A Management Plan for

Tosohatchee

Wildlife Management Area

2016 - 2026

Orange County, Florida

Florida Fish and Wildlife Conservation Commission
620 South Meridian Street
Tallahassee, Florida 32399-1600

Florida Department of Environmental Protection

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Rick Scott
Governor

Carlos Lopez-Cantera
Lt. Governor

Jonathan P. Steverson
Secretary

October 24, 2016

Mr. Thomas Houston
Florida Fish and Wildlife Conservation Commission
620 South Meridian Street
Tallahassee, FL 32399-1600

RE: Tosohatchee Wildlife Management Area - Lease #4502

Dear Mr. Houston:

On **October 21, 2016**, the Acquisition and Restoration Council recommended approval of the **Tosohatchee Wildlife Management Area** management plan. Therefore, the Division of State Lands, Office of Environmental Services, acting as agent for the Board of Trustees of the Internal Improvement Trust Fund, hereby approves the **Tosohatchee Wildlife Management Area** management plan. The next management plan update is due October 21, 2026.

Approval of this land management plan does not waive the authority or jurisdiction of any governmental entity that may have an interest in this project. Implementation of any upland activities proposed by this management plan may require a permit or other authorization from federal and state agencies having regulatory jurisdiction over those particular activities. Pursuant to the conditions of your lease, please forward copies of all permits to this office upon issuance.

Sincerely,

Paula L. Allen
Office of Environmental Services
Division of State Lands
Department of Environmental Protection

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A Management Plan
for
Tosohatchee Wildlife Management Area

Orange County, Florida

Owned by the Board of Trustees of the Internal Improvement Trust Fund

Managed by the Florida Fish and Wildlife Conservation Commission

June 2016

Approved Thomas H. Eason

Thomas H. Eason, Ph.D.
Director, Division of Habitat and Species Conservation

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LAND MANAGEMENT PLAN EXECUTIVE SUMMARY

Lead Agency: Florida Fish and Wildlife Conservation Commission (FWC)
Common Name of Property: Tosohatchee Wildlife Management Area
Location: Orange County, Florida
Acreage Total: 30,701 acres
Acreage Breakdown:

Land Cover Classification	Acres	Percentage of Area
Artificial pond	106.9	<1%
Baygall	1.5	<1%
Blackwater stream	466.7	1.6%
Clearing/regeneration	522.2	1.8%
Depression marsh	701.1	2.4%
Developed	11.2	<1%
Dome swamp	251.2	<1%
Floodplain marsh	10,174.9	35.3%
Floodplain swamp	2,330.0	8.1%
Hydric hammock	5,438.4	18.9%
Mesic flatwoods	2,805.8	9.7%
Mesic hammock	211.9	<1%
Pine plantation	10.2	<1%
River floodplain lake	214.2	<1%
Scrub	6.6	<1%
Scrubby flatwoods	3.6	<1%
Spoil area	1.1	<1%
Utility corridor	212.7	<1%
Wet flatwoods	5,374.1	18.6%

*GIS-calculated acreage for land cover classification varies slightly from actual total acreage.
Lease/Management Agreement No.: 4502 (Appendix 12.1)
Use: Single _____ Multiple X
Management Responsibilities: Agency FWC
Responsibilities: LEAD, SUBLESSEE (Wildlife Management Area, resource protection, law enforcement)
Designated Land Use: Wildlife Management Area
Sublease (s): None
Encumbrances: Power line(s) linear facility easement, other misc. (see Section 1.6.2).
Type Acquisition: Environmentally Endangered Lands.
Unique Features: Natural: Natural communities, St. Johns River
Archaeological/Historical: 18 documented: prehistoric middens, mounds; burial site.
Management Needs: Habitat restoration and improvement; public access and recreational opportunities; hydrological preservation and restoration; exotic and invasive species maintenance and control; imperiled species habitat maintenance, enhancement, and restoration.
Acquisition Needs/Acreage: 0 acres FWC Additions and Inholdings list; 20,001 acres remaining in the Brevard Coastal Scrub Ecosystem Florida Forever Project (Figure 4).
Surplus Lands/Acreage: None
Public Involvement: Management Advisory Group consensus-building meeting and Public Hearing (Appendix 12.3)

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

ARC Approval Date _____ BTIITF Approval Date: _____
Comments: _____

Land Management Plan Compliance Checklist

Required for State-owned conservation lands over 160 acres

Section A: Acquisition Information Items			
Item #	Requirement	Statute/Rule	Page Numbers and/or Appendix
1	The common name of the property.	18-2.018 & 18-2.021	1
2	The land acquisition program, if any, under which the property was acquired.	18-2.018 & 18-2.021	7
3	Degree of title interest held by the Board, including reservations and encumbrances such as leases.	18-2.021	7
4	The legal description and acreage of the property.	18-2.018 & 18-2.021	125
5	A map showing the approximate location and boundaries of the property, and the location of any structures or improvements to the property.	18-2.018 & 18-2.021	2, 96
6	An **assessment** as to whether the property, or any portion, should be declared surplus. *Provide Information regarding **assessment and analysis** in the plan, and provide **corresponding map**.*	18-2.021	74
7	Identification of other parcels of land within or immediately adjacent to the property that should be purchased because they are essential to management of the property. *Please clearly indicate parcels on a map.*	18-2.021	97-99
8	Identification of adjacent land uses that conflict with the planned use of the property, if any.	18-2.021	12-13
9	A statement of the purpose for which the lands were acquired, the projected use or uses as defined in 253.034 and the statutory authority for such use or uses.	259.032(10)	5
10	Proximity of property to other significant State, local or federal land or water resources.	18-2.021	8-12

Section B: Use Items			
Item #	Requirement	Statute/Rule	Page Numbers and/or Appendix
11	The designated single use or multiple use management for the property, including use by other managing entities.	18-2.018 & 18-2.021	72
12	A description of past and existing uses, including any unauthorized uses of the property.	18-2.018 & 18-2.021	70-71
13	A description of alternative or multiple uses of the property considered by the lessee and a statement detailing why such uses were not adopted.	18-2.018	72-73
14	A description of the management responsibilities of each entity involved in the property's management and how such responsibilities will be coordinated.	18-2.018	100
15	Include a provision that requires that the managing agency consult with the Division of Historical Resources, Department of State before taking actions that may adversely affect archeological or historical resources.	18-2.021	95

16	Analysis/description of other managing agencies and private land managers, if any, which could facilitate the restoration or management of the land.	18-2.021	95, 100, 121
17	A determination of the public uses and public access that would be consistent with the purposes for which the lands were acquired.	259.032(10)	72-73
18	A finding regarding whether each planned use complies with the 1981 State Lands Management Plan, particularly whether such uses represent "balanced public utilization," specific agency statutory authority and any other legislative or executive directives that constrain the use of such property.	18-2.021	122
19	Letter of compliance from the local government stating that the LMP is in compliance with the Local Government Comprehensive Plan.	BOT requirement	280
20	An assessment of the impact of planned uses on the renewable and non-renewable resources of the property, including soil and water resources, and a detailed description of the specific actions that will be taken to protect, enhance and conserve these resources and to compensate/mitigate damage caused by such uses, including a description of how the manager plans to control and prevent soil erosion and soil or water contamination.	18-2.018 & 18-2.021	74
21	*For managed areas larger than 1,000 acres, an analysis of the multiple-use potential of the property which shall include the potential of the property to generate revenues to enhance the management of the property provided that no lease, easement, or license for such revenue-generating use shall be entered into if the granting of such lease, easement or license would adversely affect the tax exemption of the interest on any revenue bonds issued to fund the acquisition of the affected lands from gross income for federal income tax purposes, pursuant to Internal Revenue Service regulations.	18-2.021 & 253.036	72-73
22	If the lead managing agency determines that timber resource management is not in conflict with the primary management objectives of the managed area, a component or section, prepared by a qualified professional forester, that assesses the feasibility of managing timber resources pursuant to section 253.036, F.S.	18-021	94
23	A statement regarding incompatible use in reference to Ch. 253.034(10).	253.034(10)	73

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

Section C: Public Involvement Items			
Item #	Requirement	Statute/Rule	Page Numbers and/or Appendix
24	A statement concerning the extent of public involvement and local government participation in the development of the plan, if any.	18-2.021	13, 144
25	The management prospectus required pursuant to paragraph (9)(d) shall be available to the public for a period of 30 days prior to the public hearing.	259.032(10)	13, 144
26	LMPs and LMP updates for parcels over 160 acres shall be developed with input from an advisory group who must conduct at least one public hearing within the county in which the parcel or project is located. *Include the advisory group members and their affiliations, as well as the date and location of the advisory group meeting.*	259.032(10)	13, 144
27	Summary of comments and concerns expressed by the advisory group for parcels over 160 acres	18-2.021	144
28	During plan development, at least one public hearing shall be held in each affected county. Notice of such public hearing shall be posted on the parcel or project designated for management, advertised in a paper of general circulation, and announced at a scheduled meeting of the local governing body before the actual public hearing. *Include a copy of each County's advertisements and announcements (meeting minutes will suffice to indicate an announcement) in the management plan.*	253.034(5) & 259.032(10)	13, 144
29	The manager shall consider the findings and recommendations of the land management review team in finalizing the required 10-year update of its management plan. *Include manager's replies to the team's findings and recommendations.*	259.036	80
30	Summary of comments and concerns expressed by the management review team, if required by Section 259.036, F.S.	18-2.021	158
31	If manager is not in agreement with the management review team's findings and recommendations in finalizing the required 10-year update of its management plan, the managing agency should explain why they disagree with the findings or recommendations.	259.036	158

Section D: Natural Resources			
Item #	Requirement	Statute/Rule	Page Numbers and/or Appendix
32	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding soil types. *Use brief descriptions and include USDA maps when available.*	18-2.021	13-70
33	Insert FNAI based natural community maps when available.	ARC consensus	20-21

34	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding outstanding native landscapes containing relatively unaltered flora, fauna and geological conditions.	18-2.021	68
35	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding unique natural features and/or resources including but not limited to virgin timber stands, scenic vistas, natural rivers and streams, coral reefs, natural springs, caverns and large sinkholes.	18-2.018 & 18-2.021	68
36	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding beaches and dunes.	18-2.021	68
37	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding mineral resources, such as oil, gas and phosphate, etc.	18-2.018 & 18-2.021	68
38	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding fish and wildlife, both game and non-game, and their habitat.	18-2.018 & 18-2.021	49
39	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding State and Federally listed endangered or threatened species and their habitat.	18-2.021	63
40	The identification or resources on the property that are listed in the Natural Areas Inventory. *Include letter from FNAI or consultant where appropriate.*	18-2.021	49-67
41	Specific description of how the managing agency plans to identify, locate, protect and preserve or otherwise use fragile, nonrenewable natural and cultural resources.	259.032(10)	80-118
42	Habitat Restoration and Improvement	259.032(10) & 253.034(5)	
42-A.	Describe management needs, problems and a desired outcome and the key management activities necessary to achieve the enhancement, protection and preservation of restored habitats and enhance the natural, historical and archeological resources and their values for which the lands were acquired.	↓	80-118
42-B.	Provide a detailed description of both short (2-year planning period) and long-term (10-year planning period) management goals, and a priority schedule based on the purposes for which the lands were acquired and include a timeline for completion.		104
42-C.	The associated measurable objectives to achieve the goals.		104
42-D.	The related activities that are to be performed to meet the land management objectives and their associated measures. *Include fire management plans - they can be in plan body or an appendix.*		82, 104
42-E.	A detailed expense and manpower budget in order to provide a management tool that facilitates development of performance measures, including recommendations for cost-effective methods of accomplishing those activities.		118, 220
43	***Quantitative data description of the land regarding an inventory of forest and other natural resources and associated acreage. *See footnote.*	253.034(5)	22

44	Sustainable Forest Management, including implementation of prescribed fire management		
44-A.	Management needs, problems and a desired outcome (see requirement for # 42-A).		94, 111
44-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).	18-2.021, 253.034(5) & 259.032(10) ↓	111
44-C.	Measurable objectives (see requirement for #42-C).		111
44-D.	Related activities (see requirement for #42-D).		94, 111
44-E.	Budgets (see requirement for #42-E).		118, 220
45	Imperiled species, habitat maintenance, enhancement, restoration or population restoration	259.032(10) & 253.034(5)	
45-A.	Management needs, problems and a desired outcome (see requirement for # 42-A).	↓	85, 105
45-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).		105
45-C.	Measurable objectives (see requirement for #42-C).		105
45-D.	Related activities (see requirement for #42-D).		85, 105
45-E.	Budgets (see requirement for #42-E).		118, 220
46	***Quantitative data description of the land regarding an inventory of exotic and invasive plants and associated acreage. *See footnote.*	253.034(5)	22, 40
47	Place the Arthropod Control Plan in an appendix. If one does not exist, provide a statement as to what arrangement exists between the local mosquito control district and the management unit.	BOT requirement via lease language	275
48	Exotic and invasive species maintenance and control	259.032(10) & 253.034(5)	
48-A.	Management needs, problems and a desired outcome (see requirement for # 42-A).	↓	89, 107
48-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).		107
48-C.	Measurable objectives (see requirement for #42-C).		107
48-D.	Related activities (see requirement for #42-D).		89, 107
48-E.	Budgets (see requirement for #42-E).		118, 220

Section E: Water Resources

Item #	Requirement	Statute/Rule	Page Numbers and/or Appendix
49	A statement as to whether the property is within and/or adjacent to an aquatic preserve or a designated area of critical state concern or an area under study for such designation. *If yes, provide a list of the*		12, 68

	appropriate managing agencies that have been notified of the proposed plan.	18-2.018 & 18-2.021	
50	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding water resources, including water classification for each water body and the identification of any such water body that is designated as an Outstanding Florida Water under Rule 62-302.700, F.A.C.	18-2.021	68-69
51	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding swamps, marshes and other wetlands.	18-2.021	42
52	***Quantitative description of the land regarding an inventory of hydrological features and associated acreage. *See footnote.*	253.034(5)	22, 68-69
53	Hydrological Preservation and Restoration	259.032(10) & 253.034(5)	
53-A.	Management needs, problems and a desired outcome (see requirement for # 42-A).	↓	93, 110
53-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).		110
53-C.	Measurable objectives (see requirement for #42-C).		110
53-D.	Related activities (see requirement for #42-D).		93, 110
53-E.	Budgets (see requirement for #42-E).		118, 220

Section F: Historical, Archeological and Cultural Resources

Item #	Requirement	Statute/Rule	Page Numbers and/or Appendix
54	**Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding archeological and historical resources. *Include maps of all cultural resources except Native American sites, unless such sites are major points of interest that are open to public visitation.*	18-2.018, 18-2.021 & per DHR's request	70, 183
55	***Quantitative data description of the land regarding an inventory of significant land, cultural or historical features and associated acreage.	253.034(5)	70, 183
56	A description of actions the agency plans to take to locate and identify unknown resources such as surveys of unknown archeological and historical resources.	18-2.021	95, 112
57	Cultural and Historical Resources	259.032(10) & 253.034(5)	
57-A.	Management needs, problems and a desired outcome (see requirement for # 42-A).	↓	95, 112
57-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).		112
57-C.	Measurable objectives (see requirement for #42-C).		112
57-D.	Related activities (see requirement for #42-D).		95, 112
57-E.	Budgets (see requirement for #42-E).		118, 220

**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.

Section G: Facilities (Infrastructure, Access, Recreation)			
Item #	Requirement	Statute/Rule	Page Numbers and/or Appendix
58	***Quantitative data description of the land regarding an inventory of infrastructure and associated acreage. *See footnote.*	253.034(5)	95-96
59	Capital Facilities and Infrastructure	259.032(10) & 253.034(5)	
59-A.	Management needs, problems and a desired outcome (see requirement for # 42-A).	↓	95, 112
59-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).		112
59-C.	Measurable objectives (see requirement for #42-C).		112
59-D.	Related activities (see requirement for #42-D).		95, 112
59-E.	Budgets (see requirement for #42-E).		118, 220
60	*** Quantitative data description of the land regarding an inventory of recreational facilities and associated acreage.	253.034(5)	21, 95
61	Public Access and Recreational Opportunities	259.032(10) & 253.034(5)	
61-A.	Management needs, problems and a desired outcome (see requirement for # 42-A).	↓	90, 108
61-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).		108
61-C.	Measurable objectives (see requirement for #42-C).		108
61-D.	Related activities (see requirement for #42-D).		90, 108
61-E.	Budgets (see requirement for #42-E).		118, 220

Section H: Other/ Managing Agency Tools			
Item #	Requirement	Statute/Rule	Page Numbers and/or Appendix
62	Place this LMP Compliance Checklist at the front of the plan.	ARC and managing agency consensus	iv
63	Place the Executive Summary at the front of the LMP. Include a physical description of the land.	ARC and 253.034(5)	iii
64	If this LMP is a 10-year update, note the accomplishments since the drafting of the last LMP set forth in an organized (categories or bullets) format.	ARC consensus	74
65	Key management activities necessary to achieve the desired outcomes regarding other appropriate resource management.	259.032(10)	80-117

66	Summary budget for the scheduled land management activities of the LMP including any potential fees anticipated from public or private entities for projects to offset adverse impacts to imperiled species or such habitat, which fees shall be used to restore, manage, enhance, repopulate, or acquire imperiled species habitat for lands that have or are anticipated to have imperiled species or such habitat onsite. 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) which are resource management, administration, support, capital improvements, recreation visitor services, law enforcement activities.	253.034(5)	118, 220
67	Cost estimate for conducting other management activities which would enhance the natural resource value or public recreation value for which the lands were acquired, include recommendations for cost-effective methods in accomplishing those activities.	259.032(10)	118, 220
68	A statement of gross income generated, net income and expenses.	18-2.018	72, 118, 220

*** = The referenced inventories shall be of such detail that objective measures and benchmarks can be established for each tract of land and monitored during the lifetime of the plan. All quantitative data collected shall be aggregated, standardized, collected, and presented in an electronic format to allow for uniform management reporting and analysis. The information collected by the DEP pursuant to s. 253.0325(2) shall be available to the land manager and his or her assignee.

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Management Plan Acronym Key

ARC	Acquisition and Restoration Council
ADA	Americans with Disabilities Act
BMU	Bear Management Unit
BEBR	Bureau of Economic and Business Research
CAS	Conservation Action Strategy
DACS	Department of Agriculture and Consumer Services
DOD	Department of Defense
DEO	Department of Economic Opportunity
DEP	Department of Environmental Protection
DSL	Division of State Lands
F	Fahrenheit
FE	Federally Endangered
FT	Federally Threatened
FT (S/A)	Federally Threatened due to similarity of appearance
FWRI	Fish and Wildlife Research Institute
FAC	Florida Administrative Code
FLEPPC	Florida Exotic Pest Plant Council
FWC	Florida Fish and Wildlife Conservation Commission
FFS	Florida Forest Service
FNST	Florida National Scenic Trail
FNAI	Florida Natural Areas Inventory
FS	Florida Statute(s)
FTE	Full Time Employee
GIS	Geographic Information Systems
GPS	Geographic Positioning System
GRASI	Gulf Regional Airspace Initiative
IWHRS	Integrated Wildlife Habitat Ranking System
IPCC	Intergovernmental Panel on Climate Change
IMPP	Internal Management Policies and Procedures
LMR	Land Management Review
LAP	Landowner Assistance Program

Management Plan Acronym Key

MAG	Management Advisory Group
MSL	Mean Sea Level
MOA	Memo of Agreement
NPS	National Park Service
OBVM	Objective-Based Vegetation Management
ORV	Off-Road Vehicle
OCPB	Optimal Conservation Planning Boundary
ORB	Optimal Resource Boundary
OPS	Other Person Services
OFW	Outstanding Florida Waters
PVA	Population Viability Analysis
PLCP	Public Lands Conservation Planning
RMP	Recreation Master Plan
SJRWMD	St. Johns River Water Management District
CE	State Commercially Exploited
SE	State Endangered
SSC	State Species of Special Concern
ST	State Threatened
TNC	The Nature Conservancy
TWMA	Tosohatchee Wildlife Management Area
USAF	United States Air Force
USFWS	United States Fish and Wildlife Service
USFS	United States Forest Service
WCPR	Wildlife Conservation Prioritization and Recovery
WHCNinFL	Wildlife Habitat Conservation Needs in Florida
WMA	Wildlife Management Area
WBTSR	William Beardall Tosohatchee State Reserve

1 Introduction and General Information

With meandering creeks, lush cabbage palm hammocks, slash pine flatwoods, cypress swamps, and expansive freshwater marshes associated with the St. Johns River, the Tosohatchee Wildlife Management Area (TWMA) conserves 30,701 acres of wildlife habitat in Orange County, Florida, and forms an integral part of the Upper St. Johns River Basin watershed (Figures 1 - 2). The basin extends from the headwaters of the St. Johns River in Indian River and Brevard counties to the confluence of the St. Johns and Econlockhatchee rivers in Seminole County, and originally contained more than 400,000 acres of floodplain marsh. The St. Johns River, Florida's longest, begins its 310-mile northerly journey to the Atlantic Ocean from drainage basin headwaters west of Vero Beach in Indian River County. Portions of the Upper St. Johns River Basin features a mosaic of natural communities, and in some stretches of the river is visually similar to the Florida Everglades. The TWMA conserves a large mosaic of the remaining natural habitats along this stretch of the Upper St. Johns River.

Providing important water quality and wildlife habitat protection, the TWMA has long been recognized for its stellar natural resources and "Old Florida" natural scenic beauty. The TWMA serves as home to a diverse array of natural communities and wildlife that live on or migrate through the area. The TWMA is also an important link in a large chain of public and private conservation lands that form an important wildlife corridor within the St. Johns River System.

A rich diversity of rare and imperiled wildlife species that include gopher tortoise, eastern indigo snake, Audubon's crested caracara, Florida sandhill crane, wood stork, as well as a variety of other wading birds, are found on TWMA. Observant wildlife viewers may catch a glimpse of the Florida black bear, Everglade snail kite, and southern bald eagle. Other more common wildlife abundant on the area include white-tailed deer, bobcat, alligator, and river otter. The TWMA's natural habitat diversity also provides stopover and foraging habitat for a wide variety of migrating bird species during the annual spring and fall migrations that occur along the Atlantic flyway.

Verdant native vegetation includes an assortment of ferns that carpet the hammocks, oaks, and cabbage palm forests, along with a bountiful collection of wildflowers. A wide variety of imperiled and rare plants such as Florida butterfly orchid, blueflower butterwort, giant wild-pine, hooded pitcher plant and celestial lily are also found on the area.

For much of its early public conservation land history TWMA was managed as the William Beardall Tosohatchee State Reserve (WBTSR), and was managed by the Department of Environmental Protection's (DEP) Division of Recreation and Parks (also known as the Florida Park Service) until lead management authority for the current 30,701 acre configuration was transferred to FWC in August, 2006, as approved by the Board of Trustees

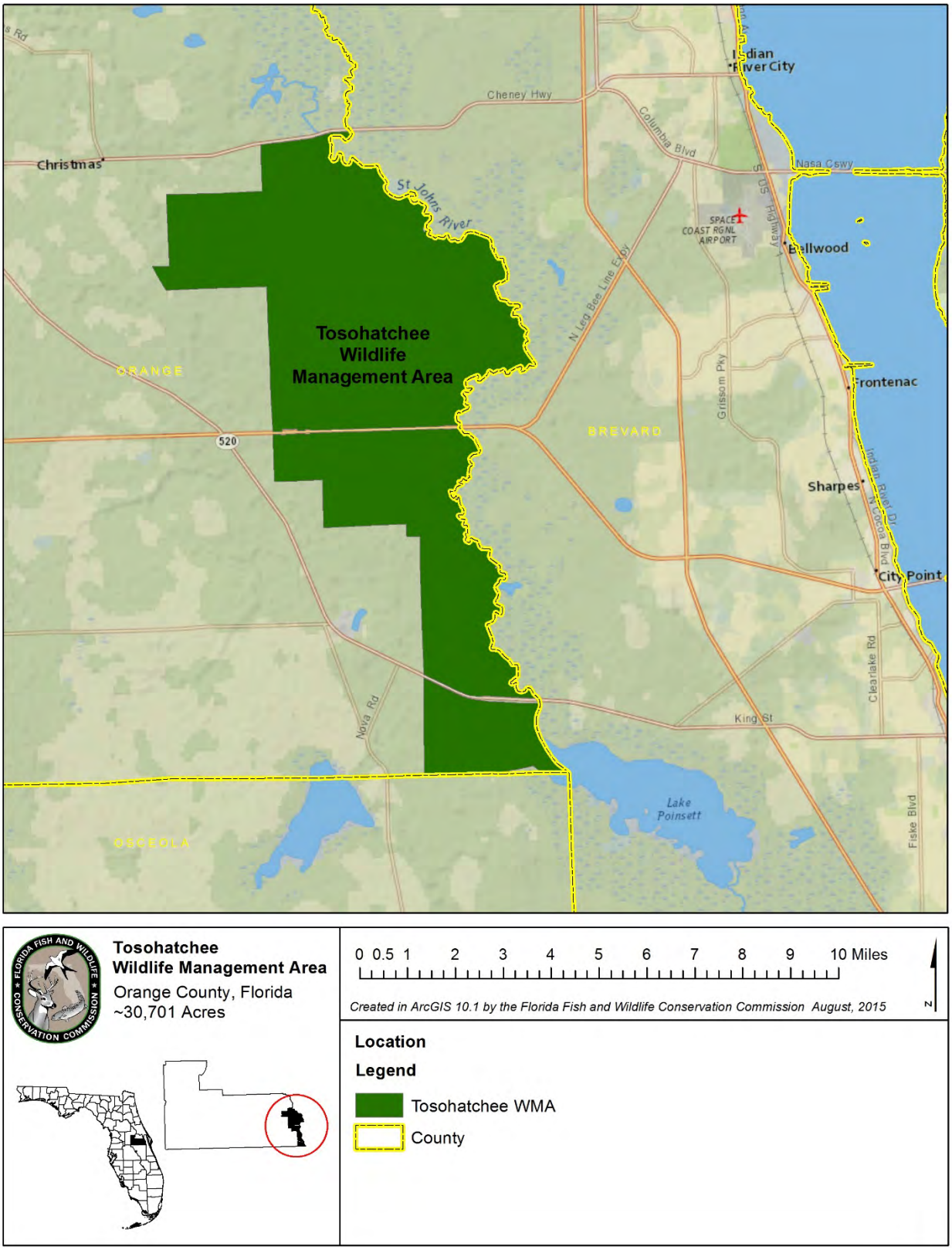


Figure 1. Location

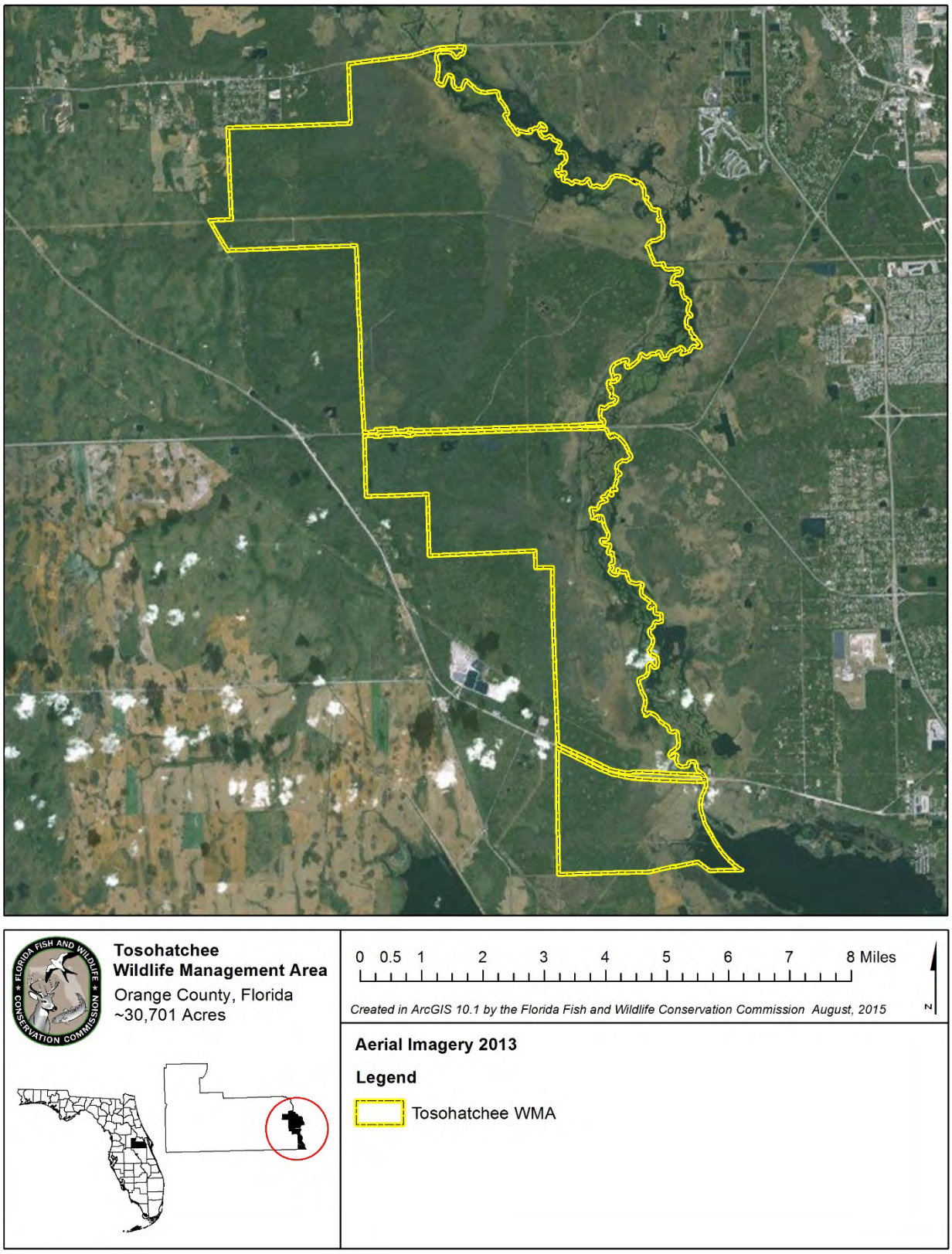


Figure 2. Aerial Imagery 2013

of the Internal Improvement Trust Fund (Board of Trustees) at the August 1, 2006 meeting.

