it a potential site for numerous listed plant species. Much of the upland areas on the project site have been fire-suppressed for many years, leading to a closed canopy structure and overgrown conditions. Several listed plant species may occur within the scrub and scrubby flatwoods, such as the large-flowered rosemary (*Conradina grandiflora*), garberia (*Gaberia heterophylla*), pinweeds (*Lechea cernua* and *L. divaricata*), sand butterfly pea (*Centrosema arenicola*), sand dune spurge (*Chamaesyce cumulicola*), wild coco (giant orchid - *Pteroglossaspis ecristata*) and shellmound pricklypear (*Opuntia stricta*) are species that are likely to occur in the xeric habitats following disturbance (such as fire or clearing) and along existing breaks such as trails and powerlines. Florida beargrass (*Nolina atopocarpa*) was sighted by FNAI staff in 2004 in a general location west of the blackwater creek on Martin's Dairy tract. This location is not within state-owned lands, however similar scrubby habitat does exist within state owned land boundaries. This species, like the others discussed, becomes crowded out of the xeric community as shrubs take over following prolonged periods without fire or other disturbances. The implication of the potential presence of these species is related to user group management and xeric habitat restoration and implementation of fuel reduction and open space creation efforts.

Commercially exploited species, such as Giant leather fern (*Acrostichum danaeifolium*), royal fern (*Osmunda regalis*), cinnamon fern (*Osmunda cinnamomea*), needle palm (*Rhapidophyllum hystrix*), greenfly orchid (*Epidendrum conopseum*), butterfly orchid (*Encyclia tampensis*) and coontie (*Zamia pumila*) have either been observed or have high potential for occurrence on the property. These species, especially the latter three, have a high threat for collection. They are relatively conspicuous in the environment and easily harvested. As the site is bordered by navigable waterways, public and private roads and properties, the implication for management is again tied to user groups. This includes managing access points and internal trail networks that do not call attention or lead to easily accessible areas where these species are present, especially in abundance.

Several species are common in the county, in high acid wet flatwoods, but will occur along borders of any of the wetlands on the Preserve. These include Catesby's lily (*Lilium catesbaei*), hooded pitcher plant (*Sarracenia minor*), and fall-flowering ixia (*Nemastylis floridana*). Managing the wet flatwoods for open mid-story and shrub layers, including reducing and preventing woody thickets are successful measures in managing for these species.

The presence of aboriginal shell mounds on the site may also harbor listed plant species such as the reddish peperomia (*Peperomia humilis*), brittle maidenhair fern (*Adiantum tenerum*), and shell mound prickly-pear (*Opuntia stricta*), although many of these species are still considered to have a low likelihood of occurrence. Preservation efforts to limit foot-traffic and the introduction of fire would benefit plant species that occur on shell mounds. In addition, when the archaeological sites are monitored by County staff, a biologist should accompany the visits where possible to review for the presence of these species.

Continued preservation efforts that protect onsite hammocks is beneficial to several listed species including Simpson's stopper (*Myrcianthes fragrans*), Florida milkweed (*Matelea floridana*), several of the above CE listed species and species still considered to have a low likelihood of occurrence including hand fern (*Ophioglossum palmatum*), widespread polypody (*Pecluma dispersa*), and plume polypody (*Pecluma plumula*). The polypody ferns are known to occur in similarly situated hammocks in Flagler County, but require live oaks larger in diameter than those observed on DLSCP.

The occurrence or potential occurrence of listed plant and wildlife species does not directly preclude public use of this site. The presence of listed species provides environmental education opportunities for the general public. However, user group management is an important component of these species continued existence or restoration efforts. Several species occur in habitats in need of restoration efforts. Where and when feasible, surveys for listed species will occur following management activities, including any land clearing or fires (prescribed or otherwise). These surveys may be conducted by County staff or coordinated with local volunteer groups such as the FNPS.

## **2. Imperiled Natural Communities**

Three (3) natural communities on the Preserve are listed by FNAI as Imperiled Natural Communities. Maritime hammock, scrub, and scrubby flatwoods each are considered imperiled in Florida because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor. The Preserve includes 162.8 acres of maritime hammock, 280.0 acres of scrub, and 254.1 acres of scrubby flatwoods. As described previously within the Section B the maritime hammock within the Preserve is functioning at an optimum level.

Management activities include protection from illegal access related to dumping and off-road vehicle (ORV) use and prevention of invasion by invasive exotic species. The scrub and scrubby flatwoods require restorative land management activities to allow them to function as required to host the flora and fauna species which historically reside within the community.

## **E. Archaeological and Historic Resources**

Archaeological resources located within the Preserve are remnants of two significant occupations—the native people who used the extensive waterways for transportation and sustenance and the British Period Andrew Turnbull “New Smyrna” settlement (1766—1777). There are no historic structures located within the Preserve.

Spruce Creek Mound (8V099) is listed on the National Register of Historic Places. The prehistoric earthen mound is the largest in East Central Florida. The mound was used as a ceremonial, social, and political center for the Timucuan and their predecessors that inhabited the lower Spruce Creek basin. The site was still being used when Europeans arrived in the early 1500’s. Interpretation of this resource along with the other lesser mounds and shell middens scattered through the surrounding areas is a key component to the educational programs proposed for the Preserve.

Sleepy Hollow (8V07142) was included in the National Register of Historic Places in 2008, one of multiple properties associated with the archaeological resources of the Eighteenth Century Smyrna Settlement of Dr. Andrew Turnbull. The site is depicted in a 1767 map as being occupied by William Watson, a carpenter contracted by Turnbull to construct settlement facilities prior to the arrival of Turnbull’s party of indentured servants.

There are 15 recorded sites on state lands, and there are 18 recorded sites on adjacent conservation lands. The vast majority of these sites are new sites recorded by registered public archaeologists retained by local governments with field investigations and reports completed in 1986, 1989, 1990, 1996, 1997, 1999 and 2006. These studies have systematically addressed areas of most probable resources. For management purposes, the entire preserve is considered to be archaeologically sensitive and investigation is undertaken prior to any site disturbance or recreational uses with potential for ground disturbance.

To protect these resources, it is the County’s policy not to provide the general public with information regarding location of these sites, with the exception of the Spruce Creek Mound Complex, where an interpretive kiosk is planned. Protection of these identified cultural resources is a key management objective for the Preserve.

### **III. USAGE OF THE PROPERTY**

#### **A. Previous Use and Development**

The first European permanent occupation was related to Andrew Turnbull's New Smyrna Settlement during the British Colonial Period of Florida's history (1763-1777). During the second Spanish period, portions of the project site and vicinity were awarded to numerous individuals in the form of land grants. However, development in the vicinity of the site stagnated with the event of the Seminole wars and the Civil War. The project site and neighboring lands were not intensely developed or utilized until the turn of the 20<sup>th</sup> century.

A portion of the project site, located on the southern and northern shores of Strickland Bay, was subdivided and eventually timbered by the Nordman Land and Timber Company. The preferred timber was cypress and pine. Effects of the early timbering activities are evident due to the age of the overstory trees on the project site. The Nordman Company also raised cattle on the project site. Intensified free-range cattle operations became more prominent in the early 20<sup>th</sup> Century and were the main activities on the project site until the late 1970s.

Since the property has been in public ownership by the State of Florida and Volusia County, it has been used by residents for passive and active recreation activities. One of the adjacent properties owned by the County is developed as a recreation area, Spruce Creek Preserve, with camping, hiking, fishing and picnicking opportunities. Multiple use, unpaved trails have been developed on the western portion of the Preserve. In addition, portions of the Preserve, specifically Spruce Creek, are listed in Florida's Greenways and Trails by the Florida Department of Transportation. The remainder of the Preserve has minimal public access.

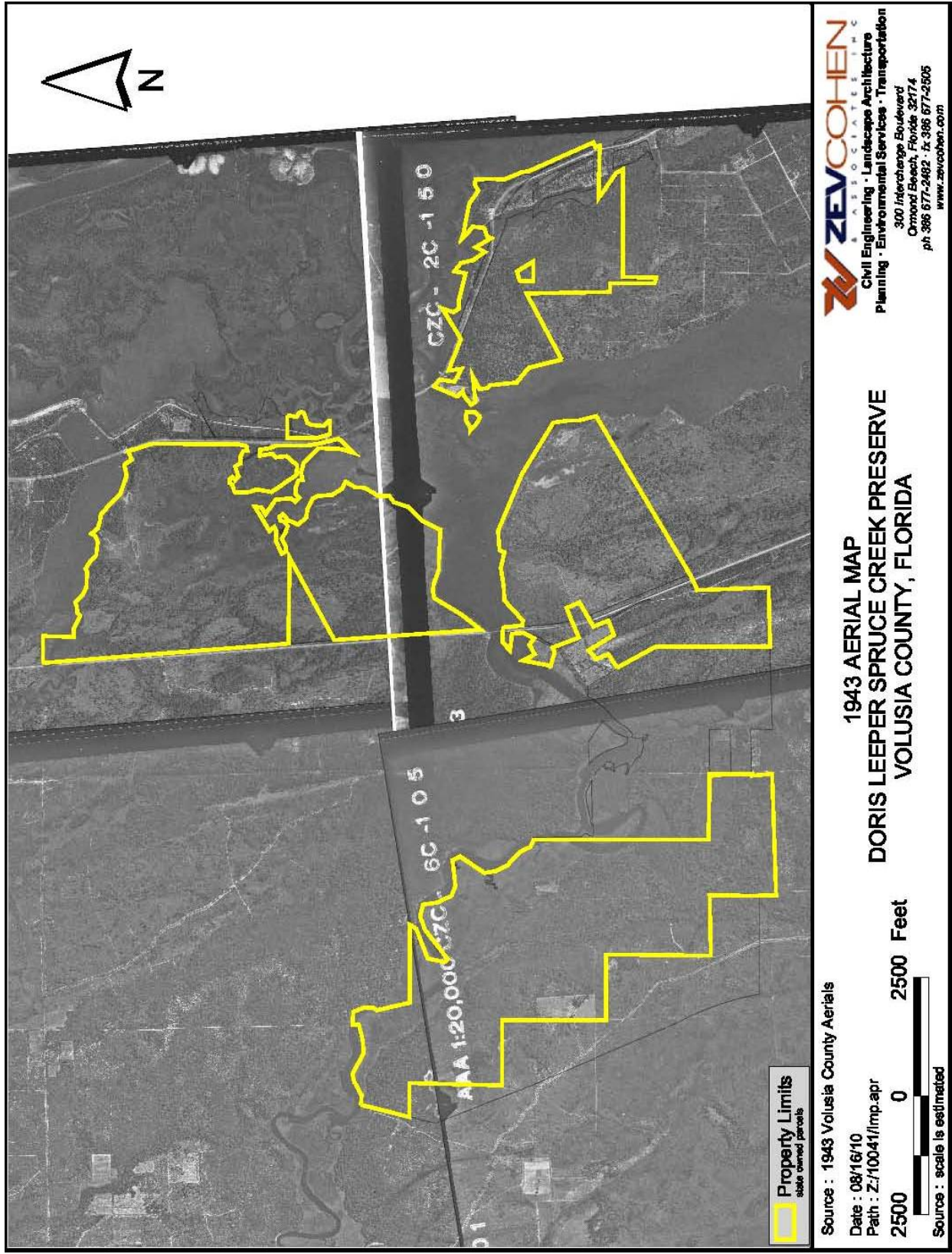


Figure 9. 1943 Aerial Map of Doris Leeper Spruce Creek Preserve of State.

## B. Current Use and Development

Current uses at the Preserve are primarily related to public access and outdoor recreation. Public access is provided to all tracts and is supported by adjacent parcels within the Preserve. The following table depicts uses and infrastructure that exist within or adjacent to each tract.

Current Use / Infrastructure	Tract				
	Martin's Dairy	Turnbull	Bolt	Sleepy Hollow	Rose Bay
Access Point	1	1	1	1	2, 1*
Parking	1		1	1	1*
Access Gate	1	2	4	1	2, 1*
Information Kiosk	1				3*
Trails**(H,B,E,V)***	H B E V	H B E V	H B V	H V	H B
Pavilion	1****			1	1, 1*
Boardwalk					1
Observation Tower					1
Camp Sites (Special use – permit required)					17*
Fishing Access			2	1	1*
Canoe/Kayak Landing/ Launch					1*
Picnic Area					24*
Playground					1*
Restroom					2*
Historic Site Open to Public	1				

\*Located on adjacent Spruce Creek Park for Rose Bay;

\*\*The 5 tracts contain approximately 84 miles of public and restricted use trails

\*\*\*H,B,E,V = Hiking, Biking, Equestrian, Vehicle. Vehicle trails are for staff and approved use only. Sleepy Hollow has a paved road (former US 1) and grass parking. Equestrian use on Turnbull is for the west portion only

\*\*\*\*Located on adjacent public land between Turnbull and Martin's Dairy Tracts

The tracts with gated access are generally open during daylight hours. Primitive group camping is allowed with a permit from the County. Vehicular parking is provided for all tracts except Turnbull, and Rose Bay is provided for via the adjacent Spruce Creek Campground. Refer to the Recreation Plan for details on locations of existing infrastructure and uses.