Today, the TWMA is managed by the Florida Fish and Wildlife Conservation Commission (FWC) for the purpose of operating a Wildlife Management Area, providing ecological diversity, providing managed habitat for both imperiled and common wildlife, and for providing the public with fish and wildlife-oriented outdoor recreational opportunities. Hunting, fishing, wildlife viewing, camping, horseback-riding, biking, and hiking are included among the outstanding fish and wildlife-based public outdoor recreational opportunities offered on the TWMA. Trail users, in particular, may want to take note that the Florida National Scenic Trail (FNST) winds through the TWMA.

1.1 Management Plan Purpose

This Management Plan serves as the basic statement of policy and direction for the management of TWMA. It provides information including the past usage, conservation acquisition history, and descriptions of the natural and historical resources found on TWMA. Furthermore, it identifies FWC's future management intent, goals and associated short and long-term objectives, as well as identifying challenges and solutions. This Management Plan has been developed to guide each aspect of TWMA's management for the next ten years.

This Management Plan is submitted for review to the Acquisition and Restoration Council (ARC) acting on behalf of the Board of Trustees, and through the DEP's Division of State Lands (DSL), in compliance with paragraph seven of Lease No. 4502 (Appendix 12.1) and pursuant to Chapters 253 and 259, Florida Statutes (FS), and Chapters 18-2 and 18-4, Florida Administrative Code (FAC). Format and content were drafted in accordance with ARC requirements for management plans and the model plan outline provided by the staff of DSL. Terms (Appendix 12.2) used in this Management Plan describing management activities and associated measurable goals and objectives conform to those developed for the Land Management Uniform Accounting Council Biennial Land Management Operational Report.

1.1.1 FWC Planning Philosophy

The FWC's planning philosophy includes emphasizing management recommendation consensus-building among stakeholders and input from user groups and the general public at the beginning of the planning process. The FWC engages stakeholders by convening a Management Advisory Group (MAG) and solicits additional input from user groups and the general public at a public hearing (Appendix 12.3). The FWC also engages area, district, and regional agency staff, as well as other FWC staff expertise, in developing this Management Plan, thereby facilitating area biologist and manager "ownership" of the Management Plan, and thus the development of meaningful management intent language, goals with associated measurable objectives, timelines for completion, and the identification

of challenges and solution strategies for inclusion in the TWMA Management Plan (Sections 5 - 7).

Further management planning input is received through Land Management Reviews (LMR) conducted every five years, which includes a review of the previous Management Plan, as well as a field review of TWMA. The LMR report (Section 5.1, Appendix 12.4) provides FWC staff with important information and guidance provided by a diverse team of land management auditors, and communicates the recommendations of the LMR team to FWC so they may be adequately addressed in this Management Plan, and thus guide the implementation of the LMR team recommendations on TWMA.

Furthermore, FWC maintains transparency and accountability throughout the development and implementation of this Management Plan. A "living document" concept, linking this updated Management Plan to the previous one, is accomplished by reporting on the objectives, management activities, and projects accomplished over the last planning timeframe (previous ten years; see Section 4), thereby ensuring agency accountability through time. Also, in an effort to remain adaptive for the duration of this Management Plan, continuous input and feedback will be collected from FWC staff, stakeholders, user groups, and other interested parties and individuals. As needed, amendments to this Management Plan will be presented to DSL and ARC for review and consideration.

1.2 Location

The TWMA is located in Orange County, Florida, approximately three miles south of the town of Christmas, and between the cities of Orlando and Titusville. The St. Johns River flows northward along the eastern portion of TWMA, and therefore helps to serve as an approximate visual reference to demarcate the eastern boundary of the area. The TWMA spans approximately 14 miles from its northern to southern borders, and is within multiple Sections of Townships 22, 23, and 24 North, Ranges 33 and 34 East (Figure 3).

1.3 Acquisition

1.3.1 Purpose for Acquisition of the Property

According the 50-year Lease Agreement between the Board of Trustees and FWC, the original purposes for the acquisition of TWMA include "protection of native animals, with emphasis on rare, endangered, and threatened species such as the Florida panther, bald eagle, osprey, dusky seaside sparrow and red-cockaded woodpecker; protection of natural plant communities, especially the virgin slash pine flatwoods and virgin cypress swamp; restoration, protection and management of the extensive floodplain marsh for the safeguarding and improvement of the St. Johns River water quality; provision of natural flood storage area; and protection of the indian mound." Other purposes and uses identified in DEP's 2003 - 2013 management plan for WBTSR include "the conservation and

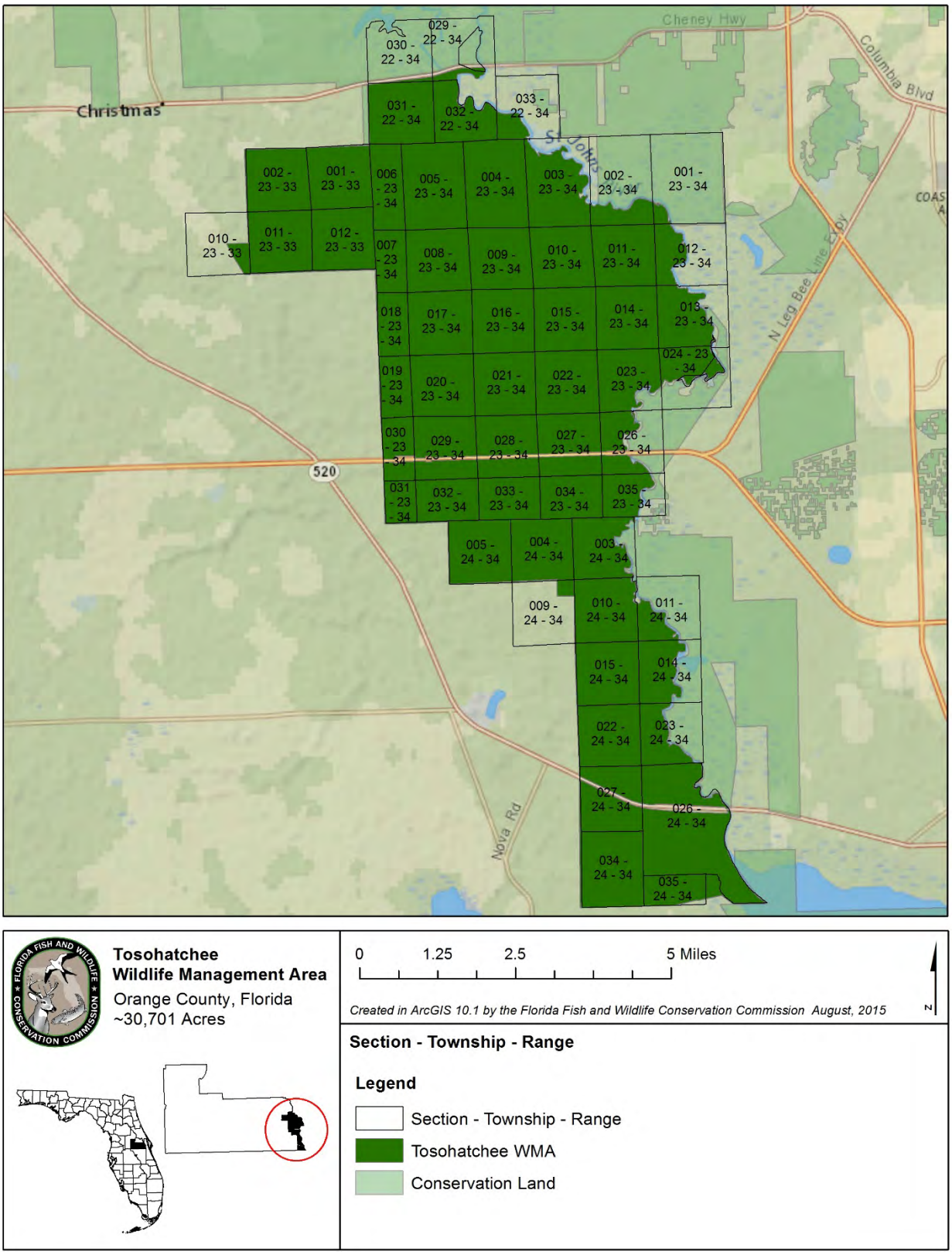


Figure 3. Section - Township - Range

protection of natural and cultural resources, and for resources-based public outdoor recreation which is compatible with the conservation and protection of the property."

1.3.2 Acquisition History

On June 20, 1977, the Board of Trustees obtained title to the initial conservation acquisition for TWMA. This initial purchase was funded through the State's Environmentally Endangered Lands program. Since the initial acquisition, the Board of Trustees and the St. Johns River Water Management District (SJRWMD) also acquired several additional parcels. As noted above, the land was originally designated the WBTSR, and was managed by DEP's Division of Recreation and Parks until lead management authority for the current 30,701 acre configuration was transferred to FWC in August, 2006. Also at that time, lead management responsibility for all lands of the original WBTSR lying east of the St. Johns River was transferred to the SJRWMD, and are now known as the Canaveral Marshes Conservation Area.

1.4 Management Authority

The FWC is the designated lead managing agency for TWMA under the authority granted by Lease Number 4502 from the Board of Trustees agent, the DSL. This 50-year Lease Agreement was executed on August 7, 2007, subsequent to management authority being granted by the Board of Trustees in August 2006. Further management authority derives from Article IV, Section 9 of the Florida Constitution as well as the guidance and directives of Chapters 253, 259, 327, 370, 373, 375, 378, 379, 403, 487, 870, and 597 FS. These constitutional provisions and laws provide FWC the authority to protect, conserve, and manage the State's fish and wildlife resources.

1.5 Management Directives

The 50-year Board of Trustees' Lease Agreement No. 4502 with FWC directs FWC 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, as set forth in subsection 253.023(11), FS..." The lease agreement further directs FWC to "implement applicable Best Management Practices for all activities under this lease in compliance with paragraph 18-2.018(2)(h), FAC, which have been selected, developed, or approved by lessor, lessee, or other land managing agencies for the protection and enhancement of the leased premises."

1.6 Title Interest and Encumbrances

1.6.1 Title Interest

As State-owned lands, full-fee title to TWMA is vested in the Board of Trustees (Governor and Cabinet).

1.6.2 Encumbrances

The TWMA is bisected by two powerline utility easements. The northern perpetual easement traverses the property approximately seven miles from east to west, is held by Tosohatchee Game Preserve, Inc., and allows the Orlando Utilities Commission and the City of Orlando to use a certain rights-of-way for the construction, operation, and maintenance of as many as three overhead electrical transmission and distribution lines for the transmission of electricity (1959). The southern perpetual easement extends approximately two and one-half miles from east to west-north-west, is held by Tosohatchee Game Preserve, Inc., and allows the Florida Power and Light Company to construct, operate, and maintain one overhead electrical transmission and distribution line (1957).

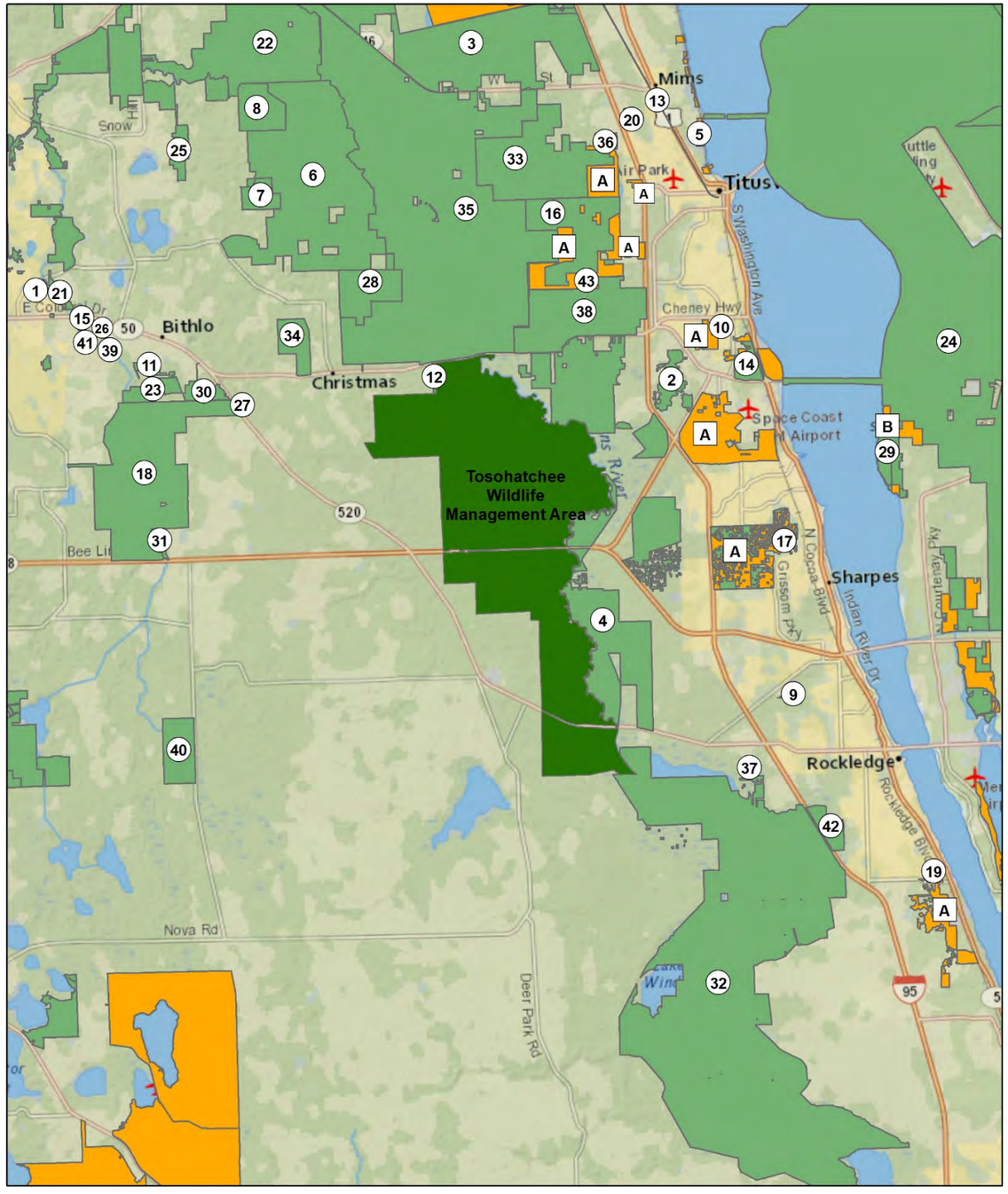
Other encumbrances include 50% undivided perpetual mineral rights held by the SJRWMD (1988); perpetual mineral rights, rights-of-way, and flowage easements held by the Tosohatchee Game Preserve, Inc. (1977); a perpetual flowage easement held by Tosohatchee Game Preserve, Inc. allowing the Central and Southern Florida Flood Control District to flow water through Structure 164 of the Jane Green Reservoir (1977); a perpetual easement held by Tosohatchee Game Preserve, Inc. allowing the Florida Gas Transmission Company to construct operate, and maintain one or two pipelines for the transportation of natural gas under and across the described lands (1967); perpetual mineral rights held by Tosohatchee Game Preserve, Inc. reserving the rights to all oil, gas, and other minerals in and under the lands as specified in the property deed (1954); perpetual mineral rights held by Peavy-Wilson Lumber Company as specified in the property deed (1946); perpetual rights held by the State of Florida's Board of Education reserving the right to build canals, cuts, sluice-ways, and dikes as necessary for the drainage of lands as specified in the property deed (1928).

Due to the lengthy history of known encumbrances on the area, not all are currently well-documented nor well-delineated using modern Geographic Information System (GIS) mapping technologies. Further encumbrances on the area may occur in the near future as the proposed All Aboard Florida high-speed rail project, currently routed through TWMA, is developed.

1.7 Proximity to Other Public Conservation Lands

The TWMA is located within ten miles of a large number of publicly owned conservation areas and two Florida Forever projects (Figure 4, Tables 1 - 2). These lands are managed by both public and private entities that conserve cultural and natural resources within this region of Florida.

Most of the conservation lands in the vicinity of TWMA are owned in full-fee by a public entity. However, some of these areas fall within a less-than-fee ownership classification

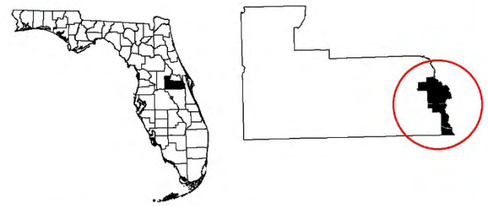


Map Symbol	Conservation Lands
1	Big Econlochatchee River Sanctuary
2	Bird Lake Marsh
3	Buck Lake Conservation Area
4	Canaveral Marshes Conservation Area
5	Chain of Lakes Park
6	Charles H. Bronson State Forest
7	Chuluota Wilderness Area
8	Clonts Conservation Easement
9	Cocoa Conservation Area
10	Dicerandra Scrub Sanctuary
11	Dietrich Conservation Easement
12	Eagan Parcels
13	East Central Regional Rail Trail
14	Enchanted Forest Sanctuary
15	Evans Property
16	Fox Lake Sanctuary
17	Grissom Parkway
18	Hal Scott Regional Preserve and Park
19	Helen and Allan Cruickshank Sanctuary
20	Indian Mound Station Sanctuary
21	Ken Bosserman Econlockhatchee River Preserve
22	Little Big Econ State Forest
23	Long Branch Park
24	Merritt Island National Wildlife Refuge
25	Mills Creek Woodlands
26	Nunnally Property
27	Orange County/Hal Scott Preserve Cons. Easement
28	Orlando Wetlands Park
29	Pine Island Conservation Area
30	Pine Lily Preserve
31	Ranger Property
32	River Lakes Conservation Area
33	Salt Lake Wildlife Management Area
34	Savage/Christmas Creek Preserve
35	Seminole Ranch Conservation Area
36	South Lake Conservation Area
37	South Region Mitigation Archipelago
38	St. Johns National Wildlife Refuge
39	Sunflower Property
40	TM Ranch Mitigation Bank
41	Vienna Property
42	Wadsworth-Greenbaum Conservation Easement
43	Wal-Mart Parcels

Map Symbol	Florida Forever Projects
A	Brevard Coastal Scrub Ecosystem
B	Indian River Lagoon Blueway

Tosohatchee Wildlife Management Area

Orange County, Florida
~30,701 Acres



Conservation Lands and Florida Forever Project Within 10 Miles of Tosohatchee WMA

Legend

- Tosohatchee WMA
- Conservation Land
- Florida Forever Project

0 5 10 Miles

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Created in ArcGIS 10.1 by the Florida Fish and Wildlife Conservation Commission September 2015

Figure 4. Conservation Lands and Florida Forever Projects

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Table 1. Conservation Lands Within 10 Miles of TWMA

Map Symbol	Name	Manager
1	Big Econlochatchee River Sanctuary	Florida Audubon Society
2	Bird Lake Marsh	SJRWMD
3	Buck Lake Conservation Area	SJRWMD
4	Canaveral Marshes Conservation Area	SJRWMD
5	Chain of Lakes Park	Brevard County
6	Charles H. Bronson State Forest	FFS
7	Chuluota Wilderness Area	Seminole County
8	Clonts Conservation Easement	SJRWMD
9	Cocoa Conservation Area	City of Cocoa
10	Dicerandra Scrub Sanctuary	Brevard County
11	Dietrich Conservation Easement	SJRWMD
12	Eagan Parcels	SJRWMD
13	East Central Regional Rail Trail	Volusia County
14	Enchanted Forest Sanctuary	Brevard County
15	Evans Property	Orange County
16	Fox Lake Sanctuary	Brevard County
17	Grissom Parkway	FWC
18	Hal Scott Regional Preserve and Park	SJRWMD
19	Helen and Allan Cruickshank Sanctuary	Brevard County
20	Indian Mound Station Sanctuary	Brevard County
21	Ken Bosserman Econlockhatchee River Preserve	Orange County
22	Little Big Econ State Forest	FFS
23	Long Branch Park	Orange County
24	Merritt Island National Wildlife Refuge	USFWS
25	Mills Creek Woodlands	USFS
26	Nunnally Property	Orange County
27	Orange County/Hal Scott Preserve Cons. Easement	SJRWMD
28	Orlando Wetlands Park	City of Orlando
29	Pine Island Conservation Area	Brevard County
30	Pine Lily Preserve	Orange County
31	Ranger Property	Orange County
32	River Lakes Conservation Area	SJRWMD
33	Salt Lake Wildlife Management Area	FWC
34	Savage/Christmas Creek Preserve	Orange County
35	Seminole Ranch Conservation Area	SJRWMD

Table 1. Conservation Lands Within 10 Miles of TWMA

Map Symbol	Name	Manager
36	South Lake Conservation Area	Brevard County
37	South Region Mitigation Archipelago	SJRWMD
38	St. Johns National Wildlife Refuge	USFWS
39	Sunflower Property	Orange County
40	TM Ranch Mitigation Bank	Orange County
41	Vienna Property	Orange County
42	Wadsworth-Greenbaum Conservation Easement	SJRWMD
43	Wal-Mart Parcels	SJRWMD

Table 2. Florida Forever Projects Within 10 Miles of TWMA

Map Symbol	Name
A	Brevard Coastal Scrub Ecosystem
B	Indian River Lagoon Blueway

where the land is owned and being managed by a private landowner while a public agency or not-for-profit organization holds a conservation easement on the land. The TWMA is not within or adjacent to an Area of Critical State Concern.

1.8 Adjacent Land Uses

According to the 2013 U.S. Census, Orange County's population is approximately 1,225,267 people. The University of Florida's Bureau of Economic and Business Research (BEBR) medium-range population projection for the year 2025 for Orange County is 1,525,100. The BEBR's medium-range population projections for the year 2025 of the surrounding counties are: Lake County, 392,000; Seminole County, 488,100; Osceola County; 409,100; Brevard County, 616,400; Volusia County-549,600; and Polk County, 744,600.

The TWMA is currently zoned Farmland Rural District (A-2) according to Orange County's interactive map. According to Orange County zoning code, the following are permitted uses on land zoned Farmland Rural District: residential, accessory buildings, religious facilities, farming, and storage of agricultural equipment, livestock, and logging. The future land use map for Orange County designates that the TWMA will be zoned Parks and Recreation/Open Space (PR-OS).

The current land use designations for areas in the vicinity of the TWMA are also zoned Farmland Rural District, and allows for one dwelling unit per ten acres. The future land use for areas in the vicinity of the TWMA have planned zoning as Parks and Recreation/Open Space and Rural/Agricultural. Specifically, the Seminole Ranch Conservation Area to the north of the TWMA will be zoned Parks and Recreation/Open Space while the remaining parcels surrounding the TWMA will be zoned Rural/Agriculture.