### **C. Purposes for Acquisition of the Property**

The acquisition of DLSCP was begun in the mid-1980's, and involved several individuals, conservancy groups, and state and local governments and agencies. The Preserve was purchased through a joint effort with Volusia County and the State's Conservation and Recreation Lands (CARL) Program. The purpose of the acquisition through the CARL program was the protection, conservation and management of natural and cultural resources along while providing for public access and recreation.

### **D. Assessment of the Impact of Planned Use**

Determination of public uses that are consistent with acquisition purposes followed the parameters outlined below. The parameters are a summary of the objectives and goals for management of the Preserve as they relate to purpose for acquisitions under the CARL program.

1. To conserve and protect environmentally unique and irreplaceable lands that contain native, relatively unaltered flora and fauna representing a natural area unique to, or scarce within, a region of Florida or a larger geographic area, including FNAI listed imperiled habitats;
2. To conserve and protect native species habitats that support or could support with appropriate management techniques state and federally listed species or species considered imperiled by FNAI;
3. To conserve, protect, manage, or restore important ecosystems, landscapes, and forests, if the protection and conservation of such lands are necessary to enhance or protect significant surface water, ground water, coastal, recreational, timber, or fish or wildlife resources which cannot otherwise be accomplished through local and state regulatory programs.
4. To provide areas, including recreational trails, for natural resource based recreation and other outdoor recreation on any part of any site compatible with conservation purposes.

The primary goal here is to provide a diversity of outdoor recreational opportunities that are environmentally, culturally, outdoor or educationally oriented where such activities do not adversely impact the long-term well-being of the natural and cultural resources for which the property was acquired or for which it is being managed. Public needs and desires, as well as assessment of the impact of planned activities on natural and cultural resources, are considered in the development of recreational opportunities and represent "balanced public utilization." Uses planned for the Doris Leeper Spruce Creek Preserve are in compliance with the Conceptual State Lands Management Plan.

### **E. Acreage that Should be Declared Surplus**

The County evaluated all state-owned parcels identified within this plan to determine if any of the parcels include lands that are not being used for the purpose for which they were originally leased. It was determined that all lands within DLSCP are being managed and utilized for the primary purpose of protection and conservation of natural resources and allow for public access and outdoor recreation and education where compatible with the primary purpose. Thus, no portion of DLSCP should be considered or declared surplus.

Note that the acreage adjustments that occurred in the updated Optimal Boundary did not include reduction of *owned* property. All State-owned properties have remained as such, and none are declared as surplus at this time.

### F. Proposed Single or Multiple-Use Potential

DLSCP will be managed under the multiple-use concept. The Preserve will allow for natural resource-based recreation and educational opportunities, while keeping protection of the natural and historical resources found in the area as the primary goal and objective.

### G. Analysis of Multiple-Use Potential

It is Volusia County’s goal to manage the property in such a way as to protect the site’s natural and historical resources, while also providing opportunities for compatible, resource-based recreation and education. During the planning process, all potential outdoor recreation uses were considered. Those found appropriate are discussed within this plan. Exceptions are evaluated on a case-by-case basis for compatibility with the Preserve’s outdoor recreation and resource preservation purposes.

The potential of generating revenue to fund management was also analyzed. Some revenues may be generated by user and concession fees at different recreation sites adjacent to the Preserve. Use of portions of the area as mitigation for development elsewhere may also yield revenues. Finally, revenues may be generated through sale of forest products generated during management. Any revenues generated through the sale of these timber products will be used for future management of the property.

The use of private land managers to facilitate restoration and management of this unit was also analyzed. Decisions regarding this type of management (such as mitigation projects, removal of timber for resource protection or restoration, etc.) will be made on case-by-case bases as necessity dictates.

Table F.1: Summary of activities and uses that were analyzed for compliance with the goals and objectives of the DLSCP Management Plan.

Activity	Status of Use*		
	Approved	Conditional	Rejected
Protection of listed species	✓		
Ecosystem maintenance	✓		
Soil and water conservation	✓		
Hunting			✓
Fishing		✓	
Wildlife Observation	✓		
Hiking		✓	
Bicycling		✓	
Equestrian use		✓	
Mining			✓
Silviculture (timber harvesting)		✓	
Cattle grazing / range management			✓

Primitive Camping		✓	
Canoe / kayak landings		✓	
Ecotourism		✓	
New Linear Facilities		✓	
Off Road Vehicle Use			✓
Survey and Mapping	✓		
Environmental Education	✓		
Citriculture or other agriculture / row crops			✓
Cultivation of native species for seed banks or propagation		✓	
Preservation of cultural sites	✓		
Preservation of historical sites	✓		
Apiaries		✓	
Vehicular Access and Parking		✓	

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**Approved** = A use considered to be in compliance with goals and objectives with the Plan.

**Conditional** = A use that is considered in compliance with Plan goals and objectives given certain conditions are met (e.g., timing, location of use, intensity, etc.)

**Rejected** = A use considered not in compliance with goals and objectives of the Plan.  
(added per direction to define status of use terms)

The majority of uses and decisions on acceptability are clear. Those worth further discussion are explained in further detail here. It is important to note that the list is primarily geared towards user groups; however, activities performed by the lead agency may appear contradictory and thus are discussed below.

Ecosystem maintenance includes any of the management activities noted in Section IV below. Note that some activities may result in soil surface disturbance. These activities will be analyzed on a case by case basis, and will consider alternative methods, goals being met that require the activity and presence within the Preserve in regards to known or potential cultural resources. Another ecosystem maintenance activity includes the eradication of nuisance wildlife species (namely feral hog) by trapping, followed by discharge of a firearm. This activity should not be considered hunting, and is performed by County staff or licensed trappers contracted by the County. Another activity involved in ecosystem maintenance includes access to all parts of the Preserve by management equipment, including off road vehicles. The rejection of this use is again applied to public user groups.

Silviculture is applied in the context of sustainable forestry management and its identification as an approved use is solely as a support mechanism to natural resource restoration and management and maintenance. The identification of this practice ensure the ability of the lead agency to properly conduct timber harvests, prescribed burns and other activities regularly associated with silviculture that often require such a label to obtain approvals by local municipalities and other regulatory agencies. The purpose here is not for revenue generation, but revenue occurring as a result of activities is encouraged to assist in funding of restoration and management activities.

Hiking, equestrian use and biking are limited to use on trails and are currently allowed in designated areas on the Preserve with equestrian use and biking primarily limited to the Martin's Dairy tract. These are on-going and popular activities and result in the greatest daily use of the Preserve. These activities have been designated as a Conditional Use as these are active uses and do result in some impacts to natural resources and historical sites. They are controlled by trail and access management.

These activities occasionally conflict with the primary goals of the Preserve as a result of the creation of new trails by the user groups. This has been the biggest challenge in management of these activities. The presence of a resident caretaker on the adjacent lands within the Preserve and the management of user groups and access points by the Volusia County Parks, Recreation and Culture Division will greatly enhance the presence of the County onsite and is expected to be sufficient to continue to allow these activities on the Preserve.

Linear facilities, including gas and power lines, already occur within the limits of the Preserve and were in place prior to acquisition. The approval of this use is limited to existing linear projects.

The Recreation Plan, provided in Appendix K, discusses the implementation of these uses, and provides for guidance of public use management in the context of the two prong approach to natural resource protection and public access.

## **H. Cooperating Agencies Responsibilities**

No other agencies are directed by the lease or other agreements as a cooperating partner in the management of DLSCP. A list of agencies that have participated in achieving the goals within this Plan follows:

Florida Communities Trust – Land Acquisition  
Florida Division of Forestry – Prescribed and Wildfire Control Assistance  
The Legacy Program – Education, Environmental Monitoring, Resource Inventory  
St. Johns River Water Management District – Land Acquisition; Salt marsh restoration  
City of Port Orange – Land Acquisition; Future Land Use Planning/ Development Encroachment  
City of New Smyrna Beach – Future Land Use Planning/ Development Encroachment  
Florida Natural Areas Inventory – Natural Resource Inventory – (Rare, Listed Species)  
Volusia County Mosquito Control – Invasive / nuisance species control  
Florida Fish and Wildlife Conservation Commission – Eagle Nest Monitoring; Hunting Analysis  
Division of Historical Resources – Historical and Archaeological Inventory / Database  
SE Volusia Historical Society – Historical and Cultural Resource Programs  
Florida Public Archaeology Network – Historical and Cultural Resource Programs  
Atlantic Center for the Arts – Education; Public Meetings  
Florida Native Plant Society – Floral Lists

## **IV. MANAGEMENT GOALS AND OBJECTIVES**

Volusia County has implemented resource and user group management programs for the purpose of preserving the significant natural and cultural resources under its directive as lead agency. The goals and objectives have been developed for DLSCP to meet the purpose for which the property was acquired. The specific goals and objectives to meet that purpose are the culmination of goals and objectives developed cooperatively by County, user groups, and other stakeholders. Target dates for completion of objectives are classified as short-term (within the next two years) or long-term (up to ten years from plan date to implementation). Successful completion of each of these objectives is contingent upon adequate funding.

The Resource Management Objectives for Doris Leeper Spruce Creek Preserve were identified as the following:

- Preserve and protect the expansive freshwater marsh wetland system and water resources on-site;
- Maintain and restore the ecological integrity of existing upland vegetative communities through sound innovative management practices in order to provide for a more healthy & productive ecosystem;
- Implement a prescribed burn program;
- Continue exotic species removal and maintenance program;
- Protect, manage and restore areas for the listed wildlife species that may occur on-site. This includes:
  - Protection and maintenance of existing wetland and upland habitats,
  - Selective restoration of scrub habitat and flatwoods,
  - Protect identified and high potential historical and archeological resources,
- Continue to monitor and protect property, environmental, historical and archaeological resources;
- Maintain use of existing facilities;
- Continue recreational nature based programs and infrastructure
- Continue environmental educational programs and infrastructure

## **A. Habitat Restoration and Improvement**

**Goal: Restore / improve native habitats trending away from optimal conditions**

**Objective: Implement Techniques to Trend Towards Desired Future Conditions / Habitat Maintenance Condition**

Many of the natural communities on the Preserve have not burned for many years, resulting in dense canopies and/or subcanopies. Areas with a dense canopy or subcanopy provide minimal habitat for listed plant and/or animal species due to increased shade, decreased availability for space, decreased herbaceous vegetation in the groundcover stratum, and decreased open patches. In xeric habitats, this also may lead to decreased return intervals for fire, with eventual evolution to xeric hammocks. Many of the extant habitats would benefit from periodic removal of the dense canopy and/or subcanopy of pines, oaks and other common shrub strata species through prescribed fire or manual removal. This reverses the conditions noted above and with fire can return nutrients to the soil and create favorable conditions for listed species. Many wildlife species, including listed species, would benefit from the reduction of oak canopy through the increase of herbaceous forage and open habitat conditions.

Prescribed fire in the appropriate habitats is an important abiotic factor in the restoration and improvement of many habitats. Other abiotic factors affecting habitat quality include hydrologic preservation and protection, and infrastructure management to protect habitats from potential multiple-use impacts.

Important biotic factors in the restoration and improvement of extant habitats include control of invasive exotic species and sustainable forestry resource management. Each of these are discussed below as specific goals.

Objectives:

- Develop a Habitat Restoration Plan
- Implement Restoration Plan where applicable
- Implement Fire Management Plan
- Implement Timber Assessment / Timber Plan

Land management and restoration require clear ecological goals with Desired Future Conditions (DFCs). The DFCs shall be included in the Habitat Restoration Plan that is to be developed. Establishing these goals is essential to successful ecosystem management and restoration. It is essential to provide a clear vision of future conditions that can be communicated to the management staff and the public, establish a guide for conservation and management actions, establish priorities for proposed activities, and integrate proper monitoring criteria that can evaluate resource management. Specific to the Preserve, there are 17 identified vegetative communities with numerous protected wildlife and plant species that require land management activities to function at peak ecological levels.

Measurable Parameters (may be extended beyond those listed here):

- List of acreages by habitat requiring specific restoration treatment techniques
- Identify parameters that define Desired Future Conditions (per habitat)
- Acres receiving fire surrogate treatments (by habitat and year)
- Acres burned (incl. wild and prescribed fires, with follow up assessment)
- Post-burn (immediate and 1-4 mos.) analysis
  - Fire intensity
  - Crown scorch / canopy mortality
  - Duff / soil litter consumed
- Acres / board feet harvested per tract per habitat
- Estimate of total pre and post Basal Areas per tract

## **B. Fire Management**

### **Goal: Return fire to appropriate habitats in DLSCP**

#### **Objective: Implement the Prescribed Burn Plan**

There are numerous benefits to implementing a prescribed fire management program for the Preserve. The following statements summarize the general benefits of a properly developed and implemented prescribed fire program:

- Reduce fuel hazards;
- Improve accessibility for fire fighters, public and wildlife mitigation;
- Control competing vegetation, forest diseases and insects in order to provide for a more healthy and productive forest;
- Improve forage for wildlife;

- Remove dead materials and return nutrients to soils;
- Improve aesthetics by increasing new understory and overstory forest growth.

Fire is a historically important disturbance within several plant communities and can be very important for reproduction and production of species endemic to the vegetation communities found on the project site. Average fire return intervals of 2-8 years (depending upon hydrologic setting) were common historically within the flatwoods communities. Scrub habitat historically underwent fire return intervals ranging from 8—20 years. Variability of the fire return intervals, extent of areas burned, and seasonality, duration and intensity of burns within burn management units are important aspects included in the burn prescription plan to maintain diversity and promote “patchiness” within habitats. A burn zone map is included in the Prescribed Burn Plan in Appendix G.