Based on current zoning and the Orange County future land use map, FWC believes it is unlikely TWMA will experience any significant impacts due to development over the next ten years. However, the route of the proposed All Aboard Florida high-speed rail project is currently planned along the State Road 528 corridor which bisects TWMA. This may result in further land use changes within TWMA and the vicinity once it is further developed.

1.9 Public Involvement

To obtain input from both public and private stakeholders regarding management of TWMA, FWC conducted a MAG meeting in Christmas, Florida on July 24, 2013. Results of this meeting were used by FWC to develop management goals and objectives and to identify opportunities and strategies for inclusion in this Management Plan. A summary of ideas and recommendations identified by the MAG, as well as a listing of participants, is included as Appendix 12.3. Further, a public hearing, as required by Chapter 259.032(10), FS, was held in Orlando, Orange County, Florida, on September 24, 2013. The report of that hearing is also contained in Appendix 12.3. A website is also maintained for receipt of public input at http://myfwc.com/conservation/terrestrial/management-plans/develop-mps/ . Further testimony and input may be received at a public hearing held by ARC. Input received from all public involvement efforts has been considered in the development of this Management Plan.

2 Natural and Historical Resources

2.1 Physiography

2.1.1 Climate

The climate of TWMA is classified as subtropical. Annual mean high and low temperatures are 82 and 64 degrees Fahrenheit (F) respectively. July and August are typically the

warmest months with a mean high temperature of 92 degrees F, while January is typically the coolest month with a mean high temperature of 71 degrees F. Mean annual rainfall is 53.2 inches.

2.1.2 Physiographic Province

The TWMA is located in Eastern Valley physiographic division of the Coastal Plain physiographic province. Stretching north to south along much of Florida's eastern coast, this division is approximately 293 miles long, and at TWMA's location is approximately 10 miles wide. The Osceola Plains physiographic division lies to the west of TWMA, the Atlantic Coastal Ridge division to the east.

2.1.3 Topography

The topography of TWMA is relatively flat, characteristic of the broad, low areas along the upper St. Johns River basin. A few scattered knolls, numerous seasonal wet depressions scattered throughout the flatwoods and several Native American mounds exemplify relief. Elevations range between 10 feet and 25 feet above mean sea level (MSL), with small areas about 45 feet above MSL near the main entrance on the western boundary and at Mulberry Mound on Lake Poinsett. Lower elevations occur along the eastern boundary within the floodplain of the St. Johns River, while higher elevations occur in the interior regions and along the western boundaries.

2.1.4 Geologic Conditions

The geological condition of TWMA is defined by three stratigraphic units that occur on the area. They include primarily the Pliocene/Pleistocene and Holocene units, with a very small portion of the Pleistocene/Holocene unit.

Pliocene/Pleistocene

Shelly sediments of Pliocene/Pleistocene age contain some of the most abundant and diverse fossil faunas in the world. Lithologically these sediments are complex, varying from unconsolidated, variably calcareous and fossiliferous quartz sands to well indurated, sandy, fossiliferous limestones (both marine and freshwater). Clayey sands and sandy clays are present. These sediments form part of the surficial aquifer system. The lithology consist of limestone, sand, clay or mud.

Holocene

The Holocene sediments in Orange County, Florida, occur near the present coastline at elevations generally less than 5 feet. The sediments include quartz sands, carbonate sands and muds, and organics. The lithology consist of beach sand, clay or mud, and biogenic sediment.

Pleistocene/Holocene

A small portion of TWMA is covered by a varying thickness of undifferentiated sediments consisting of siliciclastics, organics and freshwater carbonates. The siliciclastics are light gray, tan, brown to black, unconsolidated to poorly consolidated, clean to clayey, silty, unfossiliferous, variably organic-bearing sands to blue green to olive green, poorly to moderately consolidated, sandy, silty clays. Organics occur as plant debris, roots, disseminated organic matrix and beds of peat. Freshwater carbonates are buff colored to tan, unconsolidated to poorly consolidated, fossiliferous carbonate muds. Sand, silt and clay may be present in limited quantities. These carbonates often contain organics. The dominant fossils in the freshwater carbonates are mollusks. The lithology consist of sand, clay or mud, and silt.

2.1.5 Soils

Soil data provided by the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) indicates 23 map units (soil series) to be present on TWMA (Figure 5; map unit descriptions Appendix 12.5), with natural drainage classifications ranging from undrained to occasionally flooded. These data further indicate soil depth to the water table ranging from 0 to 84 centimeters (Figure 6).

2.2 Vegetation

The FWC, through the services of the Florida Natural Areas Inventory (FNAI), originally developed GIS mapping data of vegetation for TWMA, and their associated natural community descriptions, from assessments and field reviews performed in 2008. Subsequently, FNAI revised these original GIS mapping data and descriptions in 2014. The FNAI also mapped the probable historic natural community condition of TWMA in 2008 (Figure 7).

In the 2014 mapping of TWMA, 19 natural and altered communities were identified (Figure 8, Table 3), and lists of the known native and exotic plant species for TWMA have subsequently been compiled (Tables 4 - 5). Natural communities represent approximately 97% of the total land cover of TWMA, and include baygall, blackwater stream, depression marsh, dome swamp, floodplain marsh, floodplain swamp, hydric hammock, mesic flatwoods, mesic hammock, river floodplain lake, scrub, scrubby flatwoods, and wet flatwoods. The remainder of TWMA is comprised of altered areas (3%). The altered areas include artificial pond, clearing/regeneration, developed, pine plantation, spoil area, and utility corridor.

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Figure 5. Soils

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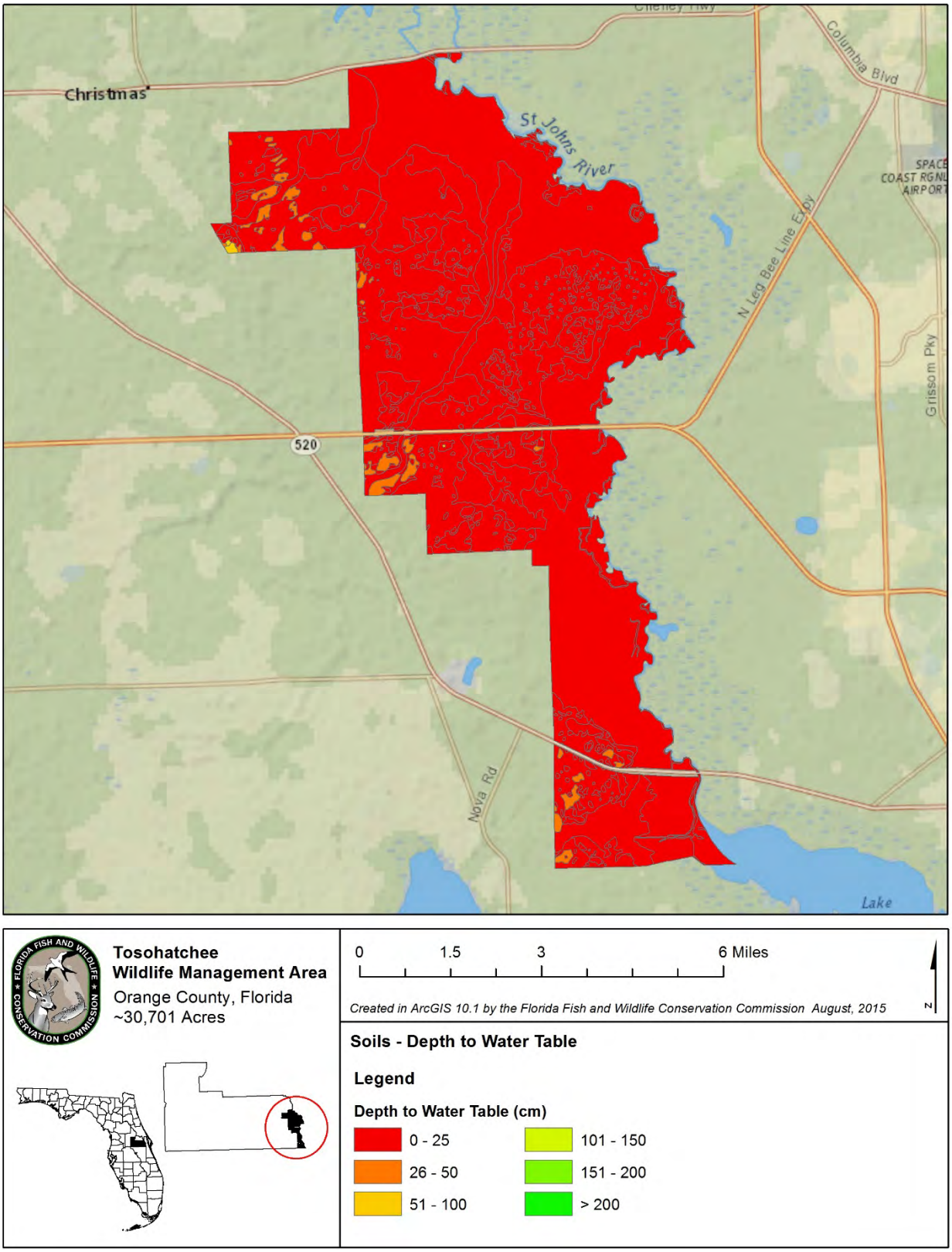

Figure 6. Soils - Depth to Water Table

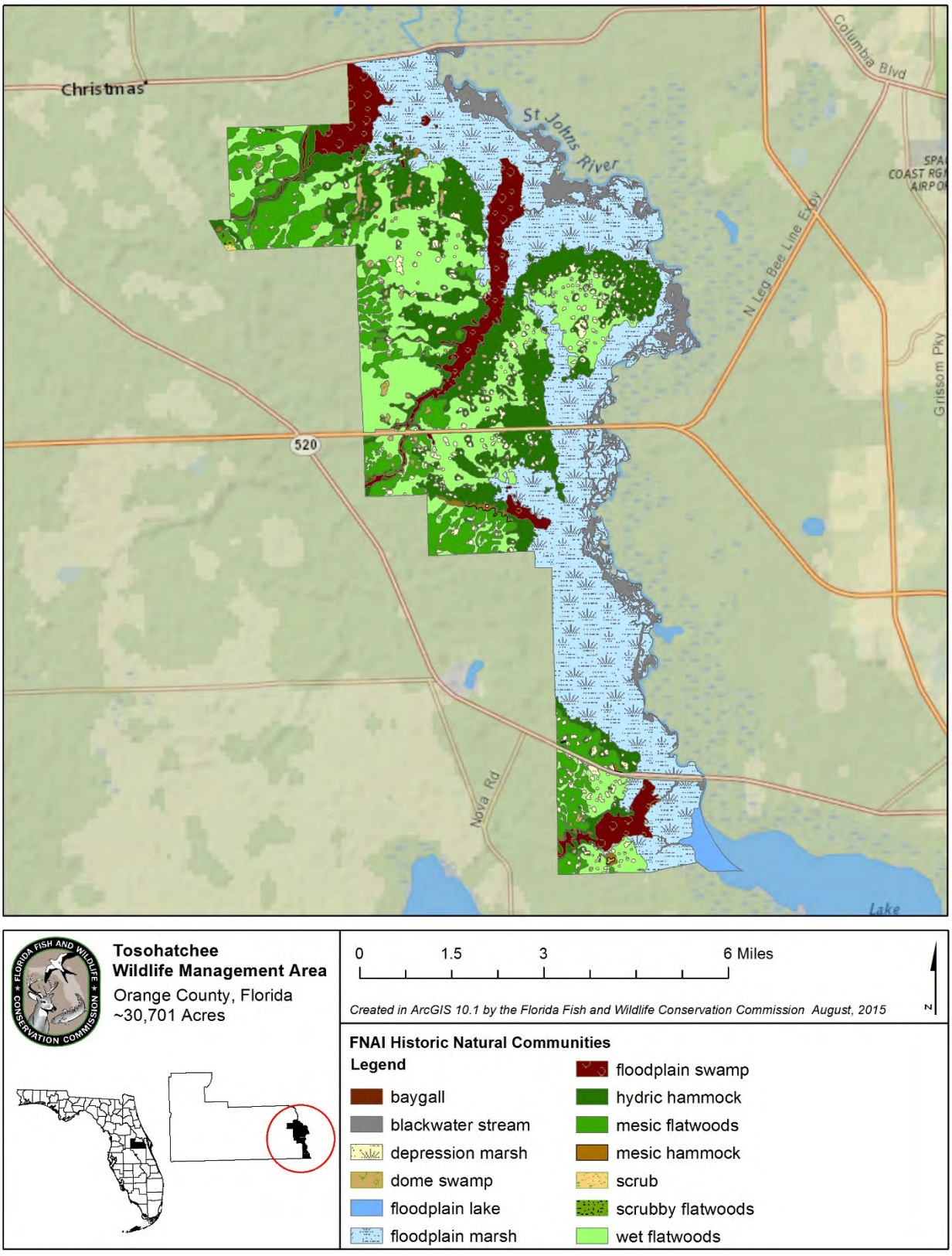

Figure 7. FNAI Historic Natural Communites

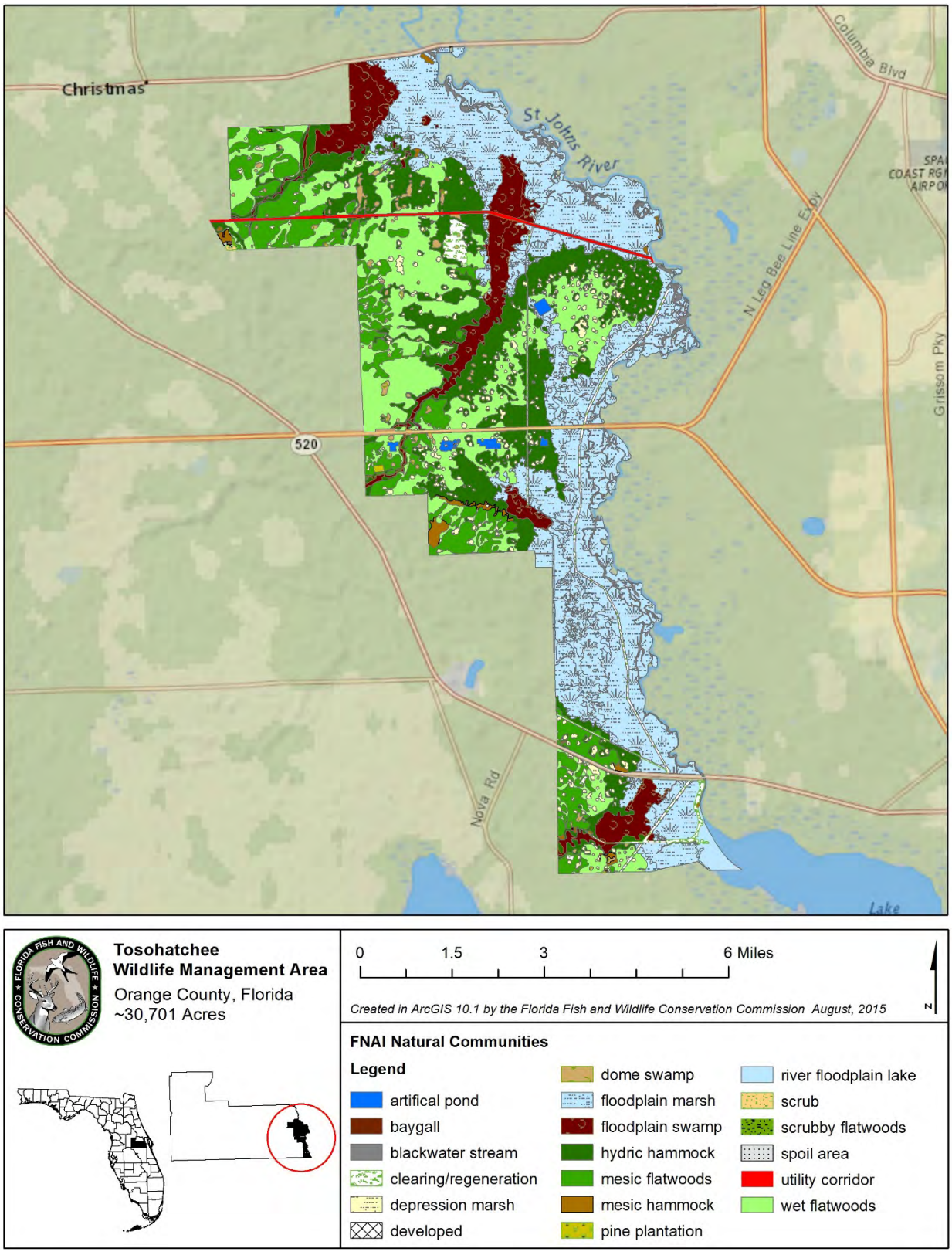

Figure 8. FNAI Natural and Altered Communites

Table 3. Natural and Altered Communities of TWMA

Community Type	Acres	Percentage of Area
Floodplain marsh	10,174.9	35.3%
Hydric hammock	5,438.4	18.9%
Wet flatwoods	5,374.1	18.6%
Mesic flatwoods	2,805.8	9.7%
Floodplain swamp	2,330.0	8.1%
Depression marsh	701.1	2.4%
Clearing/regeneration	522.2	1.8%
Blackwater stream	466.7	1.6%
Dome swamp	251.2	<1%
River floodplain lake	214.2	<1%
Utility corridor	212.7	<1%
Mesic hammock	211.9	<1%
Artificial pond	106.9	<1%
Developed	11.2	<1%
Pine plantation	10.2	<1%
Scrub	6.6	<1%
Scrubby flatwoods	3.6	<1%
Baygall	1.5	<1%
Spoil area	1.1	<1%

Table 4. Native Plant Species Observed on TWMA

Common name	Scientific name
Air-plant	*Tillandsia simulata*
Alligatorflag	*Thalia geniculata*
Alligatorweed	*Alternanthera philoxeroides*
American beautyberry	*Callicarpa americana*
American black nightshade	*Solanum americanum*
American bluehearts	*Buchnera americana*
American bulrush	*Scirpus americanus*

Table 4. Native Plant Species Observed on TWMA

Common name	Scientific name
American cupscale	*Sacciolepis striata*
American elm	*Ulmus americana*
American hornbeam	*Carpinus caroliniana*
American pokeweed	*Phytolacca americana*
American snowbell	*Styrax americanus*
American waterfern	*Azolla filiculoides*
American white waterlily	*Nymphaea odorata*
Anglestem beaksedge	*Rhynchospora caduca*
Anisescented goldenrod	*Solidago odora*
Annual saltmarsh aster	*Symphyotrichum subulatum*
Arrowfeather threeawn	*Aristida purpurascens*
Atamasco lily	*Zephyranthes atamasca*
Atlantic pigeonwings	*Clitoria mariana*
Atlantic St. John's wort	*Hypericum tenuifolium*
Awl-leaf arrowhead	*Sagittaria subulata*
Axilflower	*Mecardonia acuminata*
Azure blue sage	*Salvia azurea*
Bald-cypress	*Taxodium distichum*
Baldwin's eryngo	*Eryngium baldwinii*
Baldwin's flatsedge	*Cyperus globulosus*
Baldwin's spikerush	*Eleocharis baldwinii*
Ballmoss	*Tillandsia recurvata*
Balwin's milkwort	*Polygala balduinii*
Bandanna-of-the-Everglades	*Canna flaccida*
Barnyardgrass	*Echinochloa crusgalli*
Bartram's airplant	*Tillandsia bartramii*
Bartram's rosegentian	*Sabatia bartramii*
Bastard false indigo	*Amorpha fruticosa*
Bay lobelia	*Lobelia feayana*
Beach false foxglove	*Agalinis fasciculata*
Beaked panicum	*Panicum anceps*
Beaksedge	*Rhynchospora* sp.
Bearded grasspink	*Calopogon barbatus*
Beggerticks	*Bidens alba*
Big carpetgrass	*Axonopus furcatus*
Bigflower pawpaw	*Asimina obovata*
Bighead rush	*Juncus megacephalus*
Black cherry	*Prunus serotina*

Table 4. Native Plant Species Observed on TWMA

Common name	Scientific name
Blackeyed Susan	*Rudbeckia hirta*
Blackgum	*Nyssa sylvatica*
Blackroot	*Pterocaulon pycnostachyum*
Blackseed needlegrass	*Stipa avenacea*
Bladderpod	*Sesbania vesicaria*
Bladderwort	*Utricularia* sp.
Blazing star	*Liatris* sp.
Blodgett's ironweed	*Vernonia blodgettii*
Blue maidencane	*Amphicarpum muhlenbergianum*
Blue mistflower	*Conoclinium coelestinum*
Blue-eyed grass	*Sisyrinchium atlanticum*
Bluejacket	*Tradescantia ohiensis*
Bluejoint panicum	*Panicum tenerum*
Bluestem	*Andropogon* sp.
Bluetongue arrowhead	*Sagittaria lancifolia*
Bog white violet	*Viola lanceolata*
Bottlebrush threeawn	*Aristida spiciformis*
Bracken fern	*Pteridium aquilinum*
Branched hedgehyssop	*Gratiola ramosa*
Bristly greenbrier	*Smilax tamnoides*
Broomsedge bluestem	*Andropogon virginicus*
Browne's savory	*Clinopodium brownei*
Brownseed paspalum	*Paspalum plicatulum*
Bulrush	*Scirpus* sp.
Bunched beaksedge	*Rhynchospora microcephala*
Bushy bluestem	*Andropogon glomeratus*
Butterflyweed	*Asclepias tuberosa*
Butterweed	*Packera glabella*
Button rattlesnakemaster	*Eryngium yuccifolium*
Cabbage palm	*Sabal palmetto*
Calloose grape	*Vitis shuttleworthii*
Camphorweed	*Heterotheca subaxillaris*
Canadian germander	*Teucrium canadense*
Canadian horseweed	*Conyza canadensis*
Canadian rush	*Juncus canadensis*
Canadian toadflax	*Linaria canadensis*
Candy root	*Polygala nana*
Capillary hairsedge	*Bulbostylis ciliatifolia*

Table 4. Native Plant Species Observed on TWMA

Common name	Scientific name
Cardinalflower	*Lobelia cardinalis*
Carolina ash	*Fraxinus caroliniana*
Carolina basswood	*Tilia americana* var. *caroliniana*
Carolina cranesbill	*Geranium carolinianum*
Carolina desertchicory	*Pyrrhopappus carolinianus*
Carolina fimbry	*Fimbristylis caroliniana*
Carolina horsenettle	*Solanum carolinense*
Carolina laurelcherry	*Prunus caroliniana*
Carolina leafflower	*Phyllanthus caroliniensis*
Carolina lovegrass	*Eragrostis pectinacea*
Carolina ponysfoot	*Dichondra carolinensis*
Carolina redroot	*Lachnanthes caroliniana*
Carolina scalystem	*Elytraria caroliniensis*
Carolina wild petunia	*Ruellia caroliniensis*
Carolina yelloweyed grass	*Xyris caroliniana*
Carpetgrass	*Axonopus* sp.
Cat greenbriar	*Smilax glauca*
Catesby's lily	*Lilium catesbaei*
Chalky bluestem	*Andropogon virginicus* var. *glaucus*
Chapman skeletongrass	*Gymnopogon chapmanianus*
Chapman's goldenrod	*Solidago chapmanii*
Chapman's oak	*Quercus chapmanii*
Cinnamon fern	*Osmunda cinnamomea*
Climbing aster	*Symphyotrichum carolinianum*
Climbing hempvine	*Mikania scandens*
Club moss	*Lycopodium* spp.
Clustered bushmint	*Hyptis alata*
Clustered sedge	*Carex glaucescens*
Coast cockspur	*Echinochloa walteri*
Coast sandbur	*Cenchrus incertus*
Coastal lovegrass	*Eragrostis refracta*
Coastal mock vervain	*Glandularia maritima*
Coastal rosegentian	*Sabatia calycina*
Coastalplain chaffhead	*Carphephorus corymbosus*
Coastalplain flatsedge	*Cyperus cuspidatus*
Coastalplain hawkweed	*Hieracium megacephalon*
Coastalplain milkwort	*Polygala setacea*
Coastalplain spiderlily	*Hymenocallis crassifolia*

Table 4. Native Plant Species Observed on TWMA

Common name	Scientific name
Coastalplain staggerbush	*Lyonia fruticosa*
Coastalplain willow	*Salix caroliniana*
Coastalplain yelloweyed grass	*Xyris ambigua*
Coffeeweed	*Senna obtusifolia*
Combleaf mermaidweed	*Proserpinaca pectinata*
Common arrowhead	*Sagittaria latifolia*
Common blue violet	*Viola sororia*
Common buttonbush	*Cephalanthus occidentalis*
Common carpetgrass	*Axonopus fissifolius*
Common cattail	*Typha latifolia*
Common chickweed	*Stellaria media*
Common day-flower	*Commelina diffusa*
Common persimmon	*Diospyros virginiana*
Common ragweed	*Ambrosia artemisiifolia*
Common reed	*Phragmites australis*
Common wild-pine	*Tillandsia fasciculata*
Coontail	*Ceratophyllum demersum*
Coral greenbrier	*Smilax walteri*
Coral honeysuckle	*Lonicera sempervirens*
Coralbean	*Erythrina herbacea*
Cowitch vine	*Decumaria barbara*
Creeping cucumber	*Melothria pendula*
Creeping primrosewillow	*Ludwigia repens*
Creeping woodsorrel	*Oxalis corniculata*
Crossvine	*Bignonia capreolata*
Crowpoison	*Zigadenus densus*
Cutleaf eveningprimrose	*Oenothera laciniata*
Cypress witchgrass	*Dichanthelium dichotomum*
Cypresshead groundcherry	*Physalis arenicola*
Dahoon	*Ilex cassine*
Danglepod	*Sesbania herbacea*
Darrow's blueberry	*Vaccinium darrowii*
Deerberry	*Vaccinium stamineum*
Delicate everlasting	*Gamochaeta antillana*
Dense gayfeather	*Liatris spicata*
Ditch fimbry	*Fimbristylis schoenoides*
Dixie aster	*Sericocarpus tortifolius*
Dogfennel	*Eupatorium capillifolium*

Table 4. Native Plant Species Observed on TWMA

Common name	Scientific name
Dotted smartweed	*Polygonum punctatum*
Downy milkpea	*Galactia regularis*
Downy shield fern	*Thelypteris dentata*
Drumheads	*Polygala cruciata*
Dwarf huckleberry	*Gaylussacia dumosa*
Dwarf live oak	*Quercus minima*
Dwarf palmetto	*Sabal minor*
Dwarf St. John's-wort	*Hypericum mutilum*
Dwarf sundew	*Drosera brevifolia*
Earleaf greenbrier	*Smilax auriculata*
Early blue violet	*Viola septemloba*
Early paspalum	*Paspalum praecox*
Early whitetop fleabane	*Erigeron vernus*
Eastern false dragonhead	*Physostegia purpurea*
Eastern gamagrass	*Tripsacum dactyloides*
Eastern milkpea	*Galactia volubilis*
Eastern poison ivy	*Toxicodendron radicans*
Elderberry	*Sambucus canadensis*
Elliott's lovegrass	*Eragrostis elliottii*
Elliott's milkpea	*Galactia elliottii*
Elliott's sedge	*Carex elliottii*
Elliott's yelloweyed grass	*Xyris elliottii*
Fall panicgrass	*Panicum dichotomiflorum*
False daisy	*Eclipta prostrata*
False garlic	*Nothoscordum bivalve*
False hop sedge	*Carex lupuliformis*
False horehound	*Eupatorium rotundifolium*
False nettle	*Boehmeria cylindrica*
Fascicled beaksedge	*Rhynchospora fascicularis*
Fernald's beaksedge	*Rhynchospora fernaldii*
Fetterbush	*Lyonia lucida*
Fewflower milkweed	*Asclepias lanceolata*
Fimbry	*Fimbristylis* sp.
Finged nutrush	*Scleria pauciflora*
Fireweed	*Erechtites hieraciifolius*
Flatsedge	*Cyperus* sp.
Flattened pipewort	*Eriocaulon compressum*
Flattop goldenrod	*Euthamia tenuifolia*

Table 4. Native Plant Species Observed on TWMA

Common name	Scientific name
Flaxleaf false foxglove	*Agalinis linifolia*
Floating bladderwort	*Utricularia inflata*
Floating marshpennywort	*Hydrocotyle ranunculoides*
Florida bully	*Sideroxylon reclinatum*
Florida greeneyes	*Berlandiera subacaulis*
Florida hedgenettle	*Stachys floridana*
Florida hoarypea	*Tephrosia florida*
Florida hobblebush	*Agarista populifolia*
Florida jointtailgrass	*Coelorachis tuberculosa*
Florida Keys hempvine	*Mikania cordifolia*
Florida paspalum	*Paspalum floridanum*
Florida pellitory	*Parietaria floridana*
Florida reimargrass	*Reimarochloa oligostachya*
Florida scrub roseling	*Cuthbertia ornata*
Florida scrub skullcap	*Scutellaria arenicola*
Florida sunflower	*Helianthus floridanus*
Florida threeawn	*Aristida rhizomophora*
Florida tickseed	*Coreopsis floridana*
Florida yellow bladderwort	*Utricularia floridana*
Florida yelloweyed grass	*Xyris floridana*
Forked fimbry	*Fimbristylis dichotoma*
Forked rush	*Juncus dichotomus*
Fourleaf vetch	*Vicia acutifolia*
Fourpetal St. John's wort	*Hypericum tetrapetalum*
Fragrant beaksedge	*Rhynchospora odorata*
Fragrant flatsedge	*Cyperus odoratus*
Fringed meadowbeauty	*Rhexia petiolata*
Fringed yellow stargrass	*Hypoxis juncea*
Fringed yelloweyed grass	*Xyris fimbriata*
Frog's-bit	*Limnobium spongia*
Gallberry	*Ilex glabra*
Gaping panicum	*Panicum hians*
Giant bulrush	*Schoenoplectus californicus*
Giant flatsedge	*Cyperus giganteus*
Giant leather fern	*Acrostichum danaeifolium*
Giant sedge	*Carex gigantea*
Giant whitetop	*Rhynchospora latifolia*
Glade lobelia	*Lobelia glandulosa*

Table 4. Native Plant Species Observed on TWMA

Common name	Scientific name
Golden polypody	*Phlebodium aureum*
Goldenclub	*Orontium aquaticum*
Goldenrod	*Solidago* sp.
Gopher apple	*Licania michauxii*
Gopherweed	*Baptisia lanceolata*
Grassleaf lettuce	*Lactuca graminifolia*
Grassleaf rush	*Juncus marginatus*
Grassy arrowhead	*Sagittaria graminea*
Green arrow arum	*Peltandra virginica*
Green ash	*Fraxinus pennsylvanica*
Greenbriar	*Smilx* sp.
Green-fly orchid	*Epidendrum conopseum*
Greenwhite sedge	*Carex albolutescens*
Groundnut	*Apios americana*
Groundsel tree	*Baccharis halimifolia*
Gulfcoast spikerush	*Eleocharis cellulosa*
Hairawn muhly	*Muhlenbergia capillaris*
Hairy bluestem	*Andropogon longiberbis*
Hairy chaffhead	*Carphephorus paniculatus*
Hairy fimbry	*Fimbristylis puberula*
Hairy maiden fern	*Thelypteris hispidula* var. *versicolor*
Hairypod cowpea	*Vigna luteola*
Harsh verbena	*Verbena scabra*
Haspan flatsedge	*Cyperus haspan*
Hastateleaf dock	*Rumex hastatulus*
Hawkweed	*Hieracium* sp.
Hedge false bindweed	*Calystegia sepium*
Helmet skullcap	*Scutellaria integrifolia*
Hemlock witchgrass	*Dichanthelium portoricense*
Herb-of-grace	*Bacopa monnieri*
Hercules-club	*Zanthoxylum clava-herculis*
Highbush blueberry	*Vaccinium corymbosum*
Hop sedge	*Carex lupulina*
Hottentot fern	*Thelypteris interrupta*
India cupscale	*Sacciolepis indica*
Indian hemp	*Sida rhombifolia*
Indianpipe	*Monotropa uniflora*
Jack-in-the-pulpit	*Arisaema triphyllum*

Table 4. Native Plant Species Observed on TWMA

Common name	Scientific name
Juba's bush	*Iresine diffusa*
Knotgrass	*Paspalum distichum*
Knotroot foxtail	*Setaria geniculata*
Knotweed	*Polygonum* sp.
Lanceleaf rattlebox	*Crotalaria lanceolata*
Lanceleaf rosegentian	*Sabatia difformis*
Largeflower milkweed	*Asclepias connivens*
Largeflower rosegentian	*Sabatia grandiflora*
Laurel greenbrier	*Smilax laurifolia*
Laurel oak	*Quercus laurifolia*
Lax hornpod	*Mitreola petiolata*
Leather flower	*Clematis crispa*
Leavenworth's tickseed	*Coreopsis leavenworthii*
Lemon bacopa	*Bacopa caroliniana*
Lesser creeping rush	*Juncus repens*
Lesser Florida spurge	*Euphorbia polyphylla*
Licoriceweed	*Scoparia dulcis*
Lilac taassleflower	*Emilia sonchifolia*
Little bluestem	*Schizachyrium scoparium*
Little floating bladderwort	*Utricularia radiata*
Live oak	*Quercus virginiana*
Lizard's tail	*Saururus cernuus*
Lobelia	*Lobelia* sp.
Loblolly bay	*Gordonia lasianthus*
Loblolly pine	*Pinus taeda*
Long strap fern	*Campyloneurum phyllitidis*
Longleaf milkweed	*Asclepias longifolia*
Longleaf pine	*Pinus palustris*
Longleaf threeawn	*Aristida palustris*
Longleaf woodoats	*Chasmanthium laxum* var. *sessiliflorum*
Long-leaved panicgrass	*Coleataenia longifolia*
Lopsided Indiangrass	*Sorghastrum secundum*
Love vine	*Cassytha filiformis*
Low nutrush	*Scleria verticillata*
Low pinebarren milkwort	*Polygala ramosa*
Ludwigia	*Ludwigia* sp.
Lyreleaf sage	*Salvia lyrata*
Maid Marian	*Rhexia nashii*

Table 4. Native Plant Species Observed on TWMA

Common name	Scientific name
Maiden fern	*Thelypteris* sp.
Maidencane	*Panicum hemitomon*
Maleberry	*Lyonia ligustrina*
Manyflower beardtongue	*Penstemon multiflorus*
Manyflower marshpennywort	*Hydrocotyle umbellata*
Manyhead rush	*Juncus polycephalos*
Manyspike flatsedge	*Cyperus polystachyos* var. *texensis*
Marlberry	*Ardisia escallonioides*
Marsh fern	*Thelypteris palustris* var. *pubescens*
Marsh fimbry	*Fimbristylis spadicea*
Marsh flatsedge	*Cyperus pseudovegetus*
Marsh gentian	*Eustoma exaltatum*
Marsh mermaidweed	*Proserpinaca palustris*
Marsh rosegentian	*Sabatia dodecandra*
Marshpennywort	*Hydrocotyle* sp.
Maryland goldenaster	*Chrysopsis mariana*
Mexican primrosewillow	*Ludwigia octovalvis*
Michaux's cupgrass	*Eriochloa michauxii*
Mild waterpepper	*Polygonum hydropiperoides*
Millet beaksedge	*Rhynchospora miliacea*
Mistletoe	*Phoradendron serotinum*
Mock bishopsweed	*Ptilimnium capillaceum*
Mohr's thoroughwort	*Eupatorium mohrii*
Moistbank pimpernel	*Lindernia dubia*
Moonflowers	*Ipomoea alba*
Muscadine	*Vitis rotundifolia*
Myrsine	*Rapanea punctata*
Myrtle oak	*Quercus myrtifolia*
Narrowfruit horned beaksedge	*Rhynchospora inundata*
Narrowleaf blue-eyed grass	*Sisyrinchium angustifolium*
Narrowleaf cattail	*Typha angustifolia*
Narrowleaf silkgrass	*Pityopsis graminifolia*
Needle palm	*Rhapidophyllum hystrix*
Needle rush	*Juncus roemerianus*
Needlepod rush	*Juncus scirpoides*
Netleaf leather-flower	*Clematis reticulata*
Netted chain fern	*Woodwardia areolata*
Netted nutrush	*Scleria reticularis*

Table 4. Native Plant Species Observed on TWMA

Common name	Scientific name
Netted pawpaw	*Asimina reticulata*
Noyau vine	*Merremia dissecta*
Nutall's meadowbeauty	*Rhexia nuttallii*
Nutrush	*Scleria* sp.
Nuttall's thistle	*Cirsium nuttallii*
Oakleaf fleabane	*Erigeron quercifolius*
Oblongleaf twinflower	*Dyschoriste oblongifolia*
Orange milkwort	*Polygala lutea*
Pale meadowbeauty	*Rhexia mariana*
Pale smartweed	*Polygonum lapathifolium*
Panicgrass	*Panicum* sp.
Panicled ticktrefoil	*Desmodium paniculatum*
Partridge pea	*Chamaecrista fasciculata*
Partridgeberry	*Mitchella repens*
Paspalum grass	*Paspalum* sp.
Peelbark St. John's wort	*Hypericum fasciculatum*
Pennsylvania everlasting	*Gnaphalium pensylvanicum*
Peppervine	*Ampelopsis arborea*
Pickerelweed	*Pontederia cordata*
Pignut hickory	*Carya glabra*
Pine barren flatsedge	*Cyperus retrorsus*
Pinebarren frostweed	*Helianthemum corymbosum*
Pinebarren goldenrod	*Solidago fistulosa*
Pine-hyacinth	*Clematis baldwinii*
Pineland chaffhead	*Carphephorus carnosus*
Pineland daisy	*Chaptalia tomentosa*
Pineland pimpernel	*Samolus valerandi* var. *parviflorus*
Pineland raygrass goldenrod	*Bigelowia nudata* var. *australis*
Pineland water willow	*Justicia angusta*
Pinewoods fingergrass	*Eustachys petraea*
Pink purslane	*Portulaca pilosa*
Pink sundew	*Drosera capillaris*
Pinkladies	*Oenothera speciosa*
Pipewort	*Eriocaulon* sp.
Pitchfork crowngrass	*Paspalum bifidum*
Pitted stripeseed	*Piriqueta caroliniana*
Plumed beaksedge	*Rhynchospora plumosa*
Pond pine	*Pinus serotina*

Table 4. Native Plant Species Observed on TWMA

Common name	Scientific name
Pond-cypress	*Taxodium ascendens*
Poor joe	*Diodia teres*
Prairie fleabane	*Erigeron strigosus*
Prairie iris	*Iris hexagona*
Pricklypear	*Opuntia humifusa*
Primerosewillow	*Ludwigia* sp.
Primroseleaf violet	*Viola primulifolia*
Procession flower	*Polygala incarnata*
Purple bluestem	*Andropogon glomeratus* var. *glaucopsis*
Purple false foxglove	*Agalinis purpurea*
Purple passionflower	*Passiflora incarnata*
Purple thistle	*Cirsium horridulum*
Queen-devil	*Hieracium gronovii*
Queensdelight	*Stillingia sylvatica*
Rabbitbells	*Crotalaria rotundifolia*
Rabbitfootgrass	*Polypogon monspeliensis*
Rattan vine	*Berchemia scandens*
Ravenel's pipewort	*Eriocaulon ravenelii*
Red bay	*Persea borbonia*
Red buckeye	*Aesculus pavia*
Red cedar	*Juniperus virginiana*
Red chokeberry	*Pyrus arbutifolia*
Red maple	*Acer rubrum*
Red mulberry	*Morus rubra*
Redtop panicum	*Panicum rigidulum*
Resurrection fern	*Pleopeltis polypodioides* var. *michauxiana*
Rhodesgrass	*Chloris gayana*
Rice button aster	*Symphyotrichum dumosum*
Richard's yelloweyed grass	*Xyris jupicai*
Rose-of-Plymouth	*Sabatia stellaris*
Rose-rush	*Lygodesmia aphylla*
Rosy camphorweed	*Pluchea baccharis*
Rougeplant	*Rivina humilis*
Rough hedgehyssop	*Gratiola hispida*
Roughhair witchgrass	*Dichanthelium strigosum*
Roundleaf bluet	*Houstonia procumbens*
Roundpod St. John's wort	*Hypericum cistifolium*
Royal fern	*Osmunda regalis* var. *spectabilis*

Table 4. Native Plant Species Observed on TWMA

Common name	Scientific name
Ruellia	*Ruellia* sp.
Rugel's hoarypea	*Tephrosia rugelii*
Running oak	*Quercus pumila*
Rush	*Juncus* sp.
Rushfoil	*Crotonopsis linearis*
Rustweed	*Polypremum procumbens*
Rusty staggerbush	*Lyonia ferruginea*
Saltmarsh false foxglove	*Agalinis maritima*
Saltmarsh fingergrass	*Eustachys glauca*
Saltmarsh morning-glory	*Ipomoea sagittata*
Saltmarsh umbrellagrass	*Fuirena breviseta*
Saltwater falsewillow	*Baccharis angustifolia*
Sand blackberry	*Rubus cuneifolius*
Sand cordgrass	*Spartina bakeri*
Sand live oak	*Quercus geminata*
Sand violet	*Viola affinis*
Sarsaparilla vine	*Smilax pumila*
Sassafras	*Sassafras albidum*
Savannah beaksedge	*Rhynchospora debilis*
Savannah false pimpernel	*Lindernia grandiflora*
Savannah meadowbeauty	*Rhexia alifanus*
Savannah milkweed	*Asclepias pedicellata*
Savannah panicum	*Phanopyrum gymnocarpon*
Savannah sneezeweed	*Helenium vernale*
Savannah yelloweyed grass	*Xyris flabelliformis*
Saw greenbrier	*Smilax bona-nox*
Saw palmetto	*Serenoa repens*
Sawgrass	*Cladium jamaicense*
Sawtooth blackberry	*Rubus argutus*
Scaleleaf aster	*Symphyotrichum adnatum*
Scarlet rosemallow	*Hibiscus coccineus*
Scrub wild olive	*Osmanthus megacarpus*
Seaside goldenrod	*Solidago sempervirens*
Seaside primrosewillow	*Ludwigia maritima*
Semaphore thoroughwort	*Eupatorium mikanioides*
Sensitive briar	*Mimosa quadrivalvis*
Shaggy hedgehyssop	*Gratiola pilosa*
Shiny blueberry	*Vaccinium myrsinites*

Table 4. Native Plant Species Observed on TWMA

Common name	Scientific name
Shiny woodoats	*Chasmanthium nitidum*
Shoestring fern	*Vittaria lineata*
Shoreline seapurslane	*Sesuvium portulacastrum*
Shortbeak beaksedge	*Psilocarya nitens*
Shortbristle horned beakrush	*Rhynchospora corniculata*
Shortleaf gayfeather	*Liatris tenuifolia* var. *quadriflora*
Shortleaf rosegentian	*Sabatia brevifolia*
Shortleaf skeletongrass	*Gymnopogon brevifolius*
Shortleaf spikesedge	*Cyperus brevifolius*
Shortleaf yelloweyed grass	*Xyris brevifolia*
Shortspike bluestem	*Andropogon brachystachyus*
Sicklepod	*Senna obtusifolia*
Silverling	*Baccharis glomeruliflora*
Simpson's cupgrass	*Eriochloa michauxii* var. *simpsonii*
Sixangle foldwing	*Dicliptera sexangularis*
Sky flower	*Hydrolea corymbosa*
Skyblue lupine	*Lupinus diffusus*
Slash pine	*Pinus elliottii*
Slender fimbry	*Fimbristylis autumnalis*
Slender flattop goldenrod	*Euthamia caroliniana*
Slender gayfeather	*Liatris gracilis*
Slender threeseed mercury	*Acalypha gracilens*
Slender woodoats	*Chasmanthium laxum*
Slenderleaf false dragonhead	*Physostegia leptophylla*
Slim spikerush	*Eleocharis elongata*
Small butterwort	*Pinguicula pumila*
Smallflower pawpaw	*Asimina parviflora*
Smallfruit beggarticks	*Bidens mitis*
Small-leaf viburnum	*Viburnum obovatum*
Small's bogbutton	*Lachnocaulon minus*
Smutgrass	*Sporobolus indicus*
Snow squarestem	*Melanthera nivea*
Snowy milkwort	*Polygala grandiflora*
Snowy orchid	*Platanthera nivea*
Soft milkpea	*Galactia mollis*
Soft rush	*Juncus effusus* var. *solutus*
Softstem bulrush	*Scirpus validus*
Southeastern sneezeweed	*Helenium pinnatifidum*

Table 4. Native Plant Species Observed on TWMA

Common name	Scientific name
Southeastern sunflower	*Helianthus agrestis*
Southern beaksedge	*Rhynchospora microcarpa*
Southern beeblossom	*Gaura angustifolia*
Southern cattail	*Typha domingensis*
Southern crabgrass	*Digitaria ciliaris*
Southern dewberry	*Rubus trivialis*
Southern magnolia	*Magnolia grandiflora*
Southern needleleaf	*Tillandsia setacea*
Southern plantain	*Plantago virginica*
Southern sandbur	*Cenchrus echinatus*
Southern twayblade	*Listera australis*
Southern umbrellasedge	*Fuirena scirpoidea*
Southern wood fern	*Dryopteris ludoviciana*
Spadeleaf	*Centella asiatica*
Spanish boyonet	*Yucca aloifolia*
Spanish moss	*Tillandsia usneoides*
Spanish stopper	*Eugenia foetida*
Spatterdock	*Nuphar advena*
Spiked hoarypea	*Tephrosia spicata*
Spikerush	*Eleocharis* sp.
Splitbeard bluestem	*Andropogon ternarius*
Spoonflower	*Peltandra sagittifolia*
Spotted beebalm	*Monarda punctata*
Spurred butterfly pea	*Centrosema virginianum*
St. Andrew's cross	*Hypericum hypericoides*
St. John's wort	*Hypericum* sp.
St. Peter's-wort	*Hypericum crux-andreae*
Starrush whitetop	*Rhynchospora colorata*
Stiff sunflower	*Helianthus radula*
Stiff yellow flax	*Linum medium* var. *texanum*
Stinking camphorweed	*Pluchea foetida*
Strawcolored flatsedge	*Cyperus stenolepis*
String lily	*Crinum americanum*
Striped bladderwort	*Utricularia fibrosa*
Sugarberry	*Celtis laevigata*
Sugarcane plumegrass	*Saccharum giganteum*
Summer grape	*Vitis aestivalis*
Sundew	*Drosera* sp.

Table 4. Native Plant Species Observed on TWMA

Common name	Scientific name
Swamp azalea	*Rhododendron viscosum*
Swamp bay	*Persea palustris*
Swamp dock	*Rumex verticillatus*
Swamp dogwood	*Cornus foemina*
Swamp flatsedge	*Cyperus distinctus*
Swamp hornpod	*Mitreola sessilifolia*
Swamp milkweed	*Asclepias perennis*
Swamp rosemallow	*Hibiscus grandiflorus*
Swamp tupelo	*Nyssa sylvatica* var. *biflora*
Sweet everlasting	*Gnaphalium obtusifolium*
Sweetbay	*Magnolia virginiana*
Sweetgum	*Liquidambar styraciflua*
Sweetscent	*Pluchea odorata*
Switchcane	*Arundinaria gigantea*
Switchgrass	*Panicum virgatum*
Sword fern	*Nephrolepis exaltata*
Tailed bracken	*Pteridium aquilinum* var. *pseudocaudatum*
Tall elephantsfoot	*Elephantopus elatus*
Tall pinebarren milkwort	*Polygala cymosa*
Tall threeawn	*Aristida patula*
Tall yelloweyed grass	*Xyris platylepis*
Tampa mock vervain	*Glandularia tampensis*
Tapegrass	*Vallisneria americana*
Taperleaf waterhorehound	*Lycopus rubellus*
Tar flower	*Bejaria racemosa*
Tenangle pipewort	*Eriocaulon decangulare*
Thicket bean	*Phaseolus polystachios*
Thin paspalum	*Paspalum setaceum*
Thistle	*Cirsium* sp.
Threadfoot orchid	*Harrisella porrecta*
Threadleaf false foxglove	*Agalinis setacea*
Threeawn grass	*Aristida* sp.
Threesquare bulrush	*Schoenoplectus pungens*
Tievine	*Ipomoea cordatotriloba*
Toothachegrass	*Ctenium aromaticum*
Toothed midsorus fern	*Blechnum serrulatum*
Toothpetal false rein orchid	*Habenaria floribunda*
Torpedograss	*Panicum repens*

Table 4. Native Plant Species Observed on TWMA

Common name	Scientific name
Tread-softly	*Cnidoscolus stimulosus*
Treat's zephyrlily	*Zephyranthes atamasca* var. *treatiae*
Tropical flatsedge	*Cyperus surinamensis*
Trumpet creeper	*Campsis radicans*
Tuberous grasspink	*Calopogon tuberosus*
Turkey tangle fogfruit	*Phyla nodiflora*
Twoleaf watermilfoil	*Myriophyllum heterophyllum*
Vanillaleaf	*Carphephorus odoratissimus*
Variable witchgrass	*Dichanthelium commutatum*
Vetch	*Vicia* sp.
Violet woodsorrel	*Oxalis violacea*
Virginia buttonweed	*Diodia virginiana*
Virginia chain fern	*Woodwardia virginica*
Virginia creeper	*Parthenocissus quinquefolia*
Virginia dwarfdandelion	*Krigia virginica*
Virginia pepperweed	*Lepidium virginicum*
Virginia saltmarsh mallow	*Kosteletzkya pentacarpos*
Virginia willow	*Itea virginica*
Walter's groundcherry	*Physalis walteri*
Wand goldenrod	*Solidago stricta*
Wand loosestrife	*Lythrum lineare*
Warty panicgrass	*Panicum verrucosum*
Warty sedge	*Carex verrucosa*
Water cowbane	*Oxypolis filiformis*
Water hickory	*Carya aquatica*
Water horn fern	*Ceratopteris pteridoides*
Water locust	*Gleditsia aquatica*
Water oak	*Quercus nigra*
Water paspalum	*Paspalum repens*
Water pimpernel	*Samolus ebracteatus*
Water spangles	*Salvinia minima*
Water-lettuce	*Pistia stratiotes*
Waterspider false reinorchid	*Habenaria repens*
Wavyleaf aster	*Symphyotrichum undulatum*
Wax myrtle	*Myrica cerifera*
Western tansymustard	*Descurainia pinnata*
Whip nutrush	*Scleria triglomerata*
Whisk-fern	*Psilotum nudum*

Table 4. Native Plant Species Observed on TWMA

Common name	Scientific name
White crownbeard	*Verbesina virginica*
White fringetree	*Chionanthus virginicus*
White lobelia	*Lobelia paludosa*
White wild indigo	*Baptisia alba*
Whitehead bogbutton	*Lachnocaulon anceps*
Whitemouth day-flower	*Commelina erecta*
Whitetassles	*Dalea carnea*
Whitetop aster	*Oclemena reticulata*
Whored marshpennywort	*Hydrocotyle verticillata*
Widespread maiden fern	*Thelypteris kunthii*
Wild coco	*Eulophia alta*
Wild coffee	*Psychotria nervosa*
Wild olive	*Osmanthus americanus*
Wild pennyroyal	*Piloblephis rigida*
Winged loosestrife	*Lythrum alatum* var. *lanceolatum*
Winged sumac	*Rhus copallinum*
Wiregrass	*Aristida stricta* var. *beyrichiana*
Witchgrass	*Dichanthelium* sp.
Woodland lettuce	*Lactuca floridana*
Woodsgrass	*Oplismenus hirtellus*
Woolly witchgrass	*Dichanthelium scabriusculum*
Wright's beaksedge	*Rhynchospora wrightiana*
Wrinkled jointtailgrass	*Coelorachis rugosa*
Xyris	*Xyris* sp.
Yaupon	*Ilex vomitoria*
Yellow colicroot	*Aletris lutea*
Yellow flatsedge	*Cyperus flavescens*
Yellow hatpins	*Syngonanthus flavidulus*
Yellow jessamine	*Gelsemium sempervirens*
Yellow joyweed	*Alternanthera ramosissima*
Yellow milkwort	*Polygala rugelii*
Yellow nutgrass	*Cyperus esculentus*
Yellow pondlily	*Nuphar advena*
Yellow spikerush	*Eleocharis flavescens*
Yellow waterlily	*Nymphaea mexicana*
Zigzag bladderwort	*Utricularia subulata*

Table 5. Exotic Invasive Plant Species Observed on TWMA

Common name	Scientific name	FLEPPC Category
Air-potato	*Dioscorea bulbifera*	I
Alligator weed	*Alternanthera philoxeroides*	II
Arrowleaf elephant's ear	*Xanthosoma sagittifolium*	II
Bahiagrass	*Paspalum notatum*	-
Balsam pear	*Momordica charantia*	II
Bitter dock	*Rumex obtusifolius*	-
Black medick	*Medicago lupulina*	-
Brazilian pepper	*Schinus terebinthifolia*	I
Brazilian vervain	*Verbena brasiliensis*	-
Caesarweed	*Urena lobata*	I
Camphor tree	*Cinnamomum camphora*	I
Chinese tallow	*Triadica sebifera*	I
Cogon grass	*Imperata cylindrica*	I
Common sowthistle	*Sonchus oleraceus*	-
Common water-hyacinth	*Eichhornia crassipes*	I
Corn	*Zea mays*	-
Creeping oxeye	*Sphagneticola trilobata*	II
Durban crowfootgrass	*Dactyloctenium aegyptium*	II
Flamegold	*Koelreuteria elegans* subsp.*formosana*	II
Flattop mille graines	*Oldenlandia corymbosa*	-
Florida tasselflower	*Emilia fosbergii*	-
Giant reed	*Arundo donax*	-
Guava	*Psidium guajava*	I
Guineagrass	*Panicum maximum*	II
Hydrilla	*Hydrilla verticillata*	I
Indian goosegrass	*Eleusine indica*	-
Japanese climbing fern	*Lygodium japonicum*	I
Key lime	*Citrus x aurantiifolia*	-
Lantana	*Lantana camara*	I
Mariana maiden fern	*Macrothelypteris torresiana*	-
Mascarene Island leafflower	*Phyllanthus tenellus*	-
Melaleuca	*Melaleuca quinquenervia*	I
Mexican tea	*Dysphania ambrosioides*	-
Mimosa	*Albizia julibrissin*	I
Old World climbing fern	*Lygodium microphyllum*	I
Oriental false hawksbeard	*Youngia japonica*	-
Paragrass	*Urochloa mutica*	I

Table 5. Exotic Invasive Plant Species Observed on TWMA

Common name	Scientific name	FLEPPC Category
Peruvian primrosewillow	*Ludwigia peruviana*	I
Prostrate globe amaranth	*Gomphrena serrata*	-
Rosary pea	*Abrus precatorius*	I
Rose natalgrass	*Melinis repens*	I
Rough Mexican clover	*Richardia scabra*	-
Scratchthroat	*Ardisia crenata*	I
Showy rattlebox	*Crotalaria spectabilis*	-
Smooth rattlebox	*Crotalaria pallida*	-
Soldier's orchid	*Zeuxine strateumatica*	-
Sour orange	*Citrus x aurantium*	-
Spiny sowthistle	*Sonchus asper*	-
St. Augustine grass	*Stenotaphrum secundatum*	-
Strawberry guava	*Psidium cattleianum*	I
Thalia lovegrass	*Eragrostis atrovirens*	-
Threeflower ticktrefoil	*Desmodium triflorum*	-
Torpedograss	*Panicum repens*	I
Tropical bushmint	*Cantinoa mutabilis*	-
Tropical Mexican clover	*Richardia brasiliensis*	-
Tropical soda apple	*Solanum viarum*	I
Tuberous sword fern	*Nephrolepis cordifolia*	I
Vaseygrass	*Paspalum urvillei*	-
Wand mullein	*Verbascum virgatum*	-
Wax begonia	*Begonia cucullata*	II
Wild bushbean	*Macroptilium lathyroides*	II
Wild radish	*Raphanus raphanistrum*	-
Wild taro	*Colocasia esculenta*	I

2.2.1 FNAI Natural and Altered Community Descriptions

The following are the natural and altered communitiy descriptions for TWMA developed by FNAI for FWC. They have been modified for the purposes of this management plan.