The ultimate goal in a typical burning program is to allow for growing season burns to occur within the fire-dependent communities and to reach a stage where fire is being utilized as a habitat maintenance tool, rather than a restoration tool.

Many of the areas on the project site do not require management by fire, including the mesic hammocks, mangrove areas, salt marsh, and bottomland hardwood communities on the property. Although some areas, such as the salt marshes and the ecotones adjacent to the mesic hammocks, may benefit from periodic prescribed burns, other concerns including access constraints and muck fires would limit the viability of prescribed fire for these areas.

Several communities on the Preserve are overgrown and require significant biomass reduction. The most critical occurrence of this is within the scrub communities, especially those on the Martin’s Dairy tract. The scrub oak and other shrub species have reached a height and caliper than they have created a closed canopy. The structure of the scrub is inappropriate at this time, including height and density of the canopy/ subcanopy, lack of open ground space, and reduction in herbaceous vegetation in the ground stratum.

Several constraints exist that influence how and when prescribed fire can be implemented. These constraints are discussed in Section V, below. The constraints surrounding prescribed burning at DLSCP are numerous and significant. Prescribed burning may prove to be unfeasible or impracticable, either temporally, spatially, or logistically for portions of the Preserve. Where / when these circumstances occur, other management options will be considered. One management strategy would be to conduct hand removal and/or mechanical removal of the canopy to reduce the coverage of xeric oaks and pines. Other management strategies including roller chopping and forestry mowing reduce competition in the shrub and groundcover strata. Several methods are available as fire surrogates, but none have proven to be as ecologically effective as fire. However, many of these fire surrogate activities are necessary prior to safe fire implementation. In these cases, mechanical and other fire surrogate activities are crucial in the eventual re-introduction of fire.

There are several listed species whose occurrence and population health are directly related to fire / fire surrogate activities. Where the specifics of a particular species are well known, they are discussed in the imperiled species section below.

## Objectives:

- Implement Fire Management Plan

## Measurable Parameters (may be extended beyond those listed here):

- List of acreages suitable for fire implementation (or surrogate) by habitat / tract
- Acres receiving fire surrogate treatments (by habitat and year)
- Acres burned (incl. wild and prescribed fires, with follow up assessment)
- Post-burn (immediate and 1-4 mos.) analysis
  - Fire intensity
  - Crown scorch / canopy mortality
  - Duff / soil litter consumed
- Dominance of shrub layer pre and post treatment per treatment unit
- Canopy extent (by percent) pre and post treatment per treatment unit

## **C. Hydrological Preservation and Restoration**

**Goal: Protect water quality and quantity, restore hydrology to the extent feasible, and maintain the restored condition.**

Spruce Creek is designated as a Class III and an Outstanding Florida Water (OFW). This designation restricts development in certain areas of the adjacent uplands; includes some areas as Riparian Habitat Protection Zone under state regulation (Section 11.5.4, ERP Applicant's Handbook). Management activities on the property such as burning and mechanical treatments would be compatible with the OFW designation and would not decrease water quality. However, care must be taken to not create a potential erosion problem along a topographic gradient where siltation into the adjacent water could occur. Recreational uses such as fishing, canoeing, and trail use are compatible with this designation. Again, special care must be used in placement of trails, especially equestrian and bike trails, to avoid potential erosion issues along topographic changes that could result in silt or sediment discharges to Spruce Creek or other adjacent waters. No direct discharge into Spruce Creek will be allowed from any development on the project site. Canoe landings would be considered an allowed activity and would not result in water quality degradation, but would require permitting through state and federal agencies.

The condition of the wetlands adjacent to Spruce Creek and its tributaries and salt marshes around the area will be evaluated prior to any development (canoe landings, trail creation/ relocation, etc.) on the project site. Existing or historic field road crossings through wetland areas should be evaluated to determine if they should be removed or retrofitted with culverts for use in the trail system of the project to restore natural water movement within impacted wetland areas. In areas that the trail system is proposed to cross over wetland areas, consideration will be given to placing the alignment over the retrofitted road crossings and/or using boardwalks.

There are several mosquito ditches present in the salt marsh areas. The modification of mosquito control ditches and the removal of associated spoil piles could be used to restore portions of the salt marsh areas adjacent to Turnbull and Strickland Bays. This would include filling and replanting these small ditches to either high or low salt marsh depending on the situation. This activity is being actively pursued on and adjacent to the Preserve and the St. Johns River Water Management District

has been an active partner in these activities. Funding for this restoration is primarily expected to come from outside agencies, such as SJRWMD.

Objectives:

- Prioritize hydrologic restoration needs in relation to other restoration goals and threat to health of the overall natural community and/or imperiled species
- Implement hydrological restoration projects where feasible / necessary
- Inventory / monitor trails and infrastructure and manage trails to avoid erosion problems
- Consider boardwalks or similar for wetland / water crossings or access (canoe/ kayak launch, etc.)

Measurable Parameters (may be extended beyond those listed here):

- List of acreages of wetland habitats onsite
- Identification by habitat / acreage of areas requiring restoration vs. protection
- Acres of mosquito ditching filled / to-be-filled (per year basis, per entire Preserve – must identify acreage with BOT lands)
- Linear measurement of trails requiring relocation / relocated (per year basis, per entire Preserve – must identify acreage with BOT lands)
- Number / linear measurement of boardwalks proposed / existing (per year basis, per entire Preserve – must identify acreage with BOT lands)

#### **D. Sustainable Forest Management**

**Goal: Manage timber resources for resource conservation and habitat restoration, enhancement, and maintenance through a stewardship ethic that embraces sustainable forest management practices.**

DLSCP has multiple forested habitats. The ability to use sustainable forestry management practices to assist in habitat management is an invaluable tool. The timber stands that exist on DLSCP have been assessed. This assessment and the resulting timber management plan are provided in Appendix H.

Objectives:

- Implement the Timber Assessment / Timber Plan

Measurable Parameters (may be extended beyond those listed here):

- List of acreages by habitat requiring specific restoration treatment techniques
- Acres receiving fire surrogate treatments (by habitat and year)
- Acres burned (incl. wild and prescribed fires, with follow up assessment)
- Post-burn (immediate and 1-4 mos.) analysis
  - Crown scorch / canopy mortality
- Acres / board feet harvested per tract per habitat
- Estimate of total pre and post Basal Areas per tract
- Revenue per annum generated / spent / applied to

## **E. Exotic and Invasive Species Maintenance and Control**

**Goal: Remove exotic and invasive plants and animals to the maximum extent practicable and conduct ongoing maintenance as needed.**

Some of the more invasive, exotic plants that occur on the project site include Australian pine (*Casuarina equisetifolia*), cogongrass (*Imperata cylindrica*), and Brazilian pepper (*Schinus terebinthifolius*). Except for Brazilian pepper, all invasive exotic species occur at low levels (<5% of any given habitat) while Brazilian pepper continues to exist at about 5% of the salt marsh habitat. Cogongrass is only known to occur in two isolated spots, both of which are less than 0.1 acres in size and have been treated and are monitored for resprouts. One is on Bolt Tract and the other is not on state-owned lands, but occurs along the I-95 ROW on the west side of the Port Orange parcel.

Because of these species invasive nature and potential to disrupt natural communities by dominating native wetland and/or upland communities, these plants are targeted for removal using chemical and/or mechanical control methods. As populations of these plants are found, regular maintenance events are scheduled to eliminate or reduce these particular exotic species. Where feasible, volunteer organizations can be used to monitor the preserve for invasive and exotic species and could perform some of the control of these species in cooperation with regularly scheduled maintenance events.

Because of the location of the preserve along a major water area, the opportunistic nature of terrestrial species to spread via human use and the known natural history of the exotic species in the area, it is a reality that invasive and exotic species will continue to invade the shorelines, salt marshes, and all habitats. Those areas easily accessed such as shorelines, property boundaries marked by clearing or fencing, field roads, trails and natural breaks are the most likely to be invaded by such species and will be regularly monitored for any invasive species. The species of primary importance during monitoring include species listed as Level I or II invasive exotics by the Florida Exotic Pest Plant Council (FLEPPC or EPPC). Monitoring will consist of visual reconnaissance during all other onsite activities. Discovery of new species or locations will be recorded by species, location and size of infestation and regularly monitored until eradicated or in a maintenance level condition.

Of the invasive exotic animal species, feral hogs (*Sus scrofa*) create the greatest visible impact to the onsite natural communities and create large disturbed areas that disrupt natural vegetative processes and promote the introduction of invasive / weedy species. The hog population is relatively low at this time and impacts from this species are minor. Numerous other exotic animals may be present, from terrestrial to aquatic. Species such as Cuban tree frog (*Osteopilus septentrionalis*) are outcompeting local native treefrogs. However, these smaller, more inconspicuous species are not readily or easily controlled through land management practices. Education of such species, including proper disposal, may be a potential tool to assist in identification and control of less visible species.

The County has developed an Arthropod Control Plan to evaluate the necessity of control. This is provided in Appendix K.

### Objectives:

- Continue to inventory and control invasive exotic plant and animal species

- Conduct inventories for exotic plant species following habitat disturbances
- Remove known invasive, exotic species utilizing appropriate measures
- Practices to control exotic and invasive species will be designed and conducted in such a manner as to minimize the impacts upon native plant and animal species.

Measurable Parameters (may be extended beyond those listed here):

- List of invasive species by location and treatment required
- Estimate of existing invasive plant species (by percentage)
- Estimate of area treated per year per area
- List / amount of chemical or other treatments applied
- Number of hogs trapped / removed per year

## **F. Imperiled Species Habitat Maintenance, Enhancement, Restoration or Population Restoration**

**Goal: Maintain, improve, or restore listed and imperiled species populations and habitats.**

Doris Leeper Spruce Creek Preserve supports numerous listed wildlife and plant species. Where a particular species occurrence has an implication to resource management, it is discussed below. Those that occur due to existence of high quality habitat, or that are benefited by existing proposed management goals and objectives, are not discussed specifically in this section.

Proper management of the project site for listed wildlife and plant species is based on locations of known populations (extant or otherwise) on the property. Therefore, inventory to determine presence / absence of species with specific management objectives is necessary. Surveys will be focused in areas that have the highest likelihood of occurrence for listed species, based on habitat requirements of the species, and should follow events creating disturbances within the communities, including controlled (roller chopping, prescribed fires) and uncontrolled (wildfires, tornadoes) events.

The density of gopher tortoises (*Gopherus polyphemus*) within the Preserve appears to be low. It appears that this species is lower than carrying capacities set by the Florida Fish and Wildlife Conservation Commission (FWC) in determining whether a site would be a suitable recipient site for tortoises relocated from to-be-developed lands. The County does not currently offer mitigation for this species or other natural resources to outside private interests. However, the use of DLSCP as a tortoise-recipient site can be a source of revenue, and can be utilized by other County development projects that may occur within occupied tortoise habitat. Therefore, tortoise relocation to DLSCP is identified as suitable management tool, but is not a mandated objective by this Plan. As noted elsewhere, vegetation reduction, preferably through prescribed fire is essential to increase suitability of gopher tortoise habitats and therefore increase density and total population, which meets the goal stated above. Those habitats that are too overgrown to successfully carry a safe fire will be thinned mechanically. Any activity promoting thinning of woody vegetation and thereby an increase in open space and herbaceous vegetation in the upland habitats will be critical to the stated goal for this species.

Cox *et. al.* stated that fire used as a management tool on gopher tortoise habitat is more beneficial than other techniques because it reduces the amount of ground litter, quickly reduces nutrients bound

in plant materials, and does not disturb soil conditions and wildlife to the same extent as other management techniques. Furthermore, there is strong evidence to suggest that burning, particularly during the growing season, has several other beneficial effects on gopher tortoise populations. Prescribed burning during this period reduces the growth of deciduous shrubs and trees, thereby reducing canopy cover and stimulating herbaceous ground cover. Fire during this period also removes dead litter and tall standing plant stems at a time when hatchling tortoises are first ready to disperse from their nests and establish their first burrows. Summer burns expose mineral soil which may be necessary for burrow excavation by hatchlings. Since this species is adapted to upland plant communities in which fire is a natural and recurring feature, it is reasonable to assume applying a “natural” fire regime with respect to frequency and season will result in a habitat matrix suited to the needs of this species.

The presence of highly visible, listed snake species, the eastern indigo snake (*Drymarchon corais couperi*) and the eastern diamondback rattlesnake (*Crotalus adamanteus*), has implications to user group management as much as natural resource management. The natural resource management goals and objectives listed elsewhere in this section will meet the goal established for imperiled species within this subsection. However, user groups should be made aware of these species presence for their own safety as well as for that of the species. Identification of the species and notification that they are protected by law, and an important part of the ecosystem should be a major point of education as it relates to these species. This education can be accomplished through kiosks, brochures, and/ or internet resources made available to user groups. Warnings against the taking of these or any wildlife species should be included in such educational materials.

The Atlantic salt marsh snake (*Nerodia clarkii taeniata*) is restricted to coastal Volusia County in its range and is further restricted by habitat to estuarine habitats. Protection of salt marshes, mangrove swamps, and tidal creeks within the Preserve from drainage, ditching, impoundment, and pollution are the most valuable forms of conservation for this species. In addition, the County is working with other government agencies to remove existing mosquito ditching and conduct wetland restoration and enhancement projects where feasible. This activity and the maintenance of the saltmarsh habitat, especially through the continued control of exotic invasive species like Brazilian pepper (*Schinus terebinthifolius*) meet the goals and objectives for this imperiled species.