Natural Communities

Baygall

Baygall is a dense evergreen hardwood forest found in seepage areas, often at the bases of sandy slopes. In TWMA, baygall occurs north of the main visitor center, downslope of scrubby flatwoods on a sand ridge. East of the visitor center and immediately north of Beehead Road is an overgrown wet flatwoods that contains baygall species in all strata. Frequent fires would have maintained this area as wet flatwoods.

At TWMA, baygall of has a mature canopy of loblolly bay, sweetbay, swamp tupelo, sweetgum, red maple, and bald-cypress. Shrubs are dominated by areas of dense fetterbush, with young loblolly bay and sweetbay saplings. Toothed midsorus fern is widespread in the groundcover.

Blackwater Stream

Blackwater streams are perennial or intermittent seasonal watercourses originating deep in sandy lowlands where extensive wetlands with organic soils function as reservoirs, collecting rainfall and discharging it slowly to the stream. The tea-colored waters of Blackwater streams are laden with tannins, particulates, and dissolved organic matter and iron derived from drainage through swamps and marshes. They generally are acidic, but may become circumneutral or slightly alkaline during low-flow stages when influenced by alkaline groundwater. Water temperatures may fluctuate substantially and are generally correlated with seasonal fluctuations in air temperature. The dark-colored water reduces light penetration and, thus, inhibits photosynthesis and the growth of submerged aquatic plants. Emergent and floating aquatic vegetation may occur along shallower and slower moving sections, but their presence is often reduced because of typically steep banks and considerable seasonal fluctuations in water level.

The TWMA contains portions of four major blackwater stream systems: St. Johns River, Taylor Creek, Jim Creek, and Tosohatchee Creek. Large sections of Jim Creek and Tosohatchee Creek flow through high quality virgin floodplain swamp characterized by large old growth bald-cypress. Vegetation in the blackwater streams at TWMA is typically very sparse, the adjacent hydric hammock, floodplain swamp and marsh providing most of the cover.

Depression Marsh

Depression marshes are typically shallow, rounded depressions in sandy substrate with herbaceous vegetation in concentric bands. Many depression marshes dry up completely during periods of low rainfall and burn when fires occur in the surrounding uplands.

Vegetation forms distinctive concentric zones due to variations in hydroperiod and water depth, which increase toward the center.

At TWMA, depression marshes are dominated by the herbaceous species sawgrass, sand cordgrass, soft rush, maidencane, prairie iris, rosy camphorweed, and pickerelweed. Trees include red maple, dahoon, sweetgum, swamp tupelo, swamp bay, slash pine, cabbage palm, and pond-cypress. Shrubs include coastalplain willow, groundsel tree, common buttonbush, swamp rosemallow, peelbark St. John's wort, wax myrtle, and climbing aster.

Dome Swamp

Dome swamps are shallow, forested wetland depressions that often have a dome-like appearance because older, taller trees grow in the central deeper water and younger, shorter trees occur along the edge. Fires frequently spread from the surrounding uplands into the swamp periphery, and occasionally spread into the interior.

Dome swamps are distributed throughout TWMA, and almost all are less than eight acres in size. Canopy composition can be dominated by pond-cypress, wetland hardwoods, or a mixture. The best examples with pond-cypress are in the western half of TWMA. The eastern dome swamps are typically dominated by red maple.

Other common canopy species include sweetgum, dahoon, sweetgum, swamp bay, swamp tupelo, laurel oak, cabbage palm, pond-cypress and American elm. Shrubs include common buttonbush, groundsel tree, fetterbush, and wax myrtle. The herbaceous layer is best developed in dome swamps with sparse overstory. Dominant herbs are sawgrass and toothed midsorus fern. Epiphytes are abundant in the canopy, and include Bartram's airplant, common wild-pine, ballmoss, southern needleleaf, air-plant, Spanish moss, and giant wild-pine.

Floodplain Marsh

Floodplain marshes are herbaceous or shrubby wetlands within the floodplain of streams and rivers and are maintained by varying fire and water regimes. Severe fires during drought periods can burn into the organic substrate, creating deeper holes in times of high water.

At TWMA, extensive floodplain marshes make up approximately the eastern third of the area. These marshes are large expanses of sand cordgrass with included deeper water areas of sawgrass. A thin canopy of red maple and cabbage palm is present only in disturbed areas. Shrubs occur primarily adjacent to hydric hammock. The most common woody species include wax myrtle, cabbage palm, and red maple. Other species include groundsel tree, common buttonbush, swamp rosemallow, swamp bay, sawtooth blackberry, coastalplain willow, bald-cypress, and American elm. Other common herbaceous species include lemon bacopa, spadeleaf, prairie iris, needle rush, lizard's tail, southern cattail, Virginia chain fern, hairawn muhly, maidencane, pickerelweed, and narrowfruit horned beaksedge.

Floodplain Swamp

Floodplain swamps occur on flooded soils along stream channels and in low spots and oxbows within river floodplains. At TWMA, floodplain swamps occur along Tosohatchee Creek, Jim Creek, and Taylor Creek. Bald-cypress, pond-cypress, swamp tupelo, Carolina ash, and water locust are typical canopy trees. The understory is sparse to moderately dense with swamp dogwood, common buttonbush, dahoon, dwarf palmetto, wax myrtle, myrsine, and cabbage palm.

The groundcover is a diverse assemblage of ferns, terrestrial wetland herbs, and aquatic emergents. The dominate herbs are giant leather fern, toothed midsorus fern, spadeleaf, giant flatsedge, prairie iris, savannah panicum, pickerelweed, narrowfruit horned beaksedge, millet beaksedge, swamp dock, lizard's tail, and hottentot fern. Epiphytes are abundant and diverse with numerous Florida butterfly orchid being noteworthy. Other epiphytes include golden polypody, resurrection fern, Bartram's airplant, ballmoss, southern needleleaf, Spanish moss, and shoestring fern. Eastern poison ivy and muscadine vines are occasional.

Hydric Hammock

Hydric hammock is a well-developed evergreen hardwood and palm forest occurring on low, flat sites where soils are saturated for much of the year and often limestone is near the surface. While species composition varies, the community generally has a closed canopy of oaks and palms, an open understory, and a sparse to moderate groundcover of grasses and ferns. Hydric hammock is extensive and covers large areas of TWMA. It typically occurs between depression marshes and flatwoods, along edges of floodplain swamps and dome swamps, in slight depressions in wet flatwoods, and most extensively along the edge of the St. Johns River floodplain. It may intergrade with shrub-dominated marshes and wet flatwoods with abundant cabbage palm.

At TWMA, hydric hammock ranges from diverse hardwood stands with well-developed understory and groundcover, through stands of cabbage palm, red cedar, and red maple, to almost monotypic stands of cabbage palm with scattered live oak. Hardwood hydric hammocks occur more frequently on sandy soil with a high organic content, whereas cabbage palm hydric hammocks appear associated with calcareous soils. Generally, the canopy and sub-canopy are dominated by live oak, cabbage palm, red maple, American hornbeam, red cedar, sweetgum, swamp bay, and slash pine. Shrubs are mainly cabbage palm, common persimmon, wax myrtle, saw palmetto, highbush blueberry, and small-leaf viburnum. Herbaceous elements include toothed midsorus fern, spadeleaf, longleaf woodoats, cypress witchgrass, woodsgrass, millet beaksedge, eastern gamagrass, white crownbeard, and Virginia chain fern. Epiphyte abundance and diversity is high. These include Florida butterfly orchid, green-fly orchid, and giant wild-pine. Golden polypody, shoestring fern, and infrequently, hand fern, can be found on cabbage palms. Vines are

plentiful and include rattan vine, earleaf greenbrier, saw greenbrier, bristly greenbrier, Eastern poison ivy, and muscadine.

Mesic Flatwoods

Mesic flatwoods is the most widespread natural community in Florida, covering the flat sandy terraces left behind by former high sea levels. Mesic flatwoods is characterized by an open canopy of tall pines and a dense, low ground layer of shrubs, grasses, and forbs. Longleaf pine is the principal canopy tree in northern and Central Florida, transitioning to predominately slash pine in south Florida. Soils are acidic, nutrient-poor, fine sands with upper layers darkened by organic matter. Drainage in this flat terrain can be impeded by a loosely cemented organic layer (spodic horizon) formed within several feet of the soil surface. The soils may be alternately xeric during dry periods, and saturated or even inundated after heavy rain events.

At TWMA, the mesic flatwoods canopy is dominated by older mature and, occasionally, old growth slash pine. Other canopy and sub-canopy trees include sweetgum, pond pine, loblolly pine, laurel oak, live oak, and cabbage palm. Longleaf pine can be found in a few areas. Common shrub species are netted pawpaw, common persimmon, gallberry, coastalplain staggerbush, wax myrtle, running oak, dwarf live oak, cabbage palm, saw palmetto, and shiny blueberry. The herbaceous layer is diverse, and includes wiregrass, blue maidencane, broomsedge bluestem, variable witchgrass, slender flattop goldenrod, Elliott's milkpea, and queensdelight. Earleaf greenbrier and muscadine are common vines.

A unique 40 acre stand of old growth slash pine occurs near the former location of the Beehead Ranch House. The large stature of the trees at this site is quite remarkable. The best examples of mesic flatwoods in TWMA occur near the western boundary where the canopy is open, the midstory relatively sparse, and there is high diversity of low shrubs and herbs. Mesic flatwoods often form a complex mosaic with wet flatwoods.

Mesic Hammock

Mesic hammock is a well-developed evergreen hardwood and/or palm forest growing on soils that are rarely inundated, but kept moist by shading and accumulation of litter. Mesic hammock may occur on “islands” of high ground within wetlands, in patches within flatwoods, on river levees, or in ecotones between wetlands and uplands. Although mesic hammock is not generally considered a fire-adapted community, some patches within a pyrogenic landscape may experience occasional low-intensity ground fires.

At TWMA, mesic hammock occurs primarily on a number of small middens adjacent to the main water courses of the St. Johns River, Jim Creek, Tosohatchee Creek, and Taylor Creek. Soils are gray sands laced with shells and shell fragments. Dominant trees are live oak, cabbage palm, red maple, sweetgum, and water oak. Sand live oak may occur mixed with live oak in more dry hammocks. Dominant shrubs are American beautyberry, common persimmon, rusty staggerbush, fetterbush, wax myrtle, saw palmetto, shiny

blueberry, and deerberry. Herbs are usually infrequent due to heavy leaf litter and canopy shading. They include longleaf woodoats, cypress witchgrass, Florida Keys hempvine, partridgeberry, bracken fern, and sarsaparilla vine. Disturbed areas may also have common ragweed, chalky bluestem, and fireweed. Epiphytes are abundant and include resurrection fern, Bartram's airplant, ballmoss, southern needleleaf, air-plant, and Spanish moss. Florida butterfly orchid occurs in more sheltered hammocks. Golden polypody and shoestring fern are commonly found on cabbage palms. Common vines include earleaf greenbrier, saw greenbrier, Eastern poison ivy, and muscadine.

River Floodplain Lake

Floodplain Lakes are shallow open water zones, with or without floating and submerged aquatic plants that are surrounded by basin swamp or floodplain swamp. They are generally permanent water bodies, although water levels often fluctuate substantially and they may become completely dry during extreme droughts. They are typically lentic water bodies occurring in confined basins or depressions. However, during floods or following heavy rains, they may exhibit decidedly lotic characteristics, flowing with the flood water or overflowing their banks into lower topographic areas. Some may even exhibit a slow perennial sheet flow, but water movement is generally so slow that lentic conditions prevail.

Floodplain lakes occur along the eastern TWMA boundary adjacent to the St. Johns River. Mud Lake occurs at the terminal end of Jim Creek in the northeast section. The lake receives flow from the creek and discharges into the St. Johns River. Only a small portion of Lake Poinsett occurs in TWMA in the extreme southeast corner. All lakes are surrounded by floodplain marsh and contain a band of aquatic emergent vegetation around the shoreline. Submersed vegetation is abundant in shallow areas. The lakes provide important feeding areas and habitat for bald eagles, ospreys, ducks, American alligators, river otters, and a variety of wading birds.

Scrub

Scrub is a community composed of evergreen, xerophytic shrubs, with or without a canopy of pines, and is found on dry, infertile, sandy ridges. Scrub communities dominated by a canopy of sand pine are usually found on the highest sandy ridgelines. The pine canopy may range from widely scattered trees with a short, spreading growth form, to tall thin trees forming a dense canopy of uniform height. Scrub is located on dry, infertile, sandy ridges which often mark the location of former shorelines.

At TWMA, scrub occupies less than ten acres in a single occurrence immediately south of the visitor center. The site supports a dense thicket of scrub oaks 10 to 15 feet tall. The canopy and sub-canopy consist of a few scattered slash pine, sand live oak, and myrtle oak. The impenetrable shrub layer includes sand live oak, myrtle oak, rusty staggerbush, Chapman's oak, laurel oak, live oak, saw palmetto, and shiny blueberry. Herbaceous

species were documented in one small area and include wiregrass, coastalplain chaffhead, narrowleaf silkgrass, and nutrush.

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, often interspersed with areas of barren white sand. Principal canopy species are longleaf pine and slash pine in northern and Central Florida. The shrub layer consists of oak species and shrubs typical of mesic flatwoods, as well as grasses and dwarf varieties of other shrubs. Scrubby flatwoods occur on slight rises within mesic flatwoods and in transitional areas between scrub and mesic flatwoods. Soils of scrubby flatwoods are moderately well-drained sands with or without an organic layer (spodic horizon).

At TWMA, the distribution of scrubby flatwoods is limited to the western property boundary around the office, shop, and staff residences. The canopy and sub-canopy include slash pine, sand live oak, and live oak. Shrubs include gallberry, rusty staggerbush, fetterbush, sand live oak, saw palmetto, shiny blueberry, and deerberry. The sparse herbaceous layer has wiregrass, coastalplain chaffhead, and bracken fern. Earleaf greenbrier is occasional.

Wet Flatwoods

Wet flatwoods occur in broad, low flatlands, often in a mosaic with these communities. They are found in the ecotones between mesic flatwoods, shrub bogs, wet prairies, dome swamps, or strand swamps. Wet flatwoods are pine forests with a sparse or absent midstory and a dense groundcover of hydrophytic grasses, herbs, and low shrubs. The relative density of shrubs and herbs varies greatly in wet flatwoods. Shrubs tend to dominate where fire has been absent for a long period or where cool season fires predominate; herbs are more abundant in locations that are frequently burned. Soils and hydrology also influence the relative density of shrubs and herbs. Soils of shrubby wet flatwoods are generally poorly to very poorly drained sands. These soils generally have a mucky texture in the uppermost horizon. Loamy sands are typical of soils in grassy wet flatwoods.

At TWMA, wet flatwoods typically have a canopy dominated by mature, and occasionally, old growth slash pine and a sub-canopy of cabbage palm. Other trees include red maple, sweetgum, pond pine, swamp bay, laurel oak, and live oak. The tall and short shrub strata include common persimmon, gallberry, wax myrtle, swamp bay, cabbage palm, and highbush blueberry. Saw palmetto may be present but usually at a low percent cover. Herbaceous species diversity is high, but herbaceous cover varies from site to site. Dominant species include blue maidencane, chalky bluestem, tall threeawn, wiregrass, toothed midsorus fern, longleaf woodoats, sawgrass, toothachegrass, hairawn muhly, rosy camphorweed, and narrowfruit horned beaksedge. Vines include earleaf greenbrier, saw greenbrier, and muscadine.

Wet flatwoods in the west portion of TWMA are dominated by mature and occasional old growth slash pine, and a significant sub-canopy of cabbage palm is often present. Shrub cover typically is less than 30% cover and dominated by wax myrtle and cabbage palm. The herbaceous layer contains a diverse assemblage of grass and forb species.

Wet flatwoods in the central and eastern portions of TWMA contain more cabbage palm in all strata and a higher percent cover of shrubs. These areas have nearly closed canopies where pines are present over the tall cabbage palms. Adjacent to floodplain marsh the canopy is dominated by cabbage palm; here the vegetation appears to be wet flatwoods succeeding into hydric hammock. Wet flatwoods also occur in somewhat linear drainages that transfer surface water from the flat lands of the west to the St Johns River floodplain.

The wet flatwoods occasionally support small patches of ground cover that are dominated by herbs, primarily in slight depressions, seepage ways, and in ecotones of depression marshes and dome swamps. These openings are characterized by patches of wiregrass, toothache grass, and a number of listed plant species including hooded pitcher plant, blueflower butterwort, yellow-flowered butterwort, and celestial lily. A unique cutthroatgrass seep occurs near the south end of Long Bluff Road. The main cutthroatgrass population covers an estimated 20 to 25 acres, and other small disjunct colonies occur in the vicinity. The main seep extends off-site onto private lands.

Altered Communities

Artificial Pond

Artificial ponds are sites that have been excavated and contain areas of open water. Numerous artificial ponds occur at TWMA. These excavated areas were generally created to provide material for road and berm construction projects. These sites could alternatively be classified as borrow pit, but due to water depth and amount, artificial pond appears to be more illustrative. The herbaceous cover in these areas is minimal or nonexistent due to the presence of deep open water.

Clearing/Regeneration

Clearing/regeneration areas are characterized as lands that have undergone anthropogenic disturbances to such an extent that they have been cleared of natural groundcover and/or natural overstory. Species composition in this habitat at TWMA is variable with pioneer species that are suited to the original natural community being common. Woody species observed include scattered wax myrtle, and slash pine. Herbaceous species are often weedy and commonly include broomsedge bluestem, dogfennel, and slender flattop goldenrod.

Developed

Developed lands are defined as check stations, ORV use areas, parking lots, buildings, maintained lawns, campgrounds, recreational, and residential areas. At TWMA, developed areas include the office area, equipment buildings, and parking lots.

Pine Plantation

Pine plantation is defined as planted pines occurring in rows and lacking a significant or diverse assemblage of groundcover/herbaceous species. A single slash pine plantation occurs in TWMA. Although the site is under a prescribed fire regime, most of the native groundcover has been lost due to past forestry practices, and leaf litter is abundant due to the high pine density. Shrubs are very sparse and generally weedy with American beautyberry, cabbage palm, sweetgum, and saw palmetto. Herbs are dominated by thistle, witchgrass, and roundleaf bluet. Muscadine is a common vine. Historically, this community would have been mesic flatwoods intermixed with small inclusions of wet flatwoods.

Spoil Area

Spoil areas are sites where dredge or spoil material is deposited and may be re-colonized by plants. One spoil island area was identified within an artificial pond at TWMA.

Utility Corridor

The TWMA is crossed by a large high voltage power line and associated right-of-way. This area also contain ditching/berms, roads and culverts. Typical shrubs include groundsel tree and wax myrtle. Common herbaceous species include bluestem, dogfennel, and slender flattop goldenrod. Vines include earleaf greenbrier and muscadine.

2.2.2 Forest Resources

Forest resources found on TWMA include mature pine stands within the natural communities of mesic flatwoods, wet flatwoods, and scrubby flatwoods. Further forest resources occur in the natural communities of floodplain swamp and hydric hammock. A small portion (~10 acres) of TWMA is in pine plantation, and is currently undergoing thinning and restoration efforts. For more information on FWC's management of the TWMA forest resources please see Section 5.8.

2.3 Fish and Wildlife Resources

The area's diverse vegetative communities provide the resources necessary to sustain a diversity of wildlife assemblages (Tables 6 - 12). Common wildlife species include white-tailed deer, wild turkey, northern bobwhite, gray squirrel, resident and migratory birds, and wading birds. Several wildlife species inhabiting TWMA are considered imperiled (endangered, threatened, or species of special concern), and rare species, including Sherman's fox squirrel, gopher tortoise, wood stork, and southern bald eagle. Additionally, in 2012, a vehicle mortality of a male Florida panther on State Road 528, 2.8 miles west of TWMA indicates that this species may occasionally occur on TWMA.