The implications of the listed bird species is in the management of saltmarshes, adjacent shorelines and wetland habitats. Efforts to continually eradicate, or minimize the presence of exotic invasive species in these habitats, namely Brazilian pepper, is an important management tool for the continued health of the habitat utilized by these species. In addition, fire prevention in high organic wetland hammocks is another important goal. One method to avoid fire encroachment is by fuel consumption / reduction in adjacent fire-dependent habitats.

The bald eagle (*Haliaeetus leucocephalus*) has been removed from the FWC and FWS protected species lists, but is still listed by FNAI. Two active bald eagle nests are located within the Preserve. The nest located on the Turnbull tract is within a flatwoods community and has implication when proposing burning in this area. The nest on the Bolt tract is within maritime hammock where fire is not a proposed management tool. Since the FWC regularly monitors eagle nests, the County will not specifically develop a monitoring plan. The County will monitor the activity / presence of these nests during the course of regular site visits as well as prior to and during land management activities that

will occur in the vicinity of the nests that may have an adverse impact on the nest tree or use of the nest.

The southeastern American kestrel (*Falco sparverius paulus*) utilizes nest sites that include tall dead trees or utility poles generally with an unobstructed view of surroundings. Although the species has not been observed, snags should be left standing where feasible.

The Florida scrub-jay (*Aphelocoma coerulescens coerulescens*) is a species with great implication in regards to management of scrub communities within the Preserve. The scrub habitat on the Preserve is overgrown and the community is in need of restoration, especially in terms of structure as it relates to this species. The Florida scrub-jay inhabits low-growing, oak scrub habitat found on well-drained sandy soils. They may persist in areas with sparse oaks or scrub areas that are overgrown, but at much lower densities and with reduced survivorship. It should be noted that jays utilize not just scrub, but also habitats adjacent to scrub. Thus, the mesic flatwoods, scrubby flatwoods, and scrub found within the Preserve provides the potential for valuable acreage which could be utilized by local scrub-jay families and offspring. Canopy and mid-story biomass reduction within the above habitats is essential to re-establish these areas as optimum Florida scrub-jay habitats.

Continued existence of the Florida scrub-jay species will depend on preservation and long-term management of suitable scrub habitat. While scrub is a fire-maintained community, it is not easily ignited, nor is it an easily controlled fire. Scrub is thought to have burned less frequently than communities with a more easily ignited grassy groundcover, such as sandhill or mesic flatwoods. Scrub oak dominated scrub, as found within the Preserve, likely burned naturally at intervals between 5 and 20 years based on the habitat requirements of the Florida scrub-jay. Oak height is a critical limiting factor for Florida scrub-jays which have been documented to abandon territories where the oaks reached >3 meters. However, a minimum three to five year return interval appears critical based on the time required for re-sprouting oak stems to reach acorn-bearing height in the eastern Atlantic scrub. Acorn production provides an important food source for jays.

Growth rates of scrub oaks are related to burn history and environmental conditions onsite. Long unburned oak scrub, as found on the Preserve, may attain heights unsuitable for scrub-jays up to 50 percent faster after fire than regularly burned oak scrub and thus may at first require shorter burn intervals to maintain optimum heights following restoration of burning. In addition, small openings, needed by Florida scrub-jays for caching acorns, may need to be artificially restored in long unburned scrub by piling up fuel to create hotspots that kill the roots of the oaks. Currently, breaks in the scrub, created by the powerline adjacent to the east boundary of Martina's Dairy tract, and trails provide suitable open space. Similar activities may continue to serve as fire surrogate methods to create open space. Variability in season and frequency of prescribed fires to produce a mosaic of burned and unburned patches would be the most desirable for maintaining high biotic diversity within the scrub and scrubby flatwoods.

The above considerations, and the resulting objectives below, mirror FWC's "Scrub Management Guidelines for Peninsular Florida: Using the Scrub-Jay as an Umbrella Species" (2009). These guidelines should be evaluated as a method of restoration and management of the DLSCP scrub.

The restoration activities discussed that promote Desired Future Conditions and those activities discussed thus far within this subsection are activities that promote the maintenance, enhancement and restoration of the listed and imperiled plant species populations and habitats. As discussed in Section III, user group management and education to prevent harassment (wildlife), or collecting (plants) or to assist in appropriate inventory and management activities also promote these goals.

Objectives:

- Inventory for listed species that may utilize DLSCP, but have not been confirmed
- Partner with learning institutions / agencies / conservation groups to accomplish inventories for imperiled / listed species
- Conduct inventories for protected plant species following habitat disturbances
- Implement habitat restoration (incl. fire / forestry techniques as appropriate)
- Educate visitors and public of presence and importance of listed species
- Protect bald eagle nest trees and area; from harassment, prescribed fire, etc.
- In cooperation with FWC, Volusia County will consider developing a Wildlife Management Strategy in concert with preparation of the Habitat Restoration Plan.

Measurable Parameters (may be extended beyond those listed here):

- List of known imperiled species by habitat / location
- Estimate of listed species populations (may include simple presence/absence estimates per habitat per location)
- Identification of gopher tortoise densities (below, at or above K (carrying capacity); per habitat per tract)
- Habitat restoration, enhancement and maintenance parameters (see above)
- Estimate of herbaceous vegetation in upland habitats
- Number, type and location of educational information

## **G. Imperiled Natural Communities**

**Goal: Protect, maintain and restore, where necessary imperiled natural communities**

Three (3) natural communities, maritime hammock, scrub, and scrubby flatwoods, on the Preserve are listed by FNAI as Imperiled Natural Communities. The Preserve includes 162.8 acres of maritime hammock, 280.0 acres of scrub, and 254.1 acres of scrubby flatwoods. Management activities include protection from illegal access related to dumping and off-road vehicle (ORV) use and prevention and maintenance of invasion by invasive exotic species. The scrub and scrubby flatwoods require restorative land management activities to reach DFCs.

Objectives:

- Identify and remove debris piles located within maritime hammock
- Develop and Implement Restoration Plan where applicable

Measurable Parameters (may be extended beyond those listed here):

- Acreage of imperiled habitats

- Identify existing and DFC parameters for each
- Habitat restoration parameters for scrub and scrubby flatwoods
- Amount of debris removed / remaining and location in maritime hammock

## **H. Cultural and Historical Resources**

### **Goal: Identify, protect, preserve, and maintain the cultural resources of DLSCP**

There are no historic buildings located within the boundaries of the Preserve. Cultural resource management activities focus on archaeological resources in accordance with *Best Management Practices: An Owners Guide to Protecting Archaeological Sites and Management Procedures for Archaeological and Historical Sites and Properties on State-owned or Controlled Lands (revised August, 1995)*. On-going management activities include 1) site documentation, 2) preservation and interpretation, 3) biennial monitoring, and 4) continuing study and interpretation of these sites through partnerships with the Florida Public Archaeology Network, SE Volusia Historical Society, and others.

#### *Site Documentation*

There are 15 archaeological sites within the boundaries of the Preserve that are recorded in the Florida Master Site Files, including two National Register sites—Spruce Creek Mound (8VO99) and Sleepy Hollow (8VO7142), listed in 2008. The documentation of these sites has been accomplished through field investigation systematically addressing areas of most probable resources. In partnership with other local governments and grant assistance through the State of Florida, Division of Historical Resources, surveys and reports were completed in 1986, 1989, 1990, 1996, 1997, 1999, 2006, and 2008. New sites shall be similarly documented. National Register nominations will be prepared for sites meeting those criteria. Any naturally occurring fire in the preserve is an opportunity for investigation and documentation. When appropriate, we may take advantage of opportunity for additional investigation using ground-penetrating radar equipment and expertise through the Florida Public Archaeology Network.

As a participant in the Certified Local Government Program in partnership with the National Park Service, Volusia County employs a Historic Preservation Officer who is a member of the Preserve management team and responsible for maintaining cultural resource information including Florida Master Site File Forms, survey reports, site visit reports, monitoring notes, maps depicting locations of recorded sites, and correspondence from the Division of Historical Resources. Artifacts collected on site, either by our staff or cultural resource management firms are properly documented.

#### *Preservation and Interpretation*

For management purposes, the entire Preserve is considered to be archaeologically sensitive and investigation is undertaken prior to any site disturbance or recreational uses with potential for ground disturbance, including vehicular, equestrian or pedestrian traffic. Staff members have received Archaeological Resources Management Training (ARM) sponsored by the Bureau of Archaeological Research (BAR) and Volusia County has continuing services agreements with Cultural Resource Management Firms for situations requiring services of a registered public archaeologist.

State law allows for the location of these sites to be undisclosed to the public, in order to protect the sites in the more remote areas of the Preserve from looting and vandalism. We have permitted the surrounding vegetation to camouflage these sites to make it more difficult for potential vandals to locate these sites, and also to reduce erosion. Law enforcement officers are encouraged to participate

in Training for Archaeological Resource Protection (TARP). Kiosks at trail heads post notices informing visitors that archaeological sites should not be disturbed and that artifacts should not be collected.

Particular protections efforts have been focused on the Spruce Creek Mound Complex (8VO99). Prior to Volusia County management, this resource was severely impacted. Early 19<sup>th</sup> century professional and amateur archaeologists excavated here, preceded and followed by pot hunters through the years. In modern times, prior to public ownership/management, it was used “unofficially” as a bike “ramp.” Under our management this site has been successfully secured with fencing and alternative trail routes that do not impact cultural resources have been provided. There has been no discernable impact to this site since the fencing was installed and the site is regularly monitored. A plan is in place to stabilize the site by introducing sterile fill on top of a barrier cloth. This plan has been discussed in the field with Bureau of Archaeological Research (BAR) staff who concur with this strategy.

An interpretive kiosk is planned for this site, as well as limited interpretative programming through partnership with Florida Public Archaeology Network. Providing appropriate public access to the mound via a stairway and platform with exhibit panels is under consideration. If logistical, permitting and funding issues can be addressed, this would serve both as a protective measure and an interpretive feature. By increasing visitation and building greater awareness for the value of the site we hope to engage the public to help us monitor and protect the sites.

Presently, interpretation for the Smyrna Settlement British Colonial history and archaeology is provided in partnership with the Southeast Historical Society’s museum exhibits and archaeology lab in New Smyrna Beach. Public attention is not directed toward these sites in order to protect them from looting. This is particularly important as most of these fragile features were discovered upon noting surface deposits.

#### *Monitoring*

Site conditions are regularly reviewed, checking for any damage caused by natural erosion, impacts from fallen trees, animal damage, impacts from vehicles, horses, bikes or pedestrians, and looting activity. The two most significant sites (Sleepy Hollow and Spruce Creek Mound) and sites more easily accessible to the public are more frequently monitored. Appropriate actions shall be taken to correct/reduce impacts noted during regular monitoring. Monitoring notes are reviewed to determine any patterns of impact that may be prevented or mitigated. In 2010, with assistance from Dot Moore of Southeast Volusia Historical Society, the County conducted monitoring of these known sites.

#### Objectives:

- The County Historic Preservation officer shall continue maintenance of cultural resource information
- Develop monitoring program for known resources
- Continue to monitor, and protect and preserve resources
- Submit new finds to SHPO for inclusion on the Florida Master Site File
- Implement protection measures to protect Spruce Creek Mound from further erosion
- Monitor user group trails for exposure of new resources and adverse impacts to cultural resources; reroute or close trails accordingly.

- Work with land management and park staff in protection and monitoring of known resources
- Apply best management practices for preservation
- Erect regulatory signage regarding laws protecting the resources from damage, harvest, etc.
- Continue study and interpretation of these sites through partnerships with the Florida Public Archaeology Network, SE Volusia Historical Society, and others.

Measurable Parameters (may be extended beyond those listed here):

- Number and location of known, new and recorded sites
- Status of each site per monitoring event
- Status (% complete) of Spruce Creek Mound protection measures
- Number / linear measure of trails closed or re-routed
- Acreage of habitat surveyed following habitat restoration treatments
- Number and location of regulatory and education signage
- Dates / data of studies or other cooperative efforts with public groups

## **I. Facilities and Infrastructure**

**Goal: Develop and Maintain/Improve the capital facilities and infrastructure necessary to meet the goals and objectives of this management plan.**

The facilities and infrastructure on DLSCP are numerous and are supported by additional facilities and infrastructure on adjacent County-managed lands within the Optimal Boundary of DLSCP. For the purpose of DLSCP facility and infrastructure management, the County considers the entire managed area, regardless of ownership, as one complete unit. Overall, the facilities and infrastructure currently available and in operation are sufficient to meet the stated goal. The utilization of two Departments within the County improves the effectiveness of meeting this goal. The Volusia County Parks, Recreation and Culture Division is particularly qualified in managing facilities and infrastructure, which allows the Environmental Management Division staff to focus on natural and conservation resources management. Where the objectives overlap, coordination between the Departments will be necessary to determine how to most effectively meet said objective.

Objectives:

- Continue to monitor, maintain and relocate as necessary a system of multi-use trails
- Continue to use existing facilities on adjacent County managed lands for support of DLSCP state-owned lands
- Construct, maintain and update signage, public parking areas, and kiosks
- Maintain gates at appropriate locations to regulate traffic and visitation
- Monitor existing facilities for illegal activities and vandalism
- Consider the development of additional facilities/infrastructure for security purposes
- Acquire additional land within the Optimal Boundary as funding allows

Measurable Parameters (may be extended beyond those listed here):

- Linear measure and location of trails, including breakdown by:
  - Total
  - Final approved
  - Closed / rerouted

- Allowed use
- Number, location of signage, kiosks, etc.
- Inventory of existing and proposed infrastructure (identify new infrastructure by date completed; identify infrastructure occurring on adjacent, non-state owned managed lands)
- Number, location and estimate of spaces provided for public parking
- Record of maintenance on infrastructure, include cost where appropriate
- Reports from caretaker on incidents requiring involvement
- Acreage of acquired tracts, include cost

## **J. Public Access, Recreational and Educational Opportunities**

### **Goal: Provide public access, recreational and educational opportunities.**

Much of the infrastructure and facilities discussed above are provided to support the goal established in this subsection. The management of user groups to prevent misuse of the site's resources is an important objective in allowing continued use of the Preserve.

The County, as lead management agency, is able to supplement the goals and objectives identified here through multiple ongoing recreational and educational programs enacted County-wide. The County has an assigned staff member in charge of educational and recreational activities. The program covers all objectives identified below. Kiosks and signage have been established at key locations to aid in proper access and use by different recreational user groups. The County has partnered with the Volusia County School system to provide space for an onsite environmental resource teacher, located on the Spruce Creek campground site, which is encompassed by the Rose Bay tract. This resource teacher provides environmental educational opportunities on the Preserve and leads the Legacy Program which monitors the water quality conditions of Rose Bay and other waters adjacent to the Preserve.

The Legacy Program is described on Volusia County's environmental website (<http://volusia.org/environmental/rosebay/legacy.htm>):

Mainland High School students under the sure guidance of teacher, Ms. Louise Chapman, have adopted 33 acres of land in between Rose Bay and Spruce Creek in Volusia County as part of the St. Johns River Water Management District's Legacy Program, which brings over 500 students, teachers and advisors together in order to create an outdoor environmental education center, laboratory, and park.

Ms. Chapman coordinates the Rose Bay Legacy project with support services from Volusia County Environmental Management. The Legacy Program coordinator for the SJRWMD is Mr. Dan Hayes, who also provides support from the District. Other Volusia County Government divisions lend technical advice, as well as the Boy Scouts of America, the Native American Community Assoc., Halifax River Audubon Society and many, teachers and administrators from Mainland High School.

The Preserve provides recreational activities including mountain biking, equestrian access, hiking, birding, boardwalks, canoeing, fishing, pavilions and picnic areas, overlook towers, and restrooms. Additional resources, including canoe and kayak launches and/or landings, fishing piers, and overlook platforms may be provided as funding becomes available and are not currently critical objectives to meet the goals established here.

Specifics regarding access by tract and hours, and facilities and uses provided by tract are provided in the Recreation Plan.

Objectives:

- Implement a Recreation and Land Use Concept Plan to include but not limited to:
  - Managing user groups / user impacts
  - Existing abuse
  - Enforcement (incl. methods)
  - Carrying Capacity
  - Approved trail system / uses / locations
  - Primitive camping
  - Canoe launch / landing
  - Educational signage
  - Regulatory signage
  - Use mix / conflicts
  - Resource (cultural and natural) impact
  - Coordination with partners / local jurisdictions
  
- Cooperate with other agencies, cities, stakeholders, to provide educational and recreational opportunities
- Educate the public on the presence of protected resources and the importance of preservation
- Monitor and maintain a system of multi-use trails
- Exclude off-road vehicle (ORV) use
- Provide and enhance interpretive/education programs (i.e., website, kiosk, guides website)
- Continue to support the Legacy Program
- Provide additional recreational and educational facilities as funding allows

Measurable Parameters (may be extended beyond those listed here):

- Linear measure and location of trails, including breakdown by:
  - Total
  - Final approved
  - Closed / rerouted
  - Allowed use
- Number, location of signage, kiosks, parking, access, etc.
- Number, location, type of security measures (gate, security personnel, signage...)
- Record / reports of abuse, vandalism, user group conflicts, user group impacts (incl. dates, description of event, estimated cost, actual cost in repairs or solutions)
- Dates / data of studies or other cooperative efforts with public groups
- Efforts provided to support Legacy Program (money provided, facilities provided, incl. size, etc.)

## **K. Conservation Acquisition and Stewardship Partnerships**

**Goal: Enhance resources and management through development of an optimal boundary that identifies potential important habitats, landscape-scale linkages, wildlife corridors, operational/resource management and access needs by continuing to identify and pursue acquisition needs and conservation stewardship partnerships.**

**Goal: Develop stewardship partners to achieve management objectives**

Beginning with the initial land acquisition program from the mid-1980’s, the County, in conjunction with its partners, has been successful in identifying and acquiring additional lands to protect critical habitats and to increase the availability of resources. These partnerships have included municipalities, state agencies, and the St. Johns River Water Management District (SJRWMD).

The County’s current program, *Volusia Forever*, provides for the acquisition and management of environmentally sensitive and outdoor recreation lands. The program, created in 2000, is funded through annual ad valorem assessment for a period of twenty years. A portion of this annual revenue is set aside for the management of conservation lands located across the county.

Where feasible, volunteer organizations are utilized to conduct and/or assist the County in the above stated objectives. Objectives that are being accomplished include volunteer efforts by the local Pawpaw Chapter of the Florida Native Plant Society to inventory the plant species occurring on DLSCP.

Objectives:

- Acquire additional land within the Optimal Boundary as funding allows
- Develop and maintain a GIS shapefile and other necessary data to facilitate nominations for additions or deletions to the optimal boundary and to assist the County’s and State’s programs
- Maintain a list of properties which could be used for possible addition to the optimal boundary or potential acquisition, depending upon the willingness of the affected landowner(s) and available funding
- Identify potential non-governmental organization partnerships and grant program opportunities
- Develop partnerships with other agencies, municipalities, institutions and conservation organizations to achieve stated goals and objectives

Measurable Parameters (may be extended beyond those listed here):

- Acreage of acquired tracts, include cost
- Acreage of tracts remaining for acquisition
- Acreage and identification of tracts to be added / removed from optimal boundary
- List of potential partnerships and funding sources, including amount of funding available
- List of partnerships and activities completed to meet stated goals

**Table Summarizing Goals and Objectives for DLSCP**

Goals / Objectives		Term (Long v. Short)	Priority	Status
No.	Description			
<b>A</b>	<b>Habitat Restoration and Improvement</b>			
	<b>Restore / improve native habitats trending away from optimal conditions</b>			
	Develop a Habitat Restoration Plan	<b>Short</b>	<b>High</b>	<b>Ongoing</b>
	Implement Restoration Plan where applicable	<b>Short</b>	<b>High</b>	
	Implement Fire Management Plan	<b>Short</b>	<b>High</b>	

Goals / Objectives		Term (Long v. Short)	Priority	Status
No.	Description			
	Implement Timber Assessment / Timber Plan	Long	Low	
<b>B</b>	<b>Fire Management</b>			
	<b>Return fire to appropriate habitats in DLSCP</b>			
	Implement Fire Management Plan	Short	High	
<b>C</b>	<b>Hydrological Preservation and Restoration</b>			
	<b>Protect water quality and quantity, restore hydrology to the extent feasible, and maintain the restored condition</b>			
	Prioritize hydrologic restoration needs in relation to other restoration goals and threat to health of the overall natural community and/or imperiled species			Complete
	Implement hydrological restoration projects where feasible / necessary	Long	Low	Ongoing
	Inventory / monitor trails and infrastructure and manage trails to avoid erosion problems	Short	High	Ongoing
	Consider boardwalks or similar for wetland / water crossings or access (canoe/ kayak launch, etc.)	Short	High	Complete
<b>D</b>	<b>Sustainable Forest Management</b>			
	<b>Manage timber resources for resource conservation and habitat restoration, enhancement, and maintenance through a stewardship ethic that embraces sustainable forest management practices</b>			
	Implement Timber Assessment / Timber Plan	Short	High	
<b>E</b>	<b>Exotic and Invasive Species Maintenance and Control</b>			
	<b>Remove exotic and invasive plants and animals to the maximum extent practicable and conduct ongoing maintenance as needed</b>			
	Continue to inventory and control invasive exotic plant and animal species	Short	High	Ongoing
	Conduct inventories for exotic plant species following habitat disturbances	Short	High	Ongoing
	Remove known invasive, exotic species utilizing appropriate measures	Short	High	Ongoing
<b>F</b>	<b>Imperiled Species Habitat Maintenance, Enhancement, Restoration or Population Restoration</b>			
	<b>Maintain, improve, or restore listed and imperiled species populations and habitats</b>			

<b>Goals / Objectives</b>		<b>Term (Long v. Short)</b>	<b>Priority</b>	<b>Status</b>
<b>No.</b>	<b>Description</b>			
	Inventory for listed species that may utilize DLSCP, but have not been confirmed	<b>Long</b>	<b>Moderate</b>	<b>Ongoing</b>
	Partner with learning institutions / agencies / conservation groups to accomplish inventories for imperiled / listed species	<b>Long</b>	<b>Moderate</b>	<b>Ongoing</b>
	Conduct inventories for protected plant species following habitat disturbances	<b>Short</b>	<b>High</b>	<b>Ongoing</b>
	Implement habitat restoration (incl. fire / forestry techniques as appropriate)	<b>Short</b>	<b>High</b>	
	Educate visitors and public of presence and importance of listed species	<b>Long</b>	<b>Moderate</b>	<b>Ongoing</b>
	Protect bald eagle nest trees and area; from harassment, prescribed fire, etc.	<b>Short</b>	<b>High</b>	<b>Ongoing</b>
<b>G</b>	<b>Imperiled Natural Communities</b>			
	<b>Protect, maintain and restore, where necessary imperiled natural communities</b>			
	Identify and remove debris piles located within maritime hammock	<b>Short</b>	<b>Low</b>	
	Develop and Implement Restoration Plan where applicable	<b>Short</b>	<b>High</b>	
<b>H</b>	<b>Cultural and Historical Resources</b>			
	<b>Identify, protect, preserve, and maintain the cultural resources of DLSCP</b>			
	The County Historic Preservation officer shall continue maintenance of cultural resource information	<b>Short</b>	<b>High</b>	<b>Ongoing</b>
	Develop monitoring program for known resources			<b>Complete</b>
	Continue to monitor, and protect and preserve resources	<b>Short</b>	<b>High</b>	<b>Ongoing</b>
	Submit new finds to SHPO for inclusion on the Florida Master Site File	<b>Short</b>	<b>High</b>	<b>Ongoing</b>
	Implement protection measures to protect Spruce Creek Mound from further erosion	<b>Long</b>	<b>High</b>	
	Monitor user group trails for exposure of new resources and adverse impacts to cultural resources; reroute or close trails accordingly	<b>Short</b>	<b>High</b>	<b>Ongoing</b>
	Apply best management practices for preservation	<b>Short</b>	<b>High</b>	<b>Ongoing</b>
	Erect regulatory signage regarding laws protecting the resources from damage, harvest, etc.	<b>Short</b>	<b>Moderate</b>	

<b>Goals / Objectives</b>		<b>Term (Long v. Short)</b>	<b>Priority</b>	<b>Status</b>
<b>No.</b>	<b>Description</b>			
	Continue study and interpretation of these sites through partnerships with the Florida Public Archaeology Network, SE Volusia Historical Society, and others	<b>Short</b>	<b>Low</b>	<b>Ongoing</b>
<b>I</b>	<b>Facilities and Infrastructure</b>			
	<b>Develop and Maintain/Improve the capital facilities and infrastructure necessary to meet the goals and objectives of this management plan</b>			
	Continue to monitor, maintain and relocate as necessary a system of multi-use trails	<b>Short</b>	<b>High</b>	<b>Ongoing</b>
	Continue to use existing facilities on adjacent County managed lands for support of DLSCP state-owned lands			<b>Complete</b>
	Construct, maintain and update signage, public parking areas, and kiosks	<b>Long</b>	<b>Moderate</b>	<b>Ongoing</b>
	Maintain gates at appropriate locations to regulate traffic and visitation	<b>Long</b>	<b>Moderate</b>	<b>Ongoing</b>
	Monitor existing facilities for illegal activities and vandalism			<b>Complete</b>
	Consider the development of additional facilities/infrastructure for security purposes	<b>Long</b>	<b>Low</b>	<b>Ongoing</b>
	Acquire additional land within the Optimal Boundary as funding allows	<b>Long</b>	<b>Moderate</b>	<b>Ongoing</b>
<b>J</b>	<b>Public Access, Recreational and Educational Opportunities</b>			
	<b>Provide public access, recreational and educational opportunities</b>			
	Implement a Recreation and Land Use Concept Plan	<b>Long</b>	<b>Moderate</b>	<b>Ongoing</b>
	Cooperate with other agencies, cities, stakeholders, to provide educational and recreational opportunities	<b>Long</b>	<b>Moderate</b>	<b>Ongoing</b>
	Educate the public on the presence of protected resources and the importance of preservation	<b>Short</b>	<b>High</b>	<b>Ongoing</b>
	Monitor and maintain a system of multi-use trails	<b>Long</b>	<b>Moderate</b>	<b>Ongoing</b>
	Exclude off-road vehicle (ORV) use			<b>complete</b>
	Provide and enhance interpretive/education programs (i.e., website, kiosk, guides website)	<b>Long</b>	<b>Moderate</b>	<b>Ongoing</b>
	Continue to support the Legacy Program	<b>Short</b>	<b>Moderate</b>	<b>Ongoing</b>
	Provide additional recreational facilities as funding allows	<b>Long</b>	<b>Low</b>	<b>Ongoing</b>
<b>K</b>	<b>Conservation Acquisition and Stewardship Partnerships</b>			