Table 6. Mammal Species Observed on TWMA

Common name	Scientific name
Bobcat	*Lynx rufus*
Cotton mouse	*Peromyscus gossypinus*
Eastern cottontail	*Sylvilagus floridanus*
Eastern mole	*Scalopus aquaticus*
Eastern spotted skunk	*Spilogale putorius*
Eastern woodrat	*Neotoma floridana*
Florida black bear	*Ursus americanus floridanus*
Golden mouse	*Ochrotomys nuttalli*
Gray fox	*Urocyon cinereoargenteus*
Gray squirrel	*Sciurus carolinensis*
Hispid cotton rat	*Sigmodon hispidus*
Marsh rabbit	*Sylvilagus palustris*
Marsh rice rat	*Oryzomys palustris*
Northern short-tailed shrew	*Blarina brevicauda*
Raccoon	*Procyon lotor*
Red fox	*Vulpes vulpes*
River otter	*Lontra canadensis*
Round-tailed muskrat	*Neofiber alleni*
Southeastern shrew	*Sorex longirostris longisrostris*
Southern flying squirrel	*Glaucomys volans*
Striped skunk	*Mephitis mephitis*
Virginia opossum	*Didelphis virginiana*
White-tailed deer	*Odocoileus virginianus*

Table 7. Bird Species Observed on TWMA

Common name	Scientific name
Acadian flycatcher	*Empidonax virescens*
American bittern	*Botaurus lentiginosus*
American black duck	*Anas rubripes*
American coot	*Fulica americana*
American crow	*Corvus brachyrhynchos*
American goldfinch	*Carduelis tristis*
American pipit	*Anthus rubescens*
American redstart	*Setophaga ruticilla*
American robin	*Turdus migratorius*
American white pelican	*Pelecanus erythrorhynchos*
Bachman's sparrow	*Peucaea aestivalis*
Belted kingfisher	*Megaceryle alcyon*
Black tern	*Chlidonias niger*
Black vulture	*Coragyps atratus*
Black-and-white warbler	*Mniotilta varia*
Black-bellied plover	*Pluvialis squatarola*
Black-bellied whistling duck	*Dendrocygna autumnalis*
Blackburnian warbler	*Setophaga fusca*
Black-crowned night-heron	*Nycticorax nycticorax*
Black-necked stilt	*Himantopus mexicanus*
Blackpoll warbler	*Setophaga striata*
Black-throated blue warbler	*Setophaga caerulescens*
Blue grosbeak	*Passerina caerulea*
Blue jay	*Cyanocitta cristata*
Blue-gray gnatcatcher	*Polioptila caerulea*
Blue-winged teal	*Anas discors*
Blue-winged warbler	*Setophaga pinus*
Boat-tailed grackle	*Quiscalus major*
Bonaparte's gull	*Chroicocephalus philadelphia*
Broad-winged hawk	*Buteo platypterus*
Brown thrasher	*Toxostoma rufum*
Brown-headed cowbird	*Molothrus ater*
Brown-headed nuthatch	*Sitta pusilla*
Canvasback	*Aythya valisineria*
Cape May warbler	*Setophaga tigrina*
Carolina chickadee	*Poecile carolinensis*
Carolina wren	*Thryothorus ludovicianus*
Caspian tern	*Hydroprogne caspia*

Table 7. Bird Species Observed on TWMA

Common name	Scientific name
Cattle egret	*Bubulcus ibis*
Cedar waxwing	*Bombycilla cedrorum*
Chimney swift	*Chaetura pelagica*
Chipping sparrow	*Spizella passerina*
Chuck-will's-widow	*Caprimulgus carolinensis*
Common grackle	*Quiscalus quiscula*
Common ground-dove	*Columbina passerina*
Common moorhen	*Gallinula chloropus*
Common nighthawk	*Chordeiles minor*
Common snipe	*Gallinago gallinago*
Common yellowthroat	*Geothlypis trichas*
Cooper's hawk	*Accipiter cooperii*
Double-crested cormorant	*Phalacrocorax auritus*
Downy woodpecker	*Picoides pubescens*
Eastern bluebird	*Sialia sialis*
Eastern kingbird	*Tyrannus tyrannus*
Eastern meadowlark	*Sturnella magna*
Eastern phoebe	*Sayornis phoebe*
Eastern screech-owl	*Megascops asio*
Eastern towhee	*Pipilo erythrophthalmus*
Eastern wood-pewee	*Contopus virens*
Fish crow	*Corvus ossifragus*
Forster's tern	*Sterna forsteri*
Glossy ibis	*Plegadis falcinellus*
Golden eagle	*Aquila chrysaetos*
Golden-crowned kinglet	*Regulus satrapa*
Grasshopper sparrow	*Ammodramus savannarum*
Gray catbird	*Dumetella carolinensis*
Gray-cheeked thrush	*Catharus minimus*
Great blue heron	*Ardea herodias*
Great crested flycatcher	*Myiarchus crinitus*
Great egret	*Ardea alba*
Great horned owl	*Bubo virginianus*
Greater yellowlegs	*Tringa melanoleuca*
Green heron	*Butorides virescens*
Green-winged teal	*Anas crecca*
Hairy woodpecker	*Picoides villosus*
Henslow's sparrow	*Ammodramus henslowii*

Table 7. Bird Species Observed on TWMA

Common name	Scientific name
Hermit thrush	*Catharus guttatus*
Herring gull	*Larus argentatus*
Hooded merganser	*Lophodytes cucullatus*
Hooded warbler	*Setophaga citrina*
Horned grebe	*Podiceps auritus*
House wren	*Troglodytes aedon*
Indigo bunting	*Passerina cyanea*
Killdeer	*Charadrius vociferus*
King rail	*Rallus elegans*
Lark sparrow	*Chondestes grammacus*
Laughing gull	*Leucophaeus atricilla*
Least bittern	*Ixobrychus exilis*
Least sandpiper	*Calidris minutilla*
Lesser scaup	*Aythya affinis*
Lesser yellowlegs	*Tringa flavipes*
Loggerhead shrike	*Lanius ludovicianus*
Long-billed dowitcher	*Limnodromus scolopaceus*
Louisiana waterthrush	*Parkesia motacilla*
Magnolia warbler	*Setophaga magnolia*
Mallard	*Anas platyrhynchos*
Marsh wren	*Cistothorus palustris*
Merlin	*Falco columbarius*
Mottled duck	*Anas fulvigula*
Mourning dove	*Zenaida macroura*
Northern bobwhite	*Colinus virginianus*
Northern cardinal	*Cardinalis cardinalis*
Northern flicker	*Colaptes auratus*
Northern harrier	*Circus cyaneus*
Northern mockingbird	*Mimus polyglottos*
Northern parula	*Setophaga americana*
Northern pintail	*Anas acuta*
Northern rough-winged swallow	*Stelgidopteryx serripennis*
Northern shoveler	*Anas clypeata*
Northern waterthrush	*Parkesia noveboracensis*
Orange-crowned warbler	*Leiothlypis celata*
Osprey	*Pandion haliaetus*
Ovenbird	*Seiurus aurocapilla*
Painted bunting	*Passerina ciris*

Table 7. Bird Species Observed on TWMA

Common name	Scientific name
Palm warbler	*Setophaga palmarum*
Pectoral sandpiper	*Calidris melanotos*
Pied-billed grebe	*Podilymbus podiceps*
Pileated woodpecker	*Dryocopus pileatus*
Pine warbler	*Setophaga pinus*
Prairie warbler	*Setophaga discolor*
Prothonotary warbler	*Protonotaria citrea*
Purple gallinule	*Porphyrio martinica*
Purple martin	*Progne subis*
Red knot	*Calidris canutus*
Red-bellied woodpecker	*Melanerpes carolinus*
Red-breasted merganser	*Mergus serrator*
Red-breasted nuthatch	*Sitta canadensis*
Red-eyed vireo	*Vireo olivaceus*
Red-headed woodpecker	*Melanerpes erythrocephalus*
Red-shouldered hawk	*Buteo lineatus*
Red-tailed hawk	*Buteo jamaicensis*
Red-winged blackbird	*Agelaius phoeniceus*
Ring-billed gull	*Larus delawarensis*
Ring-necked duck	*Aythya collaris*
Ruby-crowned kinglet	*Regulus calendula*
Ruby-throated hummingbird	*Archilochus colubris*
Sanderling	*Calidris alba*
Savannah sparrow	*Passerculus sandwichensis*
Sedge wren	*Cistothorus platensis*
Semipalmated plover	*Charadrius semipalmatus*
Sharp-shinned hawk	*Accipiter striatus*
Short-eared owl	*Asio flammeus*
Short-tailed hawk	*Buteo brachyurus*
Solitary sandpiper	*Tringa solitaria*
Solitary vireo	*Vireo solitarius*
Song sparrow	*Melospiza melodia*
Sora rail	*Porzana carolina*
Southern bald eagle	*Haliaeetus leucocephalus*
Spotted sandpiper	*Actitis macularius*
Summer tanager	*Piranga rubra*
Swainson's hawk	*Buteo swainsoni*
Swainson's thrush	*Catharus ustulatus*

Table 7. Bird Species Observed on TWMA

Common name	Scientific name
Swallow-tailed kite	*Elanoides forficatus*
Swamp sparrow	*Melospiza georgiana*
Tree swallow	*Tachycineta bicolor*
Tufted titmouse	*Baeolophus bicolor*
Turkey vulture	*Cathartes aura*
Veery	*Catharus fuscescens*
Vesper sparrow	*Pooecetes gramineus*
Virginia rail	*Rallus limicola*
Whip-poor-will	*Caprimulgus vociferus*
White-eyed vireo	*Vireo griseus*
White-throated sparrow	*Zonotrichia albicollis*
Wild turkey	*Meleagris gallopavo*
Willet	*Tringa semipalmata*
Wood duck	*Aix sponsa*
Wood thrush	*Hylocichla mustelina*
Worm-eating warbler	*Helmitheros vermivorum*
Yellow warbler	*Setophaga petechia*
Yellow-bellied sapsucker	*Sphyrapicus varius*
Yellow-billed cuckoo	*Coccyzus americanus*
Yellow-crowned night-heron	*Nyctanassa violacea*
Yellow-rumped warbler	*Setophaga coronata*
Yellow-throated vireo	*Vireo flavifrons*
Yellow-throated warbler	*Setophaga dominica*

Table 8. Amphibian Species Observed on TWMA

Barking treefrog	*Hyla gratiosa*
Bullfrog	*Lithobates catesbeianus*
Cricket frog	*Acris gryllus*
Dwarf salamander	*Eurycea quadridigitata*
Eastern narrow-mouthed toad	*Gastrophryne carolinensis*
Eastern spadefoot toad	*Scaphiopus holbrookii*
Florida chorus frog	*Pseudacris nigrita verrucosa*
Florida gopher frog	*Lithobates capito aesopus*
Florida leopard frog	*Lithobates sphenocephalus sphenocephalus*
Greater siren	*Siren lacertina*
Green treefrog	*Hyla cinerea*
Little grass frog	*Pseudacris ocularis*
Oak toad	*Anaxyrus quercicus*
Peninsula newt	*Notophthalmus viridescens piaropicola*
Pig frog	*Lithobates grylio*
Pine woods treefrog	*Hyla femoralis*
Southern toad	*Anaxyrus terrestris*
Squirrel treefrog	*Hyla squirella*
Two-toed amphiuma	*Amphiuma means*

Table 9. Reptile Species Observed on TWMA

Common name	**Scientific name**
American alligator	*Alligator mississippiensis*
Bluestripe garter snake	*Thamnophis sirtalis similis*
Broadhead skink	*Plestiodon laticeps*
Dusky pigmy rattlesnake	*Sistrurus miliarius barbouri*
Eastern coral snake	*Micrurus fulvius*
Eastern diamondback rattlesnake	*Crotalus adamanteus*
Eastern glass lizard	*Ophisaurus ventralis*
Eastern slender glass lizard	*Ophisaurus attenuatus longicaudus*
Fence lizard	*Sceloporus undulatus*
Florida box turtle	*Terrapene bauri*

Table 9. Reptile Species Observed on TWMA

Common name	Scientific name
Florida brown snake	*Storeria victa*
Florida chicken turtle	*Deirochelys reticularia chrysea*
Florida cooter	*Pseudemys peninsularis*
Florida cottonmouth	*Agkistrodon piscivorus conanti*
Florida snapping turtle	*Chelydra serpentina osceola*
Florida softshell	*Apalone ferox*
Florida water snake	*Nerodia fasciata pictiventris*
Florida worm lizard	*Rhineura floridana*
Gopher tortoise	*Gopherus polyphemus*
Green anole	*Anolis carolinensis*
Ground skink	*Scincella lateralis*
Island glass lizard	*Ophisaurus compressus*
Loggerhead musk turtle	*Sternotherus minor minor*
Peninsula ribbon snake	*Thamnophis sauritus sackenii*
Pine snake	*Pituophis melanoleucus*
Pinewoods snake	*Rhadinaea flavilata*
Red rat snake	*Elaphe guttata*
Rough green snake	*Opheodrys aestivus*
Scarlet kingsnake	*Lampropeltis triangulum elapsoides*
Six-lined racerunner	*Cnemidophorus sexlineatus*
Southeastern five-lined skink	*Eumeces inexpectatus*
Southern black racer	*Coluber constrictor priapus*
Southern ringneck snake	*Diadophis punctatus punctatus*
Striped crawfish snake	*Regina alleni*
Striped mud turtle	*Kinosternon baurii*
Yellow rat snake	*Elaphe alleghaniensis*

Table 10. Fish Species Observed on TWMA

Common name	Scientific name
American shad	*Alosa sapidissima*
Atlantic needlefish	*Strongylura marina*
Atlantic stingray	*Dasyatis sabina*
Black crappie	*Pomoxis nigromaculatus*
Blue catfish	*Ictalurus furcatus*
Bluefin killifish	*Lucania goodei*
Bluegill	*Lepomis macrochirus*
Bluespotted sunfish	*Enneacanthus gloriosus*
Bowfin	*Amia calva*
Brook silversides	*Labidesthes sicculus*
Brown bullhead	*Ameiurus nebulosus*
Chain pickerel	*Esox niger*
Channel catfish	*Ictalurus punctatus*
Clear chub	*Hybopsis winchelli*
Coastal shiner	*Notropis petersoni*
Dollar sunfish	*Lepomis marginatus*
Eastern mosquitofish	*Gambusia affinis*
Flagfish	*Jordanella floridae*
Florida gar	*Lepisosteus platyrhincus*
Gizzard shad	*Dorosoma cepedianum*
Golden shiner	*Notemigonus crysoleucas*
Golden topminnow	*Fundulus chrysotus*
Grass pickeral	*Esox americanus vermiculatus*
Lake chubsucker	*Erimyzon sucetta*
Largemouth bass	*Micropterus salmoides*
Least killifish	*Heterandria formosa*
Longnose gar	*Lepisosteus osseus*
Marsh killifish	*Fundulus confluentus*
Pugnose shiner	*Notropis anogenus*
Rainwater killifish	*Lucania parva*
Redbreast sunfish	*Lepomis auritus*
Redear sunfish	*Lepomis microlophus*
Redfin pickeral	*Esox americanus americanus*
Sailfin molly	*Poecilia latipinna*
Seminole killifish	*Fundulus seminolis*
Snail bullhead	*Ameiurus brunneus*

Table 10. Fish Species Observed on TWMA

Common name	Scientific name
Spotted bullhead	*Ameiurus serracanthus*
Spotted sunfish	*Lepomis punctatus*
Striped mullet	*Mugil cephalus*
Swamp darter	*Etheostoma fusiforme*
Tadpole madtom	*Noturus gyrinus*
Taillight shiner	*Notropis maculatus*
Threadfin shad	*Dorosoma petenense*
Warmouth	*Lepomis gulosus*
White catfish	*Ameiurus catus*
Yellow bullhead	*Ameiurus natalis*

Table 11. Invertebrate (butterfly) Species Observed on TWMA

Common name	Scientific name
Aaron's skipper	*Poanes aaroni*
American lady	*Vanessa virginiensis*
Barred yellow	*Eurema daira*
Black swallowtail	*Papilio polyxenes*
Black-winged damselfly	*Calopteryx maculata*
Brazilian skipper	*Calpodes ethlius*
Byssus skipper	*Problema byssus*
Carolina satyr	*Hermeuptychia sosybius*
Cassius blue	*Leptotes cassius*
Ceraunus blue	*Hemiargus ceraunus*
Checkered white	*Pontia protodice*
Clouded skipper	*Lerema accius*
Cloudless sulfur	*Phoebis sennae*
Common buckeye	*Junonia coenia*
Common checkered skipper	*Pyrgus communis*
Common wood nymph	*Cercyonis pegala*
Confused cloudywing	*Thorybes confusis*

Table 11. Invertebrate (butterfly) Species Observed on TWMA

Common name	Scientific name
Cuban crescent	*Anthanassa frisia*
Dainty sulfur	*Nathalis iole*
Delaware skipper	*Atrytone logan*
Dorantes longtail	*Urbanus dorantes*
Dun skipper	*Euphyes vestris*
Eastern tiger swallowtail	*Papilio glaucus*
Eufala skipper	*Lerodea eufala*
Fiery skipper	*Hylephila phyleus*
Gemmed satyr	*Cyllopsis gemma*
Georgia satyr	*Neonympha areolatus*
Giant swallowtail	*Papilio cresphontes*
Gray hairstreak	*Strymon melinus*
Great purple hairstreak	*Atlides halesus*
Great southern white	*Ascia monuste*
Gulf fritillary	*Agraulis vanillae*
Horace's duskywing	*Erynnis horatius*
Least skipperling	*Ancyloxypha numitor*
Little metalmark	*Calephelis virginiensis*
Little yellow	*Pyrisitia lisa lisa*
Long-tailed skipper	*Urbanus proteus*
Monarch	*Danaus plexippus*
Monk	*Asbolis capucinus*
Neamathla skipper	*Nastra neamathla*
Northern broken dash	*Wallengrenia egeremet*
Northern cloudywing	*Thorybes pylades*
Ocola skipper	*Panoquina ocola*
Orange sulfur	*Colias eurytheme*
Orange-barred sulfur	*Phoebis philea*
Painted lady	*Vanessa cardui*
Palamedes swallowtail	*Papilio palamedes*
Palatka skipper	*Euphyes pilatka*
Palmetto skipper	*Euphyes arpa*
Pearl crescent	*Phyciodes tharos*
Phaon crescent	*Phyciodes phaon*
Queen	*Danaus gilippus*
Red admiral	*Vanessa atalanta*
Red banded hairstreak	*Calycopis cecrops*
Red-spotted purple	*Limenitis arthemis astyanax*

Table 11. Invertebrate (butterfly) Species Observed on TWMA

Common name	Scientific name
Sachem	*Atalopedes campestris*
Silver-spotted skipper	*Epargyreus clarus*
Sleepy orange	*Abaeis nicippe*
Soldier	*Danaus eresimus*
Southern broken dash	*Wallengrenia otho*
Southern cloudywing	*Thorybes bathyllus*
Southern dogface	*Zerene cesonia*
Southern skipperling	*Copaeodes minima*
Spicebush swallowtail	*Papilio troilus*
Swarthy skipper	*Nastra lherminier*
Tawny emperor	*Asterocampa clyton*
Tawny-edged skipper	*Polites themistocles*
Tropical checkered skipper	*Pyrgus oileus*
Twin-spot skipper	*Oligoria maculata*
Variegated fritillary	*Euptoieta claudia*
Viceroy	*Limenitis archippus*
Whirlabout	*Polites vibex*
White checkered skipper	*Pyrgus albescens*
White M hairstreak	*Parrhasius m-album*
White peacock	*Anartia jatrophae*
Zarucco duskywing	*Erynnis zarucco*
Zebra heliconian	*Heliconius charithonia*
Zebra swallowtail	*Eurytides marcellus*

Table 12. Non-native Wildlife Species Observed on TWMA

Common name	Scientific name
Mammals	
Coyote*	*Canis latrans*
House mouse	*Mus musculus*
Nine-banded armadillo*	*Dasypus novemcinctus*
Feral hog	*Sus scrofa*
Birds	
European starling	*Sturnus vulgaris*
Rock dove	*Columba livia*
Reptiles	
Brown anole	*Norops sagrei*
Indo-pacific gecko	*Hemidactylus garnotii*
Amphibians	
Greenhouse frog	*Eleutherodactylus planirostris*
Cuban treefrog	*Osteopilus septentrionalis*
Fish	
Walking catfish	*Clarias batrachus*

*Native to North America

The diversity of fish species present on TWMA is high due to the variety of aquatic habitats including the St. Johns River, blackwater streams, river floodplain lake, and artificial ponds. This rich assemblage of freshwater fish species offers a wide variety of recreational fishing opportunities.

2.3.1 Integrated Wildlife Habitat Ranking System

The FWC has developed the Integrated Wildlife Habitat Ranking System (IWHRS) as a Geographic Information Systems (GIS)-based assessment tool that incorporates a wide variety of land cover and wildlife species data. The IWHRS evaluates the Florida landscape based upon the habitat needs of wildlife as a way to identify ecologically significant lands in the state, and to assess the potential impacts of management and land-use changes. The IWHRS was developed to provide technical assistance to various local, regional, state, and

federal agencies, and entities interested in wildlife needs and conservation in order to: (1) determine ways to avoid or minimize project impacts by evaluating alternative placements, alignments, and transportation corridors during early planning stages, (2) assess direct, secondary, and cumulative impacts to habitat and wildlife resources, and (3) identify appropriate parcels for public land acquisition for wetland and upland habitat mitigation purposes. The IWHRS (2009) indicates that TWMA has a high mean wildlife value of 7.7 (Figure 9).

2.3.2 Imperiled Species

For the purposes of this Management Plan, the term "Imperiled Species" refers to plant and animal species that are designated as Endangered, Threatened, or a Species of Special Concern by FWC, or that are designated as Endangered or Threatened by the U.S. Fish and Wildlife Service (Tables 13 - 14). This designation is also commonly known as "listed species."

On November 8, 2010, new threatened species rules approved by the FWC were implemented. All federally listed species that occur in Florida will now be included on Florida's list as federally-designated Endangered or federally-designated Threatened species. In addition, the state has implemented a listing process to identify species that are not federally listed, but that may be at risk of extinction. These species will be called state-designated Threatened. All previous state-designated imperiled species were grandfathered on the list and are currently undergoing status reviews. The FWC will continue to maintain a separate Species of Special Concern category until all the former imperiled species have been reviewed and those species are either determined to be state-designated Threatened or removed from the list.

2.3.3 FWC Wildlife Observations and FNAI Element Occurrences

Geographic information system data maintained by FWC (Wildlife Observations) and FNAI (Element Occurrences data usage agreement Appendix 12.6) indicate that TWMA has numerous documented occurrences of wildlife and a diverse assemblage of animal species (Figure 10).

Table 13. Imperiled Wildlife Species Occurring on TWMA

Common name	Scientific name	Status
Mammals		
Sherman's fox squirrel	*Sciurus niger shermani*	SSC
Birds		
Audubon's crested caracara	*Polyborus plancus audubonii*	FT
Black skimmer	*Rynchops niger*	SSC
Brown pelican	*Pelecanus occidentalis*	SSC
Everglade snail kite	*Rostrhamus sociabilis plumbeus*	FE
Florida sandhill crane	*Grus canadensis pratensis*	ST
Limpkin	*Aramus guarauna*	SSC
Little blue heron	*Egretta caerulea*	SSC
Red-cockaded woodpecker	*Picoides borealis*	FE
Roseate spoonbill	*Platalea ajaja*	SSC
Snowy egret	*Egretta thula*	SSC
Southeastern American kestrel	*Falco sparverius paulus*	ST
Tricolored heron	*Egretta tricolor*	SSC
White ibis	*Eudocimus albus*	SSC
Wood stork	*Mycteria americana*	FT
Reptiles		
American alligator	*Alligator mississippiensis*	FT (S/A)
Eastern indigo snake	*Drymarchon corais couperi*	FT
Gopher tortoise	*Gopherus polyphemus*	ST
Amphibians		
Gopher frog	*Lithobates capito*	SSC

Acronymn Key

FE = Federally Endangered
FT = Federally Threatened
FT (S/A) = Federally Threatened due to similarity of appearance
ST = State Threatened
SSC = State Species of Special Concern

Table 14. Imperiled Plant Species Observed on TWMA

Common name	Scientific name	Status
Blueflower butterwort	*Pinguicula caerulea*	ST
Catesby lily	*Lilium catesbaei*	ST
Celestial lily	*Nemastylis floridana*	SE
Cutthroatgrass	*Panicum abscissum*	SE
Florida butterfly orchid	*Encyclia tampensis*	CE
Giant wild-pine	*Tillandsia utriculata*	SE
Hand fern	*Ophioglossum palmatum*	SE
Hooded pitcherplant	*Sarracenia minor*	ST
Many-flowered grass-pink	*Calopogon multiflorus*	SE
Plume polypody	*Polypodium plumula*	SE
Simpson's stopper	*Myrcianthes fragrans*	ST
White squirrel-banana	*Deeringothamnus pulchellus*	FE
Yellow-flowered butterwort	*Pinguicula lutea*	ST

Acronym Key

FE = Federally endangered
SE = State endangered
ST = State threatened
CE = State commercially exploited

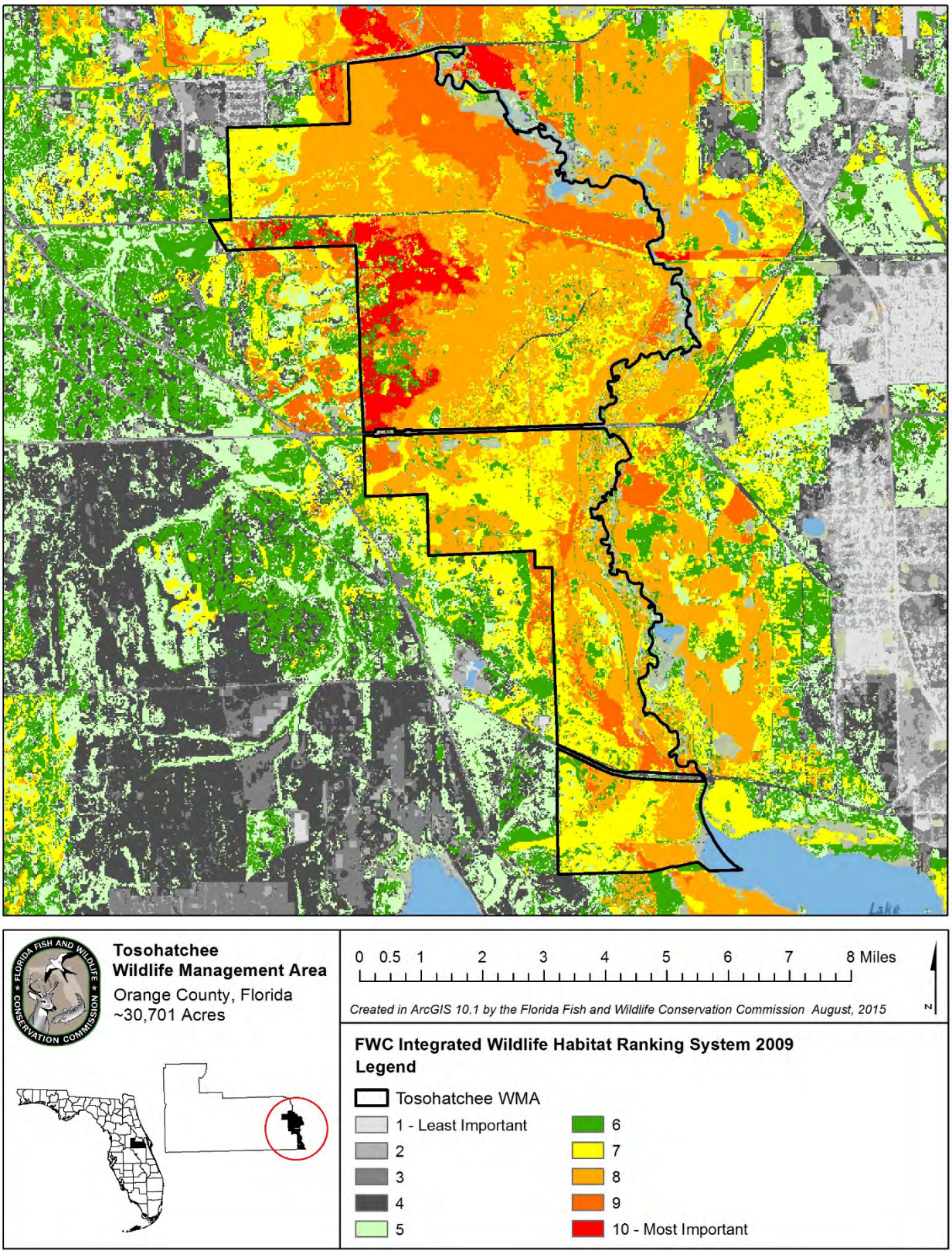

Figure 9. FWC Integrated Wildlife Habitat Ranking System 2009

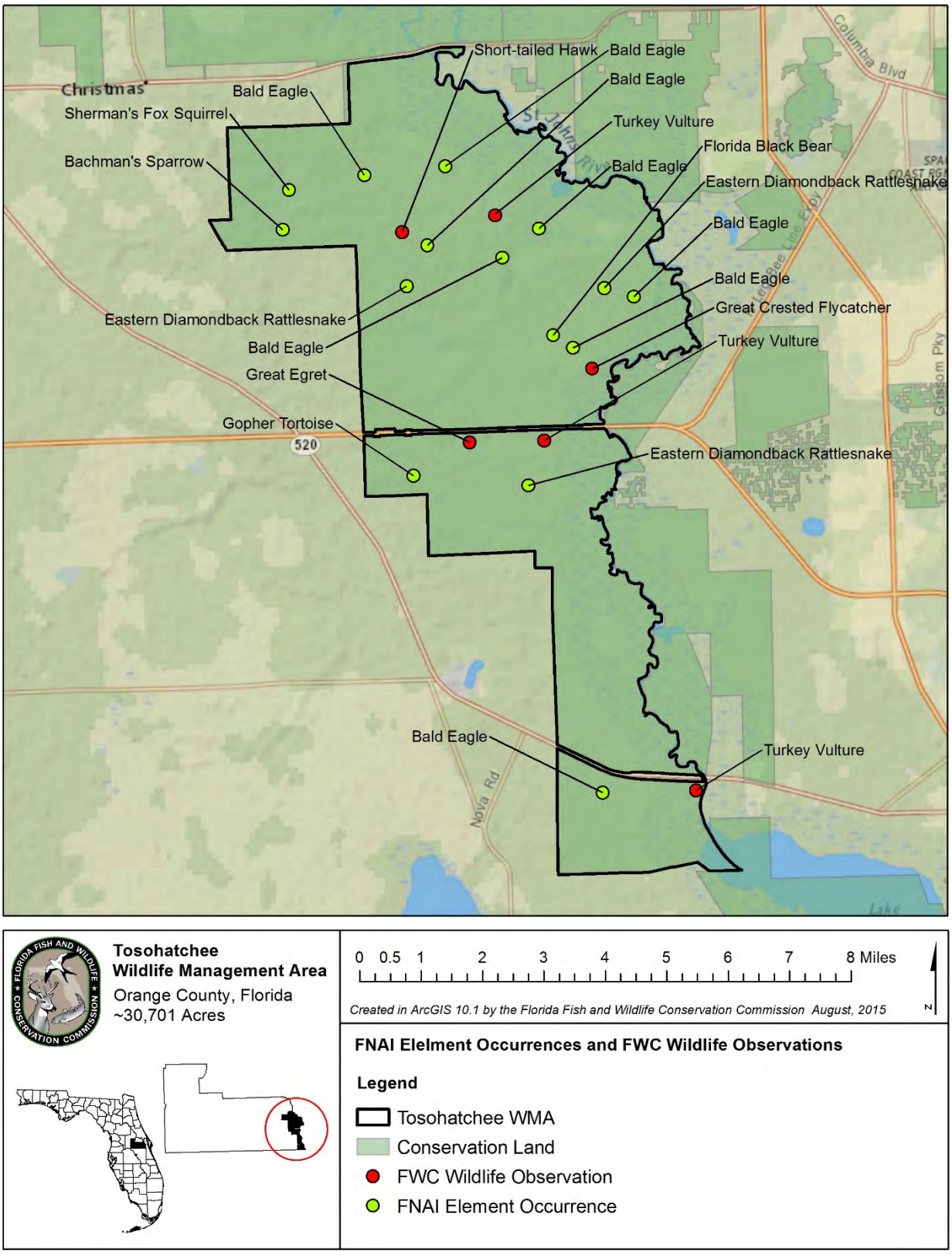

Figure 10. FNAI Element Occurrences and FWC Wildlife Observations

2.4 Native Landscapes and Scenic Resources

The principle native landscapes and scenic resources of TWMA are the area's upland and wetland habitats, as well as shoreline views of the St. Johns River and associated marshes. These native landscapes include the predominant natural communities of hydric hammock, mesic, scrubby, and wet flatwoods. Complete descriptions of the natural communities found on TWMA may be found in Section 2.2.1 of this Management Plan.

2.5 Water Resources

All surface waters of the State are classified by DEP according to designated uses as described in Chapter 62-302.44 FAC. The surface waters of TWMA are designated as Class III, and classified for fish consumption; recreation, as well as propagation and maintenance of a healthy, well-balanced population of fish and wildlife. Additionally, it is the policy of DEP to afford the highest protection to Outstanding Florida Waters (OFW) and Outstanding National Resource Waters (Chapter 62-302.700 FAC).

The entire TWMA is designated as OFW, as is the adjacent Canaveral Marshes Conservation Area, and the proximal St. Johns National Wildlife Refuge (Figure 11). No degradation of water quality, other than that allowed in subsections Chapter 62-4.242(2) and (3) FAC, is permitted in these OFW, notwithstanding any other DEP rules that may allow water quality lowering.

Riverine systems include the St. Johns River, prominent along the entire eastern boundary of TWMA, as well as 26 blackwater stream features identified and mapped by FNAI. The boundary of TWMA extends into Lake Poinsett, a river floodplain lake located at the southern end of the area. Within TWMA are also five artificial ponds. The TWMA's numerous water resources are included within the basin drainages of Bird Lake Ditches, Delespine Grant Ditch, Jim Creek, Lake Poinsett, Lake Poinsett Outlet, Second Creek, St Johns River Above Puzzle Lake, St Johns River Above Puzzle Lake (South Segment), Taylor Creek (Downstream of Reservoir), and Tootoosahatchee Creek (Figure 11).

2.6 Beaches and Dunes

There are no beaches or dunes located on TWMA.

2.7 Mineral Resources

The mineral resources of TWMA are described under Geologic Conditions (Section 2.1.4) of this Management Plan. No deposits of commercially valuable minerals (oil, gas, phosphate, or limerock) are known to occur on the area in quantities considered economically feasible to develop.

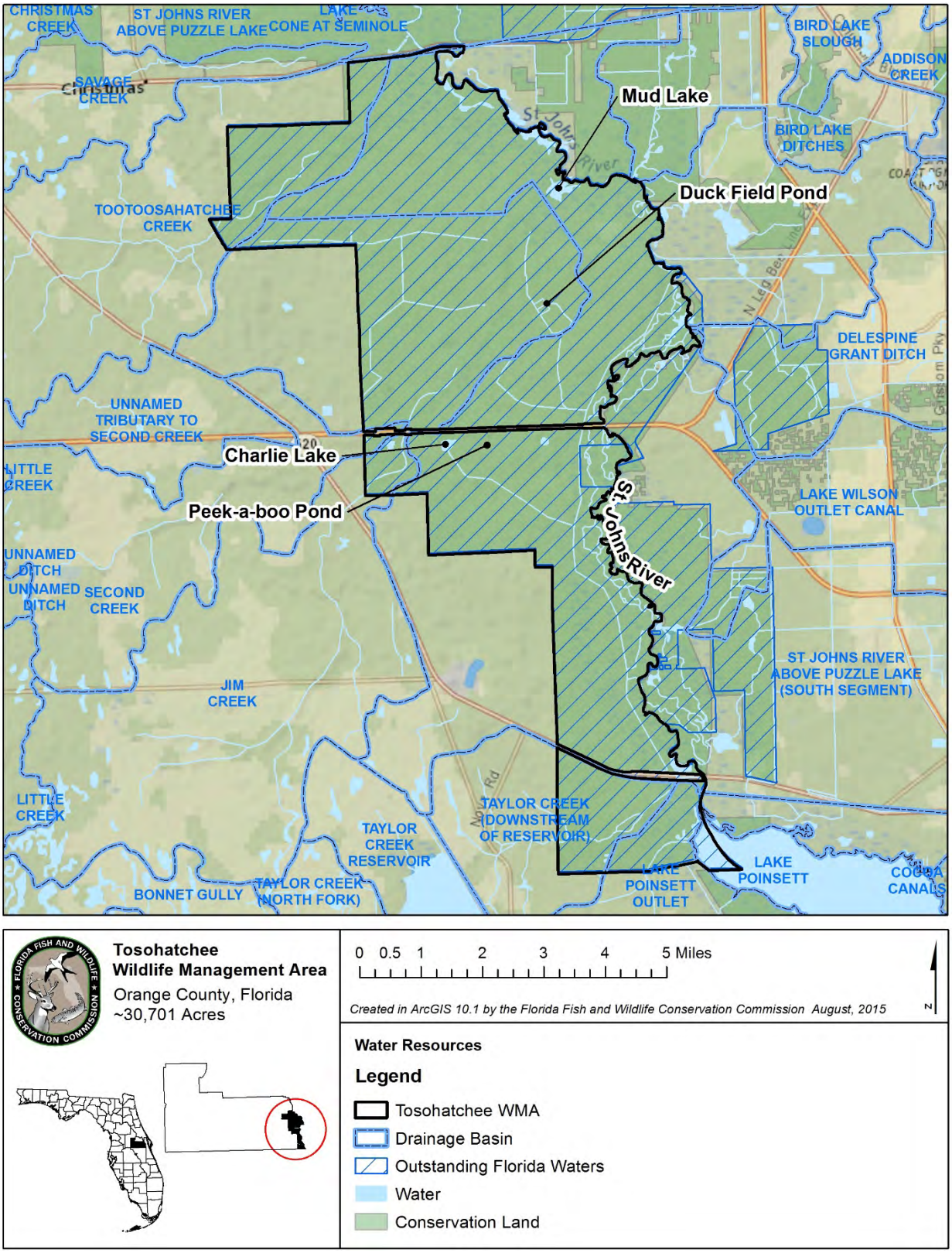

Figure 11. Water Resources

2.8 Historical Resources

The Master Site File GIS data (Appendix 12.7) maintained by the Florida Department of State's Division of Historical Resources (DHR) indicates there are 18 known historical sites (OR00432, OR00434, OR00433, OR00427, OR00006, OR00007, OR00008, OR00009, OR00010, OR00429, OR04280, OR00430, OR00437, OR00426, OR00435, OR00436, OR00428, OR00431) on TWMA, and include prehistoric middens, mounds, and a burial site. Five field surveys have been conducted on TMWA.

3 Uses of the Property

3.1 Previous Use and Development

The St. Johns culture was an archaeological culture in northeastern Florida that lasted from about 500 BC until shortly after European contact in the 17th century. The St. Johns culture was present along the St. Johns River and its tributaries, including the Ocklawaha River, and along the Atlantic coast of Florida from the mouth of the St. Johns River south to a point east of the head of the St. Johns River, near present-day Cocoa Beach, Florida.

At the time of first European contact, the St. Johns culture area was inhabited by speakers of the Timucua language and by the Mayacas. The St. Johns culture was based on the exploitation of marine and fresh water resources. Villages and camps were located close to rivers, lakes, wetlands, coastal lagoons and estuaries. During the 2000 years of the St. Johns culture, large middens of shell and other debris, sometimes covering several acres and often up to 25 feet high, accumulated throughout the region. Some existing mounds extend for as long as a half-mile along the banks of the St. Johns River.

Accordingly, prior to European settlement, the landscape of Florida had been settled and used by a variety of aboriginal peoples whose culture relied mainly on hunting, fishing, and subsistence agriculture. Though some land alteration occurred, only minor alteration of the landscape is thought to have taken place until the advent of European settlement beginning with the Spanish occupation of Florida in the sixteenth century.

Along with more advanced agricultural practices, the Spanish and other settlers brought livestock, primarily cattle and hogs, as well as horses to Florida. This began an era of broad use of the landscape for agriculture. Rangeland cattle grazing and other agricultural practices began to be utilized in a more systematic way and occurred throughout much of the central Florida peninsula through most of the European settlement era from the 16th through the 20th centuries. Use of these agricultural practices began an era of increased alteration of the natural landscape. However, it wasn't until the 19th and 20th centuries that major settlement and more extensive alteration of the landscape in the area began with the widespread use of agriculture and associated development.

Around the turn of the 19th century, like much of Florida, this landscape was subjected to heavy silvicultural and agricultural conversion. Much of the upland plant communities of the TWMA were historically an upland pine community with a somewhat more open and grassy aspect than they have today.

As noted above under Acquisition History (Section 1.3.2), more recent uses by the previous private landowners of TWMA were various. From the 1900s, the TWMA lands have served a variety of functions, including ranching and silviculture, and subsequently from 1925 to 1977 for hunting as a game reserve. The land was acquired by the State of Florida in 1977, and managed by the FPS as the WBTP until management of the area was transferred from DEP to FWC for management in 2006.

3.2 Current Use of the Property

The TWMA is being managed as a multiple-use wildlife management area. Multiple-use management strategies incorporate concerns related to wildlife, fisheries, and forest management. The area is managed in conformance with the original purposes for acquisition in order to provide a diversity of recreational opportunities that are fish and wildlife oriented, and that do not adversely impact the long-term well-being of fish and wildlife habitats and their associated wildlife populations. Provisions have been made for fish and wildlife-based public outdoor educational and recreational opportunities that are compatible with the original purposes for acquiring the TWMA.

Because TWMA is managed for the conservation and protection of fish and wildlife habitat and fish and wildlife based public outdoor recreation, a wide range of operational and resource management actions are conducted each year including: prescribed burning; wildlife habitat restoration and improvement; invasive exotic species maintenance and control; road repairs and maintenance; imperiled species management, monitoring and protection; facilities and infrastructure maintenance and repair; conservation acquisition and stewardship activities; archeological and historic resources monitoring and protection; and research related activities.

The current and anticipated resource uses of the property are diverse. Hunting continues to be a popular recreational activity on TWMA. The FWC administers hunts in the fall and spring for various game species including small game, deer, turkey, and feral hogs, which account for more than half of the user-days.

The area also offers excellent opportunities for bird watching, especially for wading birds and seasonal migratory species. The diversity of vegetation not only harbors a variety of bird species, but also provides good opportunities for mammalian wildlife viewing. Other uses include hiking, photography, biking, sightseeing, camping, and horseback riding.

3.3 Visitation and Economic Benefits

Due to the proximity of population centers in Orange County, public use can be expected to increase as public awareness of opportunities increases. For fiscal year 2014 - 2015, annual use of TWMA was estimated to be greater than 30,631 user-days for all activities combined.

Visitation and public use of the area for fish and wildlife based public outdoor recreational opportunities is the primary source of economic benefits from TWMA, and contribute to the overall economy for the central region of Florida. Primarily, as a result of this visitation and use of the area, FWC economic analysis estimates indicate that the TWMA generated an estimated annual retail sales economic benefit of $3,499,592 for the State and the central Florida region. This estimated annual retail sales economic impact has aided in the support or creation of an estimated 61 jobs.

Further revenue generating potential of the TWMA will depend upon future uses described in this Management Plan. Additional revenue from environmental lands such as the TWMA might include sales of various permits and recreational user fees and ecotourism activities, if such projects could be feasibly developed. The annual area regulations can be consulted to clarify the necessary and required permits, fees, and regulations. Additionally, the long-term value of ecosystem services, including the protection of air and water quality functions, are considered to be significant to local and regional land and water resources, as well as human health.

3.4 Single- or Multiple-use Management

The TWMA will be managed under the multiple-use concept as a Wildlife Management Area. The TWMA will provide fish and wildlife resource based public outdoor recreation and educational opportunities, while protecting the natural and historical resources found on the area. Any natural and historical resources of TWMA will be managed under the guidance of ARC, the Conceptual State Lands Management Plan, and as outlined in the original purposes for acquisition.

3.4.1 Analysis of Multiple-use Potential

The following actions or activities have been considered under the multiple-use concept as possible uses to be allowed on TWMA. Uses classified as “Approved” are considered to be in accordance with the purposes for acquisition, as well as with the Conceptual State Lands Management Plan, and with the FWC agency mission, goals and objectives as expressed in the Agency Strategic Plan (Appendix 12.8). Uses classified as "Conditional" indicate that the use may be acceptable but will be allowed only if approved through a process other than the management plan development and approval process (e.g., special-use permitting, managed-area regulation and rule development). Uses classified as “Rejected” are not

considered to be in accordance with the original purpose of acquisition or one or more of the various forms of guidance available for planning and management:

	Approved	Conditional	Rejected
Apiaries		✓	
Astronomy		✓	
Bicycling		✓	
Cattle grazing			✓
Citrus or other agriculture			✓
Ecosystem services and maintenance	✓		
Ecotourism		✓	
Environmental Education	✓		
First-responder training		✓	
Fishing		✓	
Geocaching		✓	
Hiking	✓		
Horseback riding		✓	
Hunting		✓	
Linear facilities			✓
Military training		✓	
Preservation of historical resources	✓		
Primitive camping		✓	
Protection of imperiled species	✓		
Off-road vehicle use			✓
Shooting sports park	✓		
Soil and water conservation	✓		
Timber harvest		✓	
Wildlife observation	✓		

3.4.2 Incompatible Uses and Linear Facilities

Consideration of incompatible uses and linear facilities on TWMA are made in accordance with the requirements of Section 253.034(10) FS, and other applicable Florida constitution, statute, rule, and policy requirements, as well as other provisions governing applications for proposed incompatible uses or linear facilities on state-owned conservation lands. Upon approval and implementation of this management plan, any proposed future uses that have been classified herein as Rejected, or other proposed future uses that are determined to be incompatible with the purposes of acquisition or other management authorizations and guidance, will be forwarded for review and approval consideration to the DEP-DSL, the ARC and the Board of Trustees prior to any incompatible use or linear facility being considered for authorization on TWMA.

3.4.3 Assessment of Impact of Planned Uses of the Property

To communicate FWC's planned uses and activities, specific management intentions, long- and short-term goals and with associated objectives, identified challenges, and solution strategies have been developed for TWMA (Sections 5 - 7). A detailed assessment of the benefits and potential impacts of planned uses and activities on natural and historical resources was an integral part of the development of the management activities and intent, goals, objectives, challenges, and strategies sections of this Management Plan.

3.5 Acreage Recommended for Potential Surplus Review

On conservation lands where FWC is the lead manager, FWC evaluates and identifies recommended areas for a potential surplus designation by DSL, ARC, and the Board of Trustees. This evaluation consists of GIS modeling and analysis, aerial photography interpretation, analysis of fish and wildlife resources, a review of resource and operational management needs, and a review of public access and recreational use of the area. Also, FWC considers recommendations for surplus lands as they relate to Florida's "No Net Loss of Hunting Lands" legislation (Ch. 379.3001 F.S.), as well as surplus restrictions for lands acquired through the Federal Aid in Wildlife Restoration Act (Pittman-Robertson) or through other federal grant programs.

The evaluation of TWMA by FWC has determined that all portions of the area are being managed and operated for the original purposes of acquisition, and remain integral to the continued conservation of important fish and wildlife resources, and continue to provide quality fish and wildlife resource based public outdoor recreational opportunities. Therefore, no portion of the TWMA is recommended for potential surplus review.

4 Accomplished Objectives from the Florida Department of Environmental Protection's William Beardall Tosohatchee State Reserve Management Plan 2003 - 2013

This section is dedicated to reporting the extent to which the Objectives described in the DEP WBTSR Plan 2003 - 2013 were successfully completed. Accomplishments for TWMA during the previous planning timeframe are further discussed in more comprehensive detail throughout Section 5, Management Activities and Intent of this Management Plan. The following Resource Management Goals and Objectives from the 2003 - 2013 TWMA Management Plan describe the planned activities for TWMA during this period. The degree to which FWC was able to accomplish the planned activities during this period is reflected as Percent Accomplished for each associated Objective.

Resource Management Goals and Objectives 2003 - 2013	Percent Accomplished
Natural Resources	
1. Protect, restore, and maintain natural hydrological regimes.	
A. Continue hydrologic restoration of canals, levees, and roadside ditches. *Comment: All planned mitigation projects have been completed and are being monitored. No additional projects are identified at this time.*	100%
B. Continue to install culverts under roadways to improve hydrologic sheet flow and access for management activities. *Comment: Current culvert placements are functioning well and are being replaced as they deteriorate with age.*	100%
C. Continue to seek ways to fund the replacement of the St. Nicholas bridge with a low water crossing. *Comment: A low water crossing was determined to be unfeasible and multiple large culverts were used to replace the bridge during mitigation project.*	100%
2. Design and implement restoration of highly altered communities or areas.	
A. Develop a community restoration plan for pine flatwoods that uses timber management as a tool to restore an uneven-aged pine stand while also restoring the understory and ground cover strata. *Comment: An objective to develop a Forest Resource Management Plan that addresses uneven aged management as well as overall forest management will be included in the updated management plan.*	0%
3. Establish and maintain prescribed fire program.	
A. Continue and increase efforts to restore fire type communities with emphasis on growing season burns. *Comment: A prescribed fire program has been implemented on the area and it is ongoing. To date, it has accomplished prescribed fire objectives for the area. Growing season fires are used to the greatest extent possible allowed by environmental conditions.*	100%
4. Establish and maintain invasive exotic plant species removal program.	
A. Continue to remove exotic plants, with special emphasis on Brazilian pepper and cogon grass. *Comment: An exotics species program has been implemented on the area that employs OPS staff dedicated to exotic plant species treatments. In addition, approximately $500,000 in grant funding has been received and expended to contract for exotic plant species treatment over the last seven years.*	100%
5. Establish and maintain destructive exotic animal species removal program.	

Resource Management Goals and Objectives 2003 - 2013	Percent Accomplished
A. Continue to use special hog hunts as a tool to remove feral hogs. *Comment: Hog hunting seasons continue to be offered on the area and have been increased through the offering of modified weekday hunts to allow walk-ins to increase participation.*	100%
6. Protect, restore, and maintain native plant and animal diversity, and natural relative abundance.	
A. Acquire inholdings and additions that would add to diversity of the reserve and improve management. *Comment: FWC has been unable to pursue land acquisitions due to the lack of funding. If funding for land acquisition is appropriated, FWC will evaluate its statewide acquisition priorities which will include potential acquisitions on this and other FWC management units. In addition, FWC will develop an Optimal Conservation Planning Boundary (OCPB) as a part of the updated management plan and will consider nominating additional parcels for inclusion on the FWC Florida Forever Inholdings and Additions Acquisition List as part of the TWMA OCPB development and implementation process.*	0%
B. Monitor and track species of special concern, with emphasis on hand fern and pitcher plants. *Comment: Surveys for hand fern, pitcher plant, cut-throat grass, Bachman's sparrow and gopher tortoise have been conducted, and appropriate monitoring protocols for these species have been established and implemented.*	100%
C. Continue ongoing flora and fauna surveys to identify new plant and animal species. *Comment: Staff continue to survey, identify and document plant and animal species on the area. In addition, the Native Plant Society conducts quarterly assessments, and the North American Butterfly Association does monthly surveys on the area. Recent documentations and new additions to the area's species lists include 24 plants, 11 butterfly, 11 amphibians and reptiles, four birds, and four mammal species.*	100%
7. Protect natural resources from unacceptable levels of impact caused by park visitors and outside influences as determined by the Division.	
A. Review proposals affecting hydrology, land use, and development outside of park boundaries and support efforts that establish or maintain zoning, land use, and water use policies that facilitate protection of park resources. *Comment: FWC will continue to review proposed land use changes outside of TWMA.*	100%
Cultural Resources	

Resource Management Goals and Objectives 2003 - 2013	Percent Accomplished
Identify, protect, and interpret existing cultural sites and their associated artefactual assemblage from vandalism, erosion, and other forms of encroachment.	
A. Develop and implement a written plan to protect and preserve the recorded archaeological sites from erosion, slumpage, animal burrowing, root damage and tree fall, and vandalism. *Comment: In consultation with the DHR, FWC determined that it was more appropriate to implement DHR's Management Procedures for Archaeological and Historical Sites and Properties on State-Owned or Controlled Properties, rather than develop an independent plan management of archaeological resources. FWC will continue to work with DHR to protect and preserve archaeological sites on the area. .*	0%
B. Establish measures to monitor recorded sites for erosion, vegetation intrusion, and animal and human disturbances. *Comment: FWC will work with DHR to identify appropriate monitoring protocols.*	50%
C. Complete archaeological reconnaissance survey of the Reserve using GPS technology. *Comment: DEP staff located and documented GPS locations for the majority of the area's archaeological sites prior to management of the area being transferred to FWC.*	100%
D. Interpret the Reserve's cultural resources in their context to educate visitors about the Reserve and area prehistory and history through interpretive signs and programs. *Comment: In consultation with DHR, FWC has developed interpretive material and signage for the area's archaeological resources.*	100%
E. Improve public awareness and encourage protection and stewardship of the Reserve's cultural resources through education, interpretation, and enforcement of agency rules and regulations. *Comment: Ongoing.*	100%
F. Seek grant funding for a research project to document the history of the Reserve and surrounding area. *Comment: FWC developed a written history of TWMA as part of its Recreation Master Plan development.*	100%
Recreation	
9. Continue to provide quality resource based outdoor recreational and interpretive programs and facilities at the state reserve.	