Goals / Objectives		Term (Long v. Short)	Priority	Status
No.	Description			
	<b>Enhance resources and management through development of an optimal boundary that identifies potential important habitats, landscape-scale linkages, wildlife corridors, operational / resource management and access needs by continuing to identify and pursue acquisition needs and conservation stewardship partnerships.</b>			
	<b>Develop stewardship partners to achieve management objectives</b>			
	Acquire additional land within the Optimal Boundary as funding allows	Long	Moderate	Ongoing
	Develop and maintain a GIS shapefile and other necessary data to facilitate nominations for additions or deletions to the optimal boundary and to assist the County's and State's programs			Complete
	Maintain a list of properties which could be used for possible addition to the optimal boundary or potential acquisition, depending upon the willingness of the affected landowner(s) and available funding			Complete
	Identify potential non-governmental organization partnerships and grant program opportunities	Long	Low	Ongoing
	Develop partnerships with other agencies, municipalities, institutions and conservation organizations to achieve stated goals and objectives	Short	High	Ongoing

## V. MANAGEMENT CHALLENGES AND STRATEGIES

### A. Law Enforcement / Historic Resources

#### **Challenge: Potential for impacts to environmental and historic resources due to public use.**

Situated amid an urban/suburban area experiencing significant growth pressures, there presently exists a significant demand for access and use by the public to the Preserve. As the adjacent region continues to grow, it is anticipated that the demand by the public for access to the Preserve will dramatically increase. Addressing this demand in a responsible manner that ensures proper stewardship of the Preserves' environmental and archaeological resources will be a continuing challenge. The protection and preservation of the sensitive environmental and cultural resources (archaeological sites) of the Preserve will remain the fundamental goal guiding management of the Preserve. The Preserve is regularly monitored to identify adverse impacts associated with public use, and where necessary, formulate and implement mitigating or corrective measures. For example, particular effort has been focused on the Spruce Creek Mound Complex (8VO099) which is listed on the National Register of Historic Places. Under Volusia County management this site has been

successfully secured with fencing and alternative trail routes that do not impact cultural resources have been provided. For management purposes, the entire preserve is considered to be archaeologically sensitive and investigation is undertaken prior to any site disturbance or recreational uses with potential for ground disturbance, including frequent pedestrian traffic. The general policy is not to provide the location of these sites to the public. This is a legitimate and effective tool to protect the sites in the more remote areas of the preserve from looting. The County has also permitted the surrounding vegetation to camouflage these sites, making it more difficult for potential looters to locate the sites. It is our intent to continue to provide the public with appropriate opportunities to use and enjoy the Preserve. However, these activities are to be offered in a way that is compatible with and furthers the over-arching strategy of providing proper protection of the Preserves' significant and sensitive environmental and archaeological resources.

### **Strategy:**

- 1) Establish / maintain the presence of a caretaker who resides within or near the Preserve,
- 2) Ensure the caretaker's responsibilities include the entire Preserve
- 3) Continue to maintain gates at locations with limited access
- 4) Implement barriers to use of culturally sensitive resources

### **B. Habitat Management**

**Challenge:** Many years of fire suppression has altered the strata of the fire dependant communities and reduced the potential suitability of the site for upland listed wildlife species.

Management issues related to the sandhill, scrub, scrubby flatwoods and shell mound communities create a challenge. The mosaic of natural communities within the Preserve is comprised of a wide variety of habitats, including several that are rare. These communities are of varying quality and stages of maturity/succession. Several of the communities also present challenging management opportunities, especially given the location of the Preserve. For example, several communities are dependent upon a comparably frequent fire interval. The use of prescribed fire within the Preserve is fraught with practical difficulties.

Given concerns for ecological values and mitigation of hazard to adjacent developments, a prescribed fire plan will be implemented subsequent to final approval. Due to smoke sensitive areas, such as Interstate 95, US Hwy 1, New Smyrna Beach Airport and surrounding residential communities, the plan will address challenges such as the substantial difficulty in sustaining a sufficient fire frequency to maintain healthy ecosystems and the protection of archaeological resources, and possible solutions such as mechanical alternatives to prescribed fire. The Preserve is situated amid an urban/suburban area that is experiencing significant growth pressures. While pockets of residential use have existed for years adjacent to the Preserve, residential development at the periphery of the Preserve has significantly increased in recent years in response to the heightened demand associated with the regions population growth. Aside from adjacent residential land use, the Preserve is also bounded or traversed by the regional thoroughfares of Interstate 95 and U.S. 1. The Preserve is also traversed by a primary railroad line. Also, the New Smyrna Beach airport is located a short distance from the Preserve. In addition to being adjacent to the aforementioned "smoke-sensitive areas", the wind

pattern of this region also complicates the use of prescribed fire. The prevailing wind pattern in this portion of the county is an easterly/westerly direction. However, the narrow smoke corridor that may be acceptable for prescribed burning is oriented in a north to south direction. Regardless of these concerns, it is noted that the County, like public agency land managers across the state, has experienced conditions that have significantly hindered efforts to undertake a consistent program of prescribed burning.

**Strategy:**

- 1) Implement the Prescribed Fire Plan
- 2) Conduct mechanical and other fire surrogate activities where necessary
- 3) Utilize “small” (e.g., 25 ac) burn units in scrub and scrubby flatwoods

**C. Prescribed Fire**

**Challenge: The use of prescribed fire as a management tool at the Preserve is hindered by several outside variables.**

Several constraints exist that influence how and when prescribed fire can be implemented at the Preserve. These constraints include residential housing to the north and northeast, I-95 to the west, US Highway 1 to the east, residential development, the golf course and New Smyrna Beach Airport to the south. These surrounding land uses have implications for smoke management in association with prescribed burning. Smoke management must be considered for the major highway areas to maintain safe driving conditions for these thoroughfares. Similar concerns exist for the New Smyrna Beach Airport, where visibility for incoming and outgoing air traffic must be maintained. In addition to smoke management constraints, the railroad right-of-way imposes an access constraint for workers and equipment to conduct prescribed fires in certain areas. Attention to weather conditions, proper management techniques, and education of surrounding residents can reduce some of these conflicts.

Another constraint is that in overgrown scrub conditions as found at the Preserve, extreme conditions must exist for the scrub to burn, such as high temperatures, high winds, low humidity's, and low fuel moistures. These conditions result in fires which are hot, intense, move quickly through the crown and can be hard to contain in small units.

Resistance to the use of prescribed fire as a management tool has been encountered within residential and commercial developments adjacent to managed lands. This is largely a result of smoke management issues and perceived damages to the environmental setting.

**Strategy:**

- 1) In association with the prescribed burn plan, an extensive public education program should be established to educate neighbors and users of the project site. This education program could include elements such as smoke management, the scheduling of prescribed fires, aesthetic value of the burn, the long-term protection of adjacent properties, and the importance of fire for wildlife and plant habitat.

## **D. Development Encroachment**

**Challenge: Adjoining lands are at risk for future development or other land use changes. Such changes could compromise carrying out the necessary management and thus reduce the quality and integrity of the natural systems at the Preserve.**

One of the attributes of the Preserve, and also one of the challenges presented to management, is its location. The Preserve is situated amid an urban/suburban area that is experiencing significant growth pressures. This population growth has heightened the demand for residential uses. As a result, residential development at the periphery of the Preserve has increased in recent years. Much of this activity has occurred since development of the management plan. This development and growth has, and will continue to, present a range of challenges related to stewardship of the Preserve. These issues include the ability to perform certain resource management activities and increased user demand/expectations. Adding to this complexity is the configuration of the Preserve boundaries (increased edge) and that the lands adjoining the Preserve are within three different jurisdictions – County of Volusia (unincorporated) and the municipalities of Port Orange and New Smyrna Beach. Decisions regarding use(s) of lands adjoining the Preserve reside with the appropriate jurisdiction. The staff is aware of these concerns and strives to appropriately address the issues associated with this dynamic environment. The County, using established procedures, strives to cooperate with adjacent jurisdictions to minimize potential land use conflicts.

For example, the County, its partners, and the City of Port Orange worked to preclude adjacent development impacts by acquiring title to eight separate ownerships comprising approximately 514 acres of in-holdings and additions since the year 2000. The costs associated with these acquisitions collectively total approximately \$14.5 million, including the contributions of our agency partners. The City of Port Orange has also acquired 225 acres, with a cost of approximately \$5.6 million. These acquisitions facilitate comprehensive management of the Preserve and have eliminated the potential for adverse impacts that may have otherwise be associated with development of the affected properties had each remained in private ownership. The management review team specifically commended the County on these efforts. Additional protection has been sought for the valuable resources encompassed by the Preserve from the potential impacts associated with development of adjacent properties by successfully amending the boundaries to encompass additional area. Subsequently, acquisitions of the properties within this expanded area are a priority. A potential partner in this effort has been the Division of State Lands. Concerns associated with adjacent land uses are also monitored on a more routine level. For example, staff has worked with a resident to assure that public demand for access to the shoreline adjacent to his residence is provided in a balanced, responsible, manner.

### **Strategy:**

- 1) Identify-adjoining parcels with meaningful natural resource values and willing sellers which may be considered for possible future acquisition.
- 2) Establish and maintain positive rapport with adjoining landowners and jurisdictions.

3) With concurrence of municipalities with jurisdiction and Volusia County, pursue agreement relating to management and encroachment adjacent to preserve and land use changes

4) Should the County partner with another jurisdiction for the acquisition of land within the Preserve, a mutually acceptable management agreement is to be prepared.

**E. Timber Resources**

**Challenge: Minimal areas within the Preserve provide merchantable timber and access is limited.**

Portions of the Rose Bay property contain slash pine stands with value as timber. The constraint to utilizing this area is that vehicular access to this area is very limited. The Rose Bay property is bound to the east by salt marsh, the north and south by open water, and to the west by railway.

**Strategy:**

1) A timber assessment / timber plan will be completed for those areas which provide potential for timber harvest.

**F. Scrub Management Costs**

**Challenge: Locating funding for the costs associated with the planning of the management of the scrub habitats and the construction costs to complete the land management activities.**

**Strategy:**

1) Implement restoration in limited acreages as funds allow

**VI. PRIORITY SCHEDULING, COST ESTIMATES AND FUNDING SOURCES FOR CONDUCTING MANAGEMENT ACTIVITIES**

**A. Priority Scheduling**

The short and long term goals established in Section IV above, along with their designated priority levels were used to develop a Priority Schedule. The schedule is divided into three chronological sections; 1-2 years, 2-5 years, and 6-10 years. The schedule will be used to develop costs estimates for land management activities.

**Schedule of Events Years 1 -2:**

Section / Objectives		Parameter(s)
<b>A</b>	<b>Habitat Restoration and Improvement</b>	
	Develop a Habitat Restoration Plan	Planning
	Implement Restoration Plan where applicable	Min 25 ac. Scrub / Min. 50 ac total – Per year
	Implement Fire Management Plan (incl. fire or surrogate techniques as appropriate)	Min 25 ac. Scrub / Min. 50 ac total – Per year
<b>B</b>	<b>Fire Management</b>	

Section / Objectives	Parameter(s)
Implement Fire Management Plan (incl. fire or surrogate techniques as appropriate)	Min 25 ac. Scrub / Min. 50 ac total – Per year
<b>C Hydrological Preservation and Restoration</b>	
Inventory / monitor trails and infrastructure and manage trails to avoid erosion problems	Recurring task
Consider boardwalks / water crossings or access	Planning
<b>D Sustainable Forest Management</b>	
Not within timeframe	Not within timeframe
<b>E Exotic and Invasive Species Maintenance and Control</b>	
Continue to inventory and control invasive exotic plant and animal species	Recurring task
Conduct inventories for exotic plant species following habitat disturbances	Recurring task
Remove known invasive, exotic species utilizing appropriate measures	Recurring task
<b>F Imperiled Species Habitat Maintenance, Enhancement, Restoration or Population Restoration</b>	
Conduct inventories for protected plant species following habitat disturbances	Min 25 ac. Scrub / Min. 50 ac total – Per year
Implement habitat restoration (incl. fire / forestry techniques as appropriate)	Min 25 ac. Scrub / Min. 50 ac total – Per year
Protect bald eagle nest trees and area; from harassment, prescribed fire, etc.	Only applies to Bolt and Turnbull Tracts – recurring task
<b>G Imperiled Natural Communities</b>	
Identify and remove debris piles located within maritime hammock	Amount TBD in the field
Develop and Implement Restoration Plan where applicable	Min 25 ac. Scrub – Per year
<b>H Cultural and Historical Resources</b>	
The CHPO shall continue maintenance of cultural resource information	Recurring task
Continue to monitor, and protect and preserve resources	Recurring task
Submit new finds to SHPO for inclusion on the Florida Master Site File	Recurring task
Monitor user group trails; reroute or close trails accordingly	Recurring task
Apply best management practices for preservation	Recurring task
Erect regulatory signage regarding laws protecting the resources from damage, harvest, etc.	Recurring task