Resource Management Goals and Objectives 2003 - 2013	**Percent Accomplished**
A. Maintain a system of trails for hiking, bicycling, horseback riding and scenic driving as hydrological conditions permit. When feasible, re-route trails made unusable by hydrologic restoration. *Comment: A dedicated horse trail has been developed. Also, almost all of the area's public access roads were substantially improved through capping of the roads with limerock, allowing improved vehicular access to the area except during extreme weather events.*	100%
B. Continue to provide recreational hunting opportunities for public recreation and as a management tool. *Comment: Ongoing.*	100%
C. Continue to provide primitive camping opportunities. *Comment: Existing campsites continue to be maintained and new toilet facilities, pavilions and picnic tables have been added to improve camping opportunities on the area.*	100%
D. Continue to provide access to preserve waters and shorelines for fishing, canoeing and kayaking. *Comment: A new fishing dock was constructed on Lake Charlie and boating access to the St. John River has been improved.*	100%
10. Seek funding to expand recreational and interpretive opportunities through the improvement of programs and the development of new use areas and facilities, as outlined in this management plan.	
A. Expand hiking opportunities with two interpretive loop trails. One of these trails will be designed and constructed for universal accessibility. *Comment: Two interpretive loop trails have been developed but are currently not universally accessible. FWC provides accessibility information regarding the character of the trails to trail users and will continue to evaluate the ADA accessibility on the area's trails.*	100%
B. Provide additional fill, stabilization and road culverts to improve visitor access during wet periods of the year. *Comment: Approximately$250,000 was expended to improve the area's public access roads through capping with limerock and through the replacement and enhance maintenance of road culverts to provide improved vehicular access to the area.*	100%
C. Continue to evaluate ways to increase recreational activities at the reserve. *Comment: Recreation Master Plan and Visitor Guides have been completed for the area. In addition, FWC has added two vault toilets, three pavilions and one flush toilet facility to improve camping opportunities. Also, road and trail signage have been increased to aid user navigation on the area.*	100%

Resource Management Goals and Objectives 2003 - 2013	Percent Accomplished
Park Administration/ Operations	
11. Provide efficient and effective management of park resources and facilities while maintaining a high level of visitor service.	
A. Seek funding for two park ranger positions to assist with natural community and hydrological restoration, prescribed burning, control of exotics, resource protection, interpretation and management. *Comment: FWC added three FTE positions (two Fish and Wildlife Technicians and one Wildlife Biologist) for enhanced management of the area.*	100%
B. Assign a park patrol officer to the state reserve. *Comment: FWC continues to provide Law Enforcement for the area through ongoing patrols and other ongoing law enforcement activities.*	0%
C. Continue inter-agency coordination of resource management activities with co-managing agencies. *Comment: FWC continues to coordinate and cooperate with the DEP, DHR, FFS, SJRWMD, and natural resource agencies on the management of the area.*	100%
D. Seek funding for permanent staff residence. *Comment: FWC continues to seek funding to develop a staff residence on the area. To date funding has not been appropriated.*	100%
E. Assure compliance with Division, state and federal safety guidelines and training requirements by providing training in visitor services, park information, and emergency procedures. *Comment: FWC continues to train staff with emergency and visitor service training and complies with state and federal safety guidelines.*	100%
F. Maintain high maintenance standards and conduct routine safety inspections to provide clean and safe facilities and use areas. *Comment: The area's facilities continue to be maintained in accordance with professional facility maintenance standards.*	100%
G. Recruit and maintain volunteer support to assist park staff with the maintenance of park facilities, protection of park resources and implementation of park programs. *Comment: FWC continues to engage several volunteer organizations and individuals to assist with management of the area by conducting plant surveys and trail maintenance.*	100%
H. Maintain effective park boundaries through fencing and posting. Patrol the park boundary to monitor and discourage trespassing. *Comment: The area's boundary posting is maintained and inspected regularly.*	100%

Resource Management Goals and Objectives 2003 - 2013	Percent Accomplished
H. Maintain an active public relations program that increases public awareness of and support for the resource management objectives of the park. *Comment: FWC staff have developed new interpretive material and signage for the area.*	100%

5 Management Activities and Intent

The following section provides a description of agency plans to locate, identify, protect, preserve or otherwise use fragile natural resources and nonrenewable historical resources. In general, the FWC management intent for TWMA is to restore and maintain natural communities in a condition that sustains ecological processes and conserves biological diversity, especially fish and wildlife resources. In conjunction with this primary emphasis, it is FWC's intent to provide quality fish and wildlife resource based public outdoor recreational opportunities on TWMA. The FWC will utilize the best available data, guidelines, natural resource management practices, and recreational management practices to achieve these outcomes in accordance with the original purposes for acquisition. Furthermore, as noted earlier, the management activities described in this section are in compliance with those of the Conceptual State Lands Management Plan.

5.1 Land Management Review

The 2015 LMR Report for TWMA (Appendix 12.4) found that FWC was managing the area in accordance with the purpose(s) of acquisition. The recommendations of the LMR were considered and addressed in the development of this Management Plan, including development of management intent language, goals and objectives, identification of management challenges and development of solution strategies (Sections 5 - 7).

5.2 Adaptive Management

Adaptive management is "learning by doing"[1]; it is the adjustment or modification of conservation actions to achieve a desired conservation goal. In practice, adaptive management is a rigorous process that includes sound planning and experimental design with a systematic evaluation process that links monitoring to management.[1, 2] Adaptive management requires flexibility for implementation, but should be fitted over a fundamentally sound, well-planned design.

An adaptive management process produces the strongest inference and most reliable results when experimental design components are incorporated into the monitoring process. Adaptive management is most rigorously applied in an active format when components of experimental design (i.e., controls, replication, and randomization) are included in the monitoring process.[2, 3] Incorporating valid statistical analyses of results will further

enhance the value of the adaptive management process. However, in some situations, rigorous experimental design procedures can be relaxed without invalidating monitoring results. In a passive format, adaptive management can involve applying a conservation action at a site, observing the results and adjusting the action in the future if warranted. [2, 3]

Proposed adaptive management, monitoring and performance measures are developed through literature reviews and FWC staff meetings. Overall, a results-based approach is incorporated into this Management Plan, for which effective monitoring is an integral component. The FWC will monitor conservation actions, species, habitats, and major threats to the conservation of the natural and historical resources of TWMA.

5.2.1 Monitoring

A well-developed monitoring protocol is also one of the principal, required criteria for the management of TWMA. Monitoring and performance measures are important, but often overlooked elements of conservation planning. Monitoring provides the critical link between implementing conservation actions and revising management goals.

Monitoring is the systematic, repeated measurement of environmental characteristics to detect changes, and particularly trends, in those characteristics. Monitoring provides essential feedback, the data needed to understand the costs, benefits, and effectiveness of planned conservation actions and the management projects undertaken to address them.[2]

For natural communities, monitoring protocols are established through FWC's Objective-Based Vegetation Management (OBVM, Section 5.3.1) program, which monitors how specific vegetative attributes are responding to FWC management. For imperiled and focal fish and wildlife species, monitoring protocols are established through FWC's Wildlife Conservation Prioritization and Recovery (WCPR, Section 5.4.2) program. FWC staff may monitor additional fish and wildlife species when deemed appropriate. Exotic and invasive plant and animal species (Section 5.5) are also monitored as needed and appropriate. Recreational uses are monitored through FWC's Public Access and Wildlife Viewing program, and work in conjunction with the establishment and adjustment of public access carrying capacities (Section 5.6.3). Historical resources (Section 5.9) are monitored with guidance from the DHR.

5.2.2 Performance Measures

Performance measures include qualitative or quantitative measures used to provide an estimate or index of the characteristic of interest, and to chart the overall progress of conservation actions towards specific goals. Successful monitoring programs and their associated performance measures provide natural resource professionals with valuable feedback on the effectiveness of conservation actions and make it possible to implement a more flexible adaptive management approach. An adaptive management approach ultimately will be more efficient and effective when it tracks inputs, incorporates an

effective monitoring program that integrates performance measures, and evaluates results against desired goals.

5.2.3 Implementation

The TWMA Management Plan serves as the guiding framework to implement this adaptive management process. It serves as the underpinning for the integration of management programs (OBVM, WCPR, Public Access and Wildlife Viewing, Recreation Master Plans, etc.) underway to accomplish needed conservation actions that are planned to manage the natural resources of TWMA, and resolve conservation threats to fish and wildlife and the habitats they occupy. Based on evaluations of project results, the conservation actions are revised as necessary, and the adaptive management process is repeated.

5.3 Habitat Restoration and Improvement

On TWMA, FWC will focus on managing for native habitat diversity, emphasizing maintenance of high-quality natural communities, and restoration of disturbed areas. Restoration may be achieved on disturbed areas by the re-introduction of fire, restoring historic hydrological conditions and/or the use of mechanical or chemical forest management techniques as appropriate. Retention of the native old growth component of forests, while also providing for natural regeneration, remains an important consideration. The TWMA has high-quality native communities that FWC will continue to manage and protect, including baygall, blackwater stream, depression marsh, dome swamp, floodplain marsh, floodplain swamp, hydric hammock, mesic flatwoods, mesic hammock, scrub, scrubby flatwoods, and wet flatwoods. On disturbed upland sites, FWC intends to initiate ground cover and natural community restoration.

As described above, FNAI has conducted surveys and mapped the current vegetative communities and historic vegetation communities on TWMA for FWC. This information will be used to guide and prioritize management and restoration efforts on the area.

5.3.1 Objective-Based Vegetation Management

The FWC uses a comprehensive resource management approach to managing FWC-managed areas. Restoring the form and function of Florida's natural communities is the foundation of this management philosophy. The FWC uses OBVM to monitor how specific vegetative attributes are responding to FWC management.

The first step in implementing OBVM is to map the current, and in most cases the historic natural communities, on the managed area using the FNAI Natural Community Classification. The FWC contracts with FNAI to provide these mapping services, and plans to have natural community maps recertified on most areas on a five-year basis. A natural community, as defined by FNAI, is a distinct and recurring assemblage of populations of plants, animals, fungi and microorganisms naturally associated with each other and their physical environment.

After natural communities have been mapped, management units are delineated. Delineating management units takes into account the distribution and extent of the current and/or historic mapped natural communities, existing and proposed infrastructure, and other management considerations. The FWC land managers then identify the predominant current or historic natural community within each management unit that guides the type and frequency of management activities that should be applied. Through OBVM monitoring, FWC collects data on a number of specific vegetation attributes that provide insight about the condition of the natural community. Because FWC is interested in the overall effect of management on the natural communities, OBVM data is analyzed at the natural community level.

Measurable habitat management objectives referred to as 'desired future conditions' are established for each actively managed natural community. Desired future conditions are the acceptable range of values for quantifiable vegetation attributes, such as basal area, shrub height and cover, and ground cover. The FWC collaborated with the FNAI to identify 'reference sites' for each actively managed natural community and applied the OBVM monitoring methodology at these reference sites to determine what attribute values occur in a high-quality community (http://www.fnai.org/reference-natural-communities.cfm). FWC staff considers the reference site attribute values when setting area-specific desired future conditions for natural communities.

Vegetation monitoring samples the selected attributes, with the results being compared to the established desired future conditions. All monitoring performed under OBVM is completed using the program's Standard Operating Procedures.

Consistent, long-term monitoring of managed natural communities will quantify changes in habitat conditions, provide information on the cumulative effects of management activities, and measure progress towards meeting management objectives for desired habitat conditions. Measured changes in vegetation condition are intended to be used to inform future land management actions.

Initial mapping and vegetation sampling on TWMA and other FWC areas provides FWC staff with baseline data indicating natural community structure, distribution, and condition on the area. OBVM Management Units and associated monitoring protocols have been established for TWMA. Comparing the subsequent monitoring results on TWMA and other areas to desired future conditions, provides important operational information on a natural community's vegetation structural status at a given point in time and trend over time. Using this information, managers can evaluate, adjust and modify their management practices to meet the stated objectives. By comparing natural community mapping products for TWMA and other areas through the years, managers can track progress in moving altered communities to functioning natural communities.

5.3.2 Prescribed Fire and Fire Management

Periodic spring and summer fires occurred in fire-adapted communities under natural conditions. Plant species composition reflects the frequency and intensity of these fires. In the absence of fire, fallow fields on former longleaf sites follow a successional pattern through mixed pine-hardwood forests to an exclusively hardwood community rather than to the original plant community. The plant species composition may differ slightly on poorer soils of the slash pine flatwoods, but the dominant role of fire in controlling hardwoods is equally important in either ecosystem.

Timber removal, site preparation, drainage, and lack of fire have all combined to alter the plant species composition of the area resulting in a loss of fuel and inhibiting the return to a more "natural" fire management regime. Site-specific combinations of prescribed fire, mechanical and chemical vegetation control, reforestation, and restoration of natural water regimes are likely necessary actions needed to restore the area to historic natural communities.

The FWC employs a fire management regime to increase both species and habitat diversity and will continue a prescribed burning program on the TWMA in accordance with vegetative management objectives. As fire moves across a landscape, some areas carry fire better than others. Areas with higher vegetative fuel loads typically burn more evenly and with greater intensity. Areas with lower vegetative fuel loads or wetland areas inundated with water typically will not carry fire as evenly, and usually burn at a lower intensity. Employing a burning program with different burning frequencies, intensities, and seasonality (dormant season vs. growing season) of prescribed burns create habitat diversity and a mosaic of vegetation patterns. This mosaic is designed to have both frequently burned and infrequently burned aspects.

On some areas, prescribed burning is limited by the buildup of mid-story brush and a lack of pyrogenic groundcover fuels. This condition creates unsuitable habitat for many wildlife species. Mechanical control of brush on upland sites by roller chopping, logging, shredding, or incidentally by equipment during commercial thinning operations, can reduce shading and encourage the grasses and forbs that are necessary to sustain prescribed fire.

Single drum (with standard, not offset blades), one-pass roller chopping can be a valuable management tool, enabling the use of prescribed fires in areas heavily invaded by dense woody vegetation. However, roller chopping may damage the herbaceous ground cover, especially wiregrass. Therefore, its application will be limited to situations where burning can only be accomplished by first reducing woody vegetation by mechanical means.

Whenever possible, existing firebreaks such as roads and trails, as well as natural breaks such as creeks and wetlands, will be used to define burning compartments. Disk harrows,

mowing, and foam lines will be used as necessary to minimize disturbance and damage created by fire plows.

The transitional areas between two adjacent but different vegetative cover types, such as forests and wetlands, are known as ecotones. With the possible exception of wildfire suppression, mechanical soil disturbance in ecotones will be avoided in order to protect habitats for important rare species that often occur between flatwoods and riparian drainages. Silvicultural site preparation and creation of firebreaks are avoided when possible in these zones. Additionally, fires are allowed to burn into the edges of marshes, swamps and other wetlands in order to maintain these habitats. Once fuel loads have been reduced and a more open appearance has returned, vegetative management objectives will likely dictate a fire return interval that averages 1-4 years, preferably during the spring and early summer months.

In addition to the general prescribed fire management guidelines described above, an area-specific Prescribed Fire Plan will be developed and implemented for TWMA. This plan will include delineation of burn management units with associated fire return intervals for the area's fire-adapted communities, detailed descriptions of prescribed fire methodology, safety, and smoke management guidelines along with other prescribed fire management elements.

5.3.3 Habitat Restoration

Habitat restoration and resource management activities for the area include those designed to enhance and maintain the native upland and wetland communities on TWMA. To accomplish this objective, the FWC is restoring disturbed sites, has instituted a program of prescribed burning and is eliminating or controlling non-native invasive plants through mechanical and chemical treatments. Plants such as Brazilian pepper, Chinese tallow, and cogongrass are problematic on the area. There have also been several timber harvests on TWMA to help restore areas of flatwoods that had been converted to high-density stands of slash pine. Other restoration activities include re-establishing hydrologic regimes to benefit fish and wildlife habitats.

5.4 Fish and Wildlife Management, Imperiled and Focal Species Habitat Maintenance, Enhancement, Restoration, or Population Restoration

5.4.1 Fish and Wildlife

Due to the variety of natural communities, a diversity of associated wildlife, including rare, imperiled, common game, and non-game species, can be found on TWMA. In managing for wildlife species, an emphasis will be placed on conservation, protection and management of natural communities. As noted above, natural communities important to wildlife on TWMA

include floodplain marsh, floodplain swamp, hydric hammock, mesic flatwoods, and wet flatwoods. Natural communities that are less represented on TWMA, but nevertheless still provide important habitat include baygall, blackwater stream, depression marsh, dome swamp, mesic hammock, scrub, scrubby flatwoods.

The size and natural community diversity of TWMA creates a habitat mosaic for a wide variety of wildlife species. Resident wildlife will be managed for optimum richness, diversity and abundance. In addition to resident wildlife, TWMA provides resources critical to many migratory birds including waterfowl, passerines, raptors, shorebirds and others. Habitats important to migratory species will be protected, maintained or enhanced.

The FWC intends to manage game populations on a sustained-yield basis to assure healthy game populations and a high-quality recreational experience. In general, game wildlife populations will be managed to provide continued recreational sport hunting and wildlife viewing opportunities. However, due to the limited size of the area, some of the hunting opportunities may be regulated through a limited entry hunt program to ensure the persistence of viable game species populations, as well as hunter safety and satisfaction. The potential for conflicts among recreational activities and user groups will also be considered and continually monitored.

Wildlife management emphasis is placed on documenting the occurrence and abundance of rare and imperiled species on the property. The FWC will continue to update inventories for certain species, with emphasis on rare and imperiled fish and wildlife species. Monitoring of wildlife species will continue as an ongoing effort for the area.

Concurrent with ongoing species inventory and monitoring activities, management practices are designed to restore, enhance or maintain rare and imperiled species, and their habitats. This will be further augmented by following approved Federal and FWC species recovery plans, guidelines, and other scientific recommendations for these species. Guided by these recommendations, land management activities including prescribed burning and timber stand improvements will address rare and imperiled species requirements and habitat needs. The following Section provides further information on FWC's comprehensive species management strategy for rare and imperiled wildlife and their respective habitats.

5.4.2 Imperiled and Focal Species - Wildlife Conservation Prioritization and Recovery

The FWC has identified the need to: 1) demonstrate optimal wildlife habitat conservation on FWC-managed lands; 2) develop science-based performance measures to evaluate management; 3) recover imperiled species; and 4) prevent future imperilment of declining wildlife species. To help meet these needs, the FWC uses a comprehensive resource management approach to managing FWC-managed areas. Restoring the form and function of Florida's natural communities is the foundation of this management philosophy. The FWC uses OBVM to monitor how specific vegetative parameters are responding to FWC

management, and uses the WCPR program to ensure management is having the desired effect on wildlife.

The goal of WCPR is to provide assessment, recovery, and planning support for the FWC-managed areas to enhance management of focal species and the recovery of imperiled species. The WCPR program objectives include prioritizing what FWC does for imperiled and focal species on FWC-managed areas; ensuring the actions taken on these areas are part of statewide conservation programs and priorities; and informing others about the work accomplished on lands FWC manages.

The WCPR program helps FWC take a proactive, science-based approach to species management on FWC-managed lands. This approach assesses information from statewide potential habitat models and Population Viability Analysis (PVA), and in conjunction with input from species experts and people with knowledge of the area, creates site-specific wildlife assessments for imperiled wildlife species and a select suite of focal species. Staff combines these assessments with area-specific management considerations to develop a wildlife management strategy for the area. Each strategy contains area-specific measurable objectives for managing priority species and their habitat, prescribes management actions to achieve these objectives, and establishes monitoring protocols to verify progress towards meeting the objectives. By providing FWC managers with information on actions they should undertake, the FWC intends for the strategy to assure the presence and persistence of Florida's endangered and threatened fish and wildlife species (see http://myfwc.com/media/1515251/Threatened_Endangered_Species.pdf), as well as select focal species found on the area.

In summary, for FWC-managed areas, the WCPR program helps assess imperiled and focal wildlife species needs and opportunities, prioritize what FWC does for imperiled and focal species, prescribe management actions to aid in species recovery, prescribe monitoring protocols to allow evaluation of the species' response to management, and ensure the information is shared with others. Through the actions of this program, FWC will facilitate fulfilling the needs of focal and imperiled wildlife species on TWMA. In the long-term, by implementing these strategies on FWC-managed lands and continuing to assess wildlife species' needs, FWC will continue to play an integral role in aiding the recovery of imperiled species and preventing the future imperilment of declining wildlife species.

5.4.3 Focal Species Selection and Management

For comprehensive information regarding monitoring and specific management actions for focal species, please refer to the TWMA WCPR Species Management Strategy (Appendix 12.10). Where applicable, measurable objectives contained within the TWMA WCPR Species Management Strategy are included in Section 6 of this Management Plan.
The FWC hosted a WCPR workshop in December 2014 for TWMA, and has subsequently developed a WCPR Species Management Strategy based on input received at the workshop. After incorporating input from an array of wildlife species experts, the WCPR Species

Management Strategy was reviewed and approved, and will include monitoring and management actions for imperiled and focal species including gopher tortoise, Bachman's sparrow, brown-headed nuthatch, Cooper's hawk, crested caracara, Florida mottled duck, Florida sandhill crane, limpkin, Northern bobwhite, red-cockaded woodpecker, short-tailed hawk, Southern bald eagle, swallow-tailed kite, wading birds (multiple species), Florida black bear, and Sherman's fox squirrel. Striped newt, and painted bunting were also identified as species with a limited-opportunity for monitoring and management.

The following are excerpts from FWC's WCPR Species Management Strategy for TWMA:

The FWC's management approach focuses on maintaining and restoring the ecological form and function of natural communities. However, in some instances, it is important to consider the needs of specific wildlife species and to monitor the influences of natural community management on these species. To achieve a science-informed approach to species management, the FWC uses the focal species concept embraced by the Wildlife Habitat Conservation Needs in Florida (WHCNinFL) project. This concept allows one to identify the needs of wildlife collectively by strategically focusing on a subset of wildlife species. The subset of species selected includes umbrella species, keystone species, habitat specialist species, and indicator species.

The Public Lands Conservation Planning (PLCP) project, an expansion of the WHCNinFL project, added a few species and provided potential habitat modeling on public lands. For the PLCP, the FWC selected 60 focal species (including 1 group of species, the wading birds) for which potential habitat models were created to generate statewide potential habitat maps for each focal species. The FWC's 2003 landcover data served as the base layer for all potential habitat models, and staff selected additional layers considering the particular natural history of each species (e.g., species' range, known occurrence records); as such, each model is species specific. Once statewide potential habitat maps were completed, a PVA was conducted for each focal species.

The statewide landcover-based habitat models identified 17 focal species and 1 focal species group of the 60 focal species to have potential habitat on TWMA. For all species modeled to have potential habitat on the TWMA, staff created more accurate area-specific potential habitat maps by using the same statewide models but replacing the landcover data with area-specific natural community data. The resulting area-specific potential habitat maps were then refined based on the input of local managers and species experts.

5.4.4 Florida black bear

Due to the improving condition of the statewide population, the Florida black bear was removed from Florida's Endangered and Threatened Species List on August 23, 2012 after approval by FWC's Commissioners at the June 2012, Commission meeting. A Florida Black Bear Management Plan was also approved at this meeting.

Located within the Central Bear Management Unit (BMU), TWMA is south of the secondary range of the Ocala/St. Johns subpopulation. If observations of females with cubs become more frequent, TWMA may be included within the secondary or primary range of this subpopulation in the future. From a regional perspective, TWMA is part of a large complex of conservation areas that provide habitat and dispersal corridors for this species. Black bears occurring on TWMA will be managed in accordance with the FWC Florida Black Bear Management Plan, and as more specifically described in the TWMA WCPR Species Management Strategy.

5.5 Exotic and Invasive Species Maintenance and Control

The FWC will continue efforts to control the establishment and spread of Florida Exotic Pest Plant Council (FLEPPC) Category I or II plants on TWMA. Control technologies may include mechanical, chemical, biological, and other appropriate treatments. Treatments utilizing herbicides will comply with instructions found on the herbicide label and employ the Best Management Practices for their application.

The 31 known FLEPPC Category I or II exotic and invasive plant species occurring on the TWMA and treated annually by the FWC are listed in Table 5. Exotic and invasive plant species have been identified as occurring at varying densities on approximately 10,000 acres of the TWMA. However, the FWC's methodology for determining the number of acres "infested" with invasive exotic plants only represents a cumulative acreage, and does not reflect the degree of the invasive exotic occurrence. The degree of infestation among areas identified with invasive exotic plant occurrences often varies substantially by species, level of disturbance, environmental conditions, and the status of ongoing eradication and control efforts. The FWC will continue to focus treatments on areas identified as having invasive exotic plant occurrences, as well as treating any new occurrences as they are identified through continued monitoring.

During this previous planning period, FWC established and implemented an exotic plant species treatment program for the area. This included conducting exotic plant species surveys, and approximately $500,000 of grant funding for exotic plant species treatment. Additionally, the FWC employed three additional OPS staff to conduct exotic plant species treatments. These efforts have resulted in the treatment of significant acreage, with the majority of previously infested acres now in maintenance condition. Ongoing exotic plant species issues for the area include the spread of exotic plant species from surrounding lands, as well as continued monitoring of the area.

Additionally, the FWC will continue efforts to control the introduction of exotic and invasive species, as well as pests and pathogens, on the TWMA by inspecting any vehicles and equipment brought onto the area by contractors and requiring that they be free of vegetation and dirt. If vehicles or equipment used by contractors are found to be contaminated, they will be referred to an appropriate location to clean the equipment prior to being allowed on the area. This requirement is included in every contract for

contractors who are conducting any operational or resource management work on the area. In this way, FWC implements a proactive approach to controlling the introduction of exotic pests and pathogens to the area.

An exotic animal species of concern on the TWMA is the feral hog. These animals have high reproductive rates, and when populations reach high densities, feral hogs can significantly degrade natural communities through foraging activity (rooting). The FWC will consult with other regional natural resource managing agencies and private landowners to coordinate feral hog control measures as necessary. Hog populations are controlled by hunts during the wild hog-dog hunt season, archery, small game, general gun, muzzleloading gun, and archery/muzzleloading gun seasons. Trapping is another measure that may be implemented to augment ongoing feral hog control efforts and to further reduce the natural community damage and degradation caused by this species.

5.6 Public Access and Recreational Opportunities

5.6.1 Americans with Disabilities Act

When public facilities are developed on areas managed by FWC, every effort is made to comply with the Americans with Disabilities Act (Public Law 101-336). As new facilities are developed, the universal access requirements of this law are followed in all cases except where the law allows reasonable exceptions. Recreation facilities in semi-primitive or primitive zones will be planned to be universally accessible to the degree possible except as allowed by the ADA[4] where:

1. Compliance will cause harm to historical resources, or significant natural features and their characteristics.

2. Compliance will substantially alter the nature of the setting and therefore the purpose of the facility.

3. Compliance would not be feasible due to terrain or prevailing construction practices.

4. Compliance would require construction methods or materials prohibited by federal or state statutes, or local regulations.

5.6.2 Recreation Master Plan

The FWC has adopted a comprehensive approach to the planning and administration of fish and wildlife resource based public outdoor recreational opportunities for TWMA. To accomplish this, FWC has worked with recreational stakeholders and the general public to develop an updated (2013) Recreation Master Plan (RMP) for TWMA that is currently being implemented. This RMP is utilized to further design and develop appropriate infrastructure that will support the recreational use of the area by the general public, and includes planning for parking, trail design, and area resource interpretation.

5.6.3 Public Access Carrying Capacity

Baseline carrying capacities for users on FWC-managed lands are established by conducting a site specific sensitivity analysis using available data for the site. The intent of the carrying capacity analysis is to minimize wildlife and habitat disturbance and provide the experience of being "immersed in nature" that visitors to FWC-managed areas desire. Carrying capacities are just a first step; management of recreational use requires a means of monitoring visitor impacts. Responding to these impacts may require adjusting the carrying capacities as necessary. The carrying capacities generated through this process are used as a tool to help plan and develop public access, wildlife viewing, and fish and wildlife resource based public outdoor recreation opportunities. Based on an analysis of the overall approved uses and supported public access user opportunities, and the anticipated proportional visitation levels of the various user groups, FWC has determined that TWMA can currently support 1,028 visitor opportunities per day (including hunting capacity). However, an objective to increase the public access carrying capacity to 1,073 visitor opportunities per day has been proposed in Section 6.4 and the RMP (Appendix 12.12) component of this Management Plan. It is important to note that public access carrying capacities are not developed to serve as a goal for expanding