Section / Objectives		Parameter(s)
	Continue study and interpretation of these sites through partnerships with the Florida Public Archaeology Network, SE Volusia Historical Society, and others	Recurring task
<b>I</b>	<b>Facilities and Infrastructure</b>	
	Continue to monitor, maintain and relocate as necessary a system of multi-use trails	Recurring task
	Monitor existing facilities for illegal activities and vandalism	Recurring task
<b>J</b>	<b>Public Access, Recreational and Educational Opportunities</b>	
	Educate the public on the presence of protected resources and the importance of preservation	Kiosk and website information
	Exclude off-road vehicle (ORV) use	Recurring task
	Continue to support the Legacy Program	Recurring task
<b>K</b>	<b>Conservation Acquisition and Stewardship Partnerships</b>	
	Develop partnerships with other agencies, municipalities, institutions and conservation organizations to achieve stated goals and objectives	Recurring task

### Schedule of Events Years 3-5:

Goals / Objectives		Parameter(s)
<b>A</b>	<b>Habitat Restoration and Improvement</b>	
	Implement Restoration Plan where applicable	Min 25 ac. Scrub or Scrubby Flatwoods / Min. 25 ac total – Per year
	Implement Fire Management Plan (incl. fire or surrogate techniques as appropriate)	Min. 25 ac total – Per year; Minimum 225 acres by end of year 5
<b>B</b>	<b>Fire Management</b>	
	Implement Fire Management Plan (incl. fire or surrogate techniques as appropriate)	Min. 25 ac total – Per year; Minimum 225 acres by end of year 5
<b>C</b>	<b>Hydrological Preservation and Restoration</b>	
	Inventory / monitor infrastructure and manage trails to avoid erosion problems	Recurring task
<b>D</b>	<b>Sustainable Forest Management</b>	
	Not within timeframe	Not within timeframe
<b>E</b>	<b>Exotic and Invasive Species Maintenance and Control</b>	
	Continue to inventory and control invasive exotic plant and animal species	Recurring task
	Conduct inventories for exotic plant species following habitat disturbances	Recurring task
	Remove known invasive, exotic species utilizing appropriate measures	Recurring task

Goals / Objectives		Parameter(s)
<b>F</b>	<b>Imperiled Species Habitat Maintenance, Enhancement, Restoration or Population Restoration</b>	
	Inventory for listed species that may utilize DLSCP, but have not been confirmed	Utilize FNAI or other partnerships as available
	Partner with institutions / groups to accomplish inventories	Partner with FNAI / FNPS and similar organizations
	Conduct inventories for protected plant species following habitat disturbances	Min 25 ac. Scrub or Scrubby Flatwoods / Min. 25 ac total – Per year
	Implement habitat restoration (incl. fire / forestry techniques as appropriate)	Min 25 ac. Scrub or Scrubby Flatwoods / Min. 25 ac total – Per year
	Educate visitors and public of presence and importance of listed species	Kiosk, website information
	Protect bald eagle nest trees and area; from harassment, prescribed fire, etc.	Only applies to Bolt and Turnbull Tracts – recurring task
<b>G</b>	<b>Imperiled Natural Communities</b>	
	Identify and remove debris piles located within maritime hammock	Monitor for new / remaining debris
	Develop and Implement Restoration Plan where applicable	Min 25 ac. Scrub or Scrubby Flatwoods – Per Year
<b>H</b>	<b>Cultural and Historical Resources</b>	
	The County Historic Preservation officer shall continue maintenance of cultural resource information	Recurring task
	Continue to monitor, and protect and preserve resources	Recurring task
	Submit new finds to SHPO for inclusion on the Florida Master Site File	Recurring task
	Implement protection measures to protect Spruce Creek Mound from further erosion	Have at least 50% of plan completed
	Monitor trails for exposure of, and impacts to resources; reroute or close trails accordingly	Recurring task
	Apply best management practices for preservation	Recurring task
	Erect regulatory signage	Recurring task
	Continue study of sites through partnerships	Recurring task
<b>I</b>	<b>Facilities and Infrastructure</b>	
	Continue to monitor, maintain and relocate as necessary a system of multi-use trails	Recurring task
	Continue to use existing facilities on adjacent County managed lands for support of DLSCP state-owned lands	Recurring task

Goals / Objectives		Parameter(s)
	Construct, maintain and update signage, public parking areas, and kiosks	Provided on an as-needed basis & based on Recreation Plan
	Maintain gates at appropriate locations to regulate traffic and visitation	Provided on an as-needed basis & based on Recreation Plan
	Monitor existing facilities for illegal activities and vandalism	Recurring task
	Acquire additional land within the Optimal Boundary as funding allows	As funding allows
<b>J</b>	<b>Public Access, Recreational and Educational Opportunities</b>	
	Implement a Recreation and Land Use Concept Plan	Identify specific location of proposed features
	Cooperate with other agencies, cities, stakeholders, to provide educational and recreational opportunities	Host public meeting / advisory group
	Monitor and maintain a system of multi-use trails	Recurring task
	Exclude off-road vehicle (ORV) use	Recurring task
	Provide and enhance interpretive/education programs (i.e., website, kiosk, guides website)	Kiosk, website information
	Continue to support the Legacy Program	Recurring task
<b>K</b>	<b>Conservation Acquisition and Stewardship Partnerships</b>	
	Acquire additional land within the Optimal Boundary as funding allows	As funding allows
	Identify potential non-governmental organization partnerships and grant program opportunities	Planning task
	Develop partnerships with other agencies, municipalities, institutions and conservation organizations to achieve stated goals and objectives	Recurring task

### Schedule of Events Years 6-10:

Goals / Objectives		Parameter(s)
<b>A</b>	<b>Habitat Restoration and Improvement</b>	
	Implement Restoration Plan where applicable	TBD at beginning of year 6
	Implement Fire Management Plan (incl. fire or surrogate techniques as appropriate)	Based on previous acreages burned – acreage should be sufficient to maintain fire return intervals – minimum 350 acres total burned by end of year 10
	Implement Timber Assessment / Timber Plan	Re-evaluate BA (basal area) on Turnbull; determine viability of access to Rose Bay; re-evaluate market for Martin's Dairy
<b>B</b>	<b>Fire Management</b>	
	<b>Return fire to appropriate habitats in DLSCP</b>	

Goals / Objectives	Parameter(s)
Implement Fire Management Plan (incl. fire or surrogate techniques as appropriate)	Based on previous acreages burned – acreage should be sufficient to maintain fire return intervals – minimum 350 acres total burned by end of year 10
<b>C Hydrological Preservation and Restoration</b>	
Prioritize hydrologic restoration needs in relation to other restoration goals and threat to health of the overall natural community and/or imperiled species	Update list
Implement hydrological restoration projects where feasible / necessary	Based on work with SJRWMD and other partnerships
Inventory / monitor trails and infrastructure and manage trails to avoid erosion problems	Recurring task
Consider boardwalks or similar for wetland / water crossings or access (canoe/ kayak launch, etc.)	Develop 1 water landing / access point
<b>D Sustainable Forest Management</b>	
Implement Timber Assessment / Timber Plan	Re-evaluate BA on Turnbull; determine viability of access to Rose Bay; re-evaluate market for Martin’s Dairy
<b>E Exotic and Invasive Species Maintenance and Control</b>	
Continue to inventory and control invasive exotic plant and animal species	Recurring task
Conduct inventories for exotic plant species following habitat disturbances	Recurring task
Remove known invasive, exotic species utilizing appropriate measures	Recurring task
<b>F Imperiled Species Habitat Maintenance, Enhancement, Restoration or Population Restoration</b>	
Inventory for listed species that may utilize DLSCP, but have not been confirmed	Recurring task; update list of observed species and locations; determine target survey areas; monitor known sites
Partner with learning institutions / agencies / conservation groups to accomplish inventories for imperiled / listed species	Recurring task; update list of observed species and locations; determine target survey areas; monitor known sites
Conduct inventories for protected plant species following habitat disturbances	Recurring task; update list of observed species and locations; determine target survey areas; monitor known sites
Protect bald eagle nest trees and area; from harassment, prescribed fire, etc.	Only applies to Bolt and Turnbull Tracts – recurring task
<b>G Imperiled Natural Communities</b>	
Develop and Implement Restoration Plan where applicable	Determine remaining acreage requiring restoration, and location
<b>H Cultural and Historical Resources</b>	

Goals / Objectives		Parameter(s)
	The County Historic Preservation officer shall continue maintenance of cultural resource information	Recurring task
	Continue to monitor, and protect and preserve resources	Recurring task
	Submit new finds to SHPO for inclusion on the Florida Master Site File	Recurring task
	Implement protection measures to protect Spruce Creek Mound from further erosion	Complete this project
	Monitor user group trails for exposure of new resources and adverse impacts to cultural resources; reroute or close trails accordingly	Recurring task
	Apply best management practices for preservation	Recurring task
	Maintenance as necessary for regulatory signage regarding laws protecting the resources from damage, harvest, etc.	As needed basis
	Continue study and interpretation of these sites through partnerships with the Florida Public Archaeology Network, SE Volusia Historical Society, and others	Recurring task
<b>I</b>	<b>Facilities and Infrastructure</b>	
	Continue to monitor, maintain and relocate as necessary a system of multi-use trails	Recurring task
	Continue to use existing facilities on adjacent County managed lands for support of DLSCP state-owned lands	Recurring task
	Construct, maintain and update signage, public parking areas, and kiosks	Install remaining kiosks; signage
	Maintain gates at appropriate locations to regulate traffic and visitation	Recurring task
	Monitor existing facilities for illegal activities and vandalism	Recurring task
	Consider the development of additional facilities/infrastructure for security purposes	TBD
	Acquire additional land within the Optimal Boundary as funding allows	As funding allows
<b>J</b>	<b>Public Access, Recreational and Educational Opportunities</b>	
	Implement a Recreation and Land Use Concept Plan	Update inventory; determine priority for development / implementation; develop at least 1 water landing / access

Goals / Objectives		Parameter(s)
	Cooperate with other agencies, cities, stakeholders, to provide educational and recreational opportunities	Conduct 1 public meeting – status update
	Monitor and maintain a system of multi-use trails	Recurring task
	Exclude off-road vehicle (ORV) use	Recurring task
	Provide and enhance interpretive/education programs (i.e., website, kiosk, guides website)	Update as necessary
	Continue to support the Legacy Program	Recurring task
	Provide additional recreational facilities as funding allows	Develop at least 1 water landing, as funding allows
<b>K</b>	<b>Conservation Acquisition and Stewardship Partnerships</b>	
	Acquire additional land within the Optimal Boundary as funding allows	As funding allows
	Develop and maintain a GIS shapefile and other necessary data to facilitate nominations for additions or deletions to the optimal boundary and to assist the County's and State's programs	Assist State with update
	Maintain a list of properties which could be used for possible addition to the optimal boundary or potential acquisition, depending upon the willingness of the affected landowner(s) and available funding	Assist State with update
	Identify potential non-governmental organization partnerships and grant program opportunities	Planning task
	Develop partnerships with other agencies, municipalities, institutions and conservation organizations to achieve stated goals and objectives	Recurring task

## B. Cost Estimates

The cost estimates provided here reflect the costs necessary to achieve the goals stated above, and organized in a manner consistent with the Land Management Uniform Accounting Council, Chapter 259.037(3)(a) as provided below:

259.037 Land Management Uniform Accounting Council.

All land management activities and costs must be assigned to a specific category, and any single activity or cost may not be assigned to more than one category. Administrative costs, such as planning or training, shall be segregated from other management activities. Specific management activities and costs must initially be grouped, at a minimum, within the following categories:

1. Resource management.
2. Administration.

- 3. Support.
- 4. Capital improvements.
- 5. Recreation visitor services.
- 6. Law enforcement activities.

**Short Term Annual Expenditure Estimate (Years 1 - 2):**

<b>1. Resource management</b>	<b>Annual Cost</b>
Habitat restoration	
Prescribed burning	
Exotic species control	
Listed species survey and protection	
Cultural resource management	
Timber Management	
Hydrological Management	
Other	
Subtotal	\$65,000
<b>2. Administration</b>	
General Administration	\$5,120
<b>3. Support</b>	
Resource Management Planning	
Land Management Review	
Training / Staff Development	
Vehicle / Equipment Operation & Maintenance	\$8,250
Other	
Subtotal	
<b>4. Capital improvements</b>	
New construction	
Facility/ infrastructure maintenance	
Subtotal	\$5,150
<b>5. Recreation visitor services</b>	
Signage; operations; programs	
Public meetings	
Subtotal	\$8,100
<b>6. Law enforcement activities</b>	
Resource protection	\$2,000
<b>TOTAL</b>	<b>\$93,620</b>

**Long Term Annual Expenditure Estimate (Years 3 - 10):**

<b>1. Resource management</b>	<b>Annual Cost</b>
Habitat restoration	
Prescribed burning	
Exotic species control	
Listed species survey and protection	

Cultural resource management	
Timber Management	
Hydrological Management	
Other	
Subtotal	\$70,000
<b>2. Administration</b>	
General Administration	\$5,430
<b>3. Support</b>	
Resource Management Planning	
Land Management Review	
Training / Staff Development	
Vehicle / Equipment Operation & Maintenance	
Other	
Subtotal	\$8,850
<b>4. Capital improvements</b>	
New construction	
Facility/ infrastructure maintenance	
Subtotal	\$12,650
<b>5. Recreation visitor services</b>	
Signage; operations; programs	
Public meetings	
Subtotal	\$8,100
<b>6. Law enforcement activities</b>	
Resource protection	\$2,000
<b>TOTAL</b>	<b>\$107,030</b>

### **C. Estimated Revenue Sources**

Revenue resources for accomplishing the above goals come from different sources depending upon the Division. Any revenue received by either Division, represents only a small fraction of the costs associated with management of the property.

Thus the revenue falls short of meeting all stated objectives. The County will follow the priority schedule to achieve high priority items first. Additional sources of revenue, and working with partners will be sought to fill the gaps where funding is not adequate. The partnerships have been listed above. Revenue from timber is discussed in the Timber Assessment / Timber Plan, but is expected to be nominal at best. Mitigation revenue, related to wetland and/or protected species, is not included as the County does not currently accept mitigation on their public lands. This may be re-evaluated in the long term. Additionally, grants will be explored for funding specific tasks.

## VII. ANALYSIS OF POTENTIAL FOR CONTRACTING PRIVATE VENDORS FOR RESTORATION AND MANAGEMENT

The following management and restoration activities have been considered for outsourcing to private entities. It has been determined that items selected as “approved” below are those that Volusia County either does not have in-house expertise to accomplish or which can be done at less cost by an outside provider of services. Those items selected as “rejected” represent those for which Volusia County has in-house expertise and/or which the agency has found it can accomplish at less expense than through contracting with outside sources. “Conditional” items are those that could be done either by an outside provider or by the agency at virtually the same cost or with the same level of competence:

Activity	Approved	Conditional	Rejected
Road/Trail Development and Maintenance		X	
Mosquito Ditch Removal		X	
Prescribed Burning			X
Vegetation Inventories		X	
Timber Harvest Activities	X		
Mechanical Restoration Activities		X	
Public Contact and Educational Facilities Development		X	
Exotic Species Control		X	
Management Plan Development		X	
Imperiled Species Survey / Monitoring		X	
Habitat Restoration Plan Development		X	

## VIII. LAND MANAGEMENT REVIEW

In compliance with Chapter 259.036, F. S. the Department of Environmental Protection (DEP) Division of State Lands (DSL) conducted a review of DLSCP to determine whether conservation, preservation, and recreation lands owned by the state Board of Trustees of the Internal Improvement Trust Fund (Board) are being managed properly. In compliance with directives of the statute the DEP to established a land management review team in 2007 that evaluated the extent to which the existing management plan provided sufficient protection to threatened or endangered species, unique or important natural or physical features, geological or hydrological functions, and archaeological features. The team also evaluated 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. A complete report of the review team findings and the County’s responses to items addressed by the Review Team is provided in Appendix I.

The team provided both commendations and recommendations for the Plan and for implementation of the Plan. The recommendations are summarized below, focusing on those actions or portions of the Plan that were found to be insufficient. The responses below each item provide a brief summary of corrective actions taken by the County.

The County is currently establishing annual monitoring of all known archaeological sites on the property, including photographic documentation and GIS mapping. There are 15 known archaeological sites (all documented in the Florida Master Site Files) located within the state owned lands of the preserve. Those sites with more frequent visitor access are frequently monitored for natural and man-made impacts. The more remote sites are routinely monitored and documented.

The County has prioritized the protection of environmentally sensitive and archaeological sites within the Preserve as the main priority in determining public recreational use of the property. We anticipate that as the adjacent region continues to grow, the demand by the public for access to the Preserve will dramatically increase. The Preserve will continue regular monitoring to identify adverse impacts associated with public use, and where necessary, formulate and implement mitigating or corrective measures including the implementation of a law enforcement post within the Preserve. It is our intent to continue to provide the public with appropriate opportunities to use and enjoy the Preserve. However, these activities are to be offered in a way that is compatible with and furthers the over-arching strategy of providing proper protection of the Preserves' significant and sensitive environmental and archaeological resources.

Although most of the acreage associated with Doris Leeper Spruce Preserve is not appropriate for timber harvesting, a Timber Assessment / Timber Plan for the remaining acreage has been developed and is included in Appendix H of the Management Plan.

In order to improve protection of the Preserve from illegal encroachments and vandalism, Volusia County aims to provide an offsite residence for law enforcement adjacent to the Preserve. The duties of this individual, include patrolling Preserve grounds and to act a deterrent to vandalism. The County has expended approximately \$50,000 to maintain the residence and surrounding grounds as part of this commitment to protecting the resources and users of the Preserve. Please refer to Section V for further details regarding law enforcement presence.

The facilities and infrastructure on the Preserve are numerous and are supported by additional facilities and infrastructure on adjacent County-owned lands within the Optimal Boundary of DLSCP. For the purpose of the Preserve facility and infrastructure management, the County considers the entire managed area, regardless of ownership, as one complete unit. Overall, the facilities and infrastructure currently available and in operation appear sufficient to meet the stated goal. The utilization of two Departments within the County improves the effectiveness of meeting this goal. The Volusia County Parks, Recreation and Culture Division is particularly qualified in managing facilities and infrastructure, which allows Environmental Management Division staff to focus on natural and conservation resources management. Where the objectives overlap, coordination between the Departments will be necessary to determine how to most effectively meet said objective. Please refer to section IV.I.

The County is in the process of developing a scrub jay monitoring and habitat restoration plan for the Preserve. Monitoring over all suitable habitats within the Preserve was conducted in July of 2010. Details regarding the results of this survey can be found in Appendix E. A Timber Assessment / Timber Plan can be found in Appendix H which outlines the restoration plan for habitat improvements.

Revised Habitat Maps with FNAI natural community categories can be found on pages 23-27 of the Management Plan. Detailed descriptions of these natural communities can be found in Section II.B.1.

A Prescribed Fire Plan has been developed and is included in Appendix G of the Management Plan.

Please refer to Section II.D.1 and IV.F for details related to plant and wildlife species management and inventory.

Please refer to Section IV.H for details related to the protection and preservation of cultural resources.

Please refer to Section IV.B and Appendix G for details related to prescribed fire within the Preserve.

Please refer to Section II and IV.A for details relating to the efforts to restore pastures and mosquito ditches within the Preserve. Australian pine has been eradicated from the Preserve.

Please refer to Section II and IV.E for details relating to non-native invasive and problem species

Please refer to Section IV.I. for details relating to resource protection including the gates and fencing, signage and law enforcement presence

With regards to adjacent property concerns, including expanding development, one of the attributes of the Preserve, and also one of the challenges presented to management, is its location. The Preserve is situated amid an urban/suburban area that is experiencing significant growth pressures. This population growth has heightened the demand for residential uses. As a result, residential development at the periphery of the Preserve has increased in recent years. Much of this activity has occurred since development of the management plan. This development and growth has, and will continue to, present a range of challenges related to stewardship of the Preserve. The relationship between management of the Preserve and adjacent land uses (existing and future) will continuously be evaluated and addressed as part of the management plan.

Please refer to Section IV.J for details related to public access and education

A mixture of public access and recreational uses are planned for the Preserve. The Preserve is overseen by the Volusia County Parks, Recreation and Culture Division. The Environmental Management Division provides support where necessary.

## **IX. COMPLIANCE WITH STATE, FEDERAL AND LOCAL GOVERNMENT REQUIREMENTS**

The proposed activities within this Plan are in accordance with state, federal and local government requirements and regulations. Some activities proposed may require permits from these agencies prior to implementation. This is primarily related to infrastructure and facility construction. Any such proposed construction activities will be reviewed with the appropriate agencies. This will include, but not necessarily limited to, Florida Department of Environmental Protection, St. Johns River Water Management District, Army Corps of Engineers, City of New Smyrna Beach, City of Port Orange, Volusia County, Florida Department of Transportation, etc.

Where practicable, all facilities are designed and constructed to comply with the American Disabilities Act (Public Law 101-336). The universal access requirements of this law are followed in all cases except where the law allows for reasonable exceptions, such as when handicap access is structurally impractical or when providing access fundamentally changes the purpose / character of the facility.

Uses planned for DLSCP are in compliance with the Conceptual State Lands Management Plan and its requirement for “balanced public utilization,” and are in compliance with the eight Florida Forever goals, as well as the guidance and directives of Chapters 372, 253, 259, 327, 370, 403, 870, 373, 375, 378, 487, and 597 FS. This plan is also in conformance with the Local Government Comprehensive Plan for Volusia County, Florida, as approved and adopted. The letter confirming compliance is contained in Appendix M.

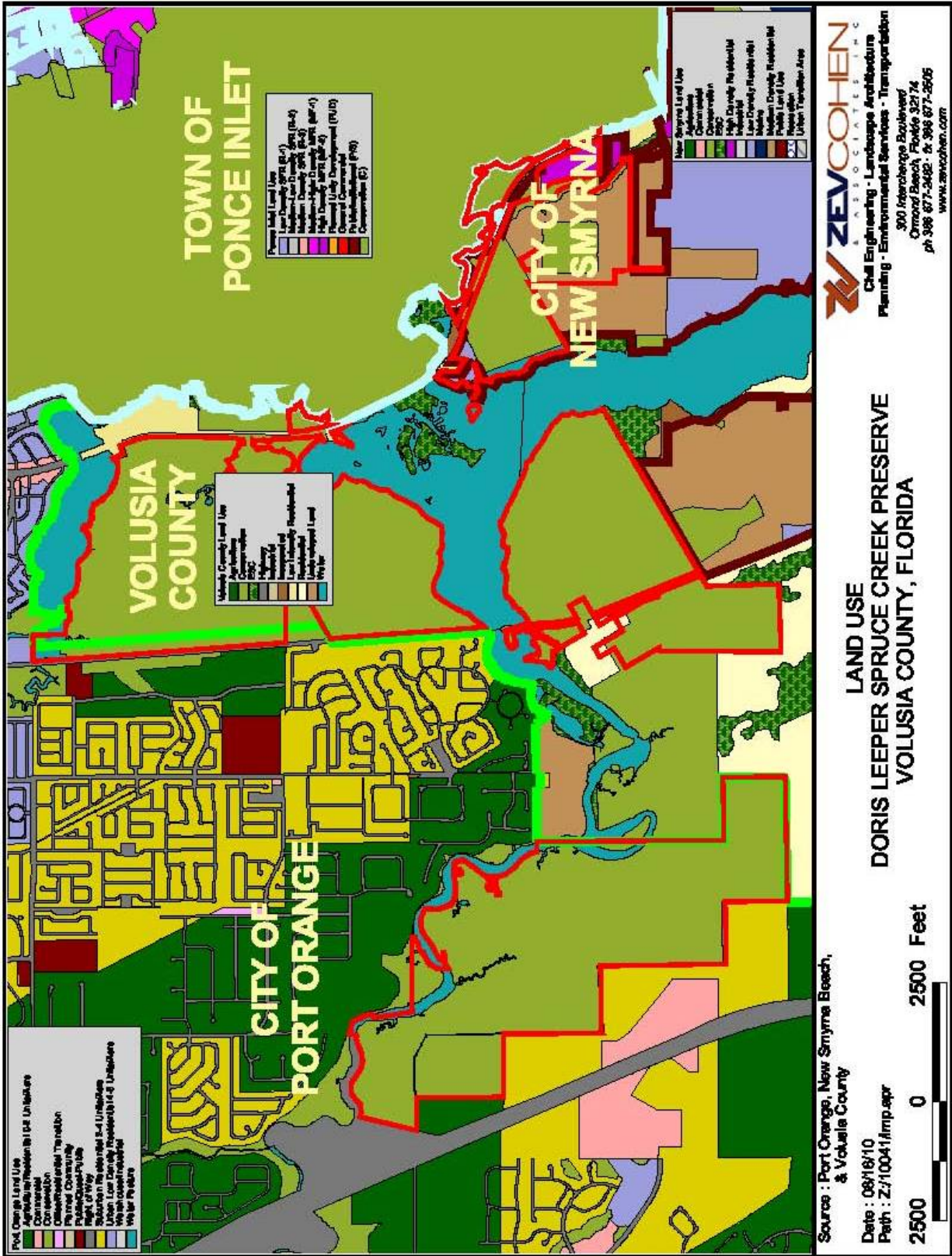


Figure 10. Land Use Map of Doris Leeper Spruce Creek Preserve.

## X. SOIL AND WATER RESOURCE CONSERVATION

The County will continue to employ best management practices for activities and projects which potentially impact soil and water in order to minimize soil erosion and protect water quality. Soil disturbing activities will be conducted only in areas that present the least likelihood of causing erosion problems, avoiding the steepest slopes, streamside management zones and impacts to cultural resources. Soil disturbing activities will follow landform contours to the extent practicable and will not occur without assessment against potential impacts to cultural resources and supervision during such activities by the CHPO or designee. On areas that have been discovered that may prevent erosion problems, an assessment will be made to determine if soil erosion is occurring, and if so, appropriate measures will be implemented to stop or control the effects of this erosion. An example of such measures was the fencing, trail relocation and tree removal along the bluff trail along Spruce Creek on the Martin's Dairy tract where users groups were utilizing a rope swing and causing erosion when climbing the bank back to the trail. These items are more specifically addressed in Section IV, above.

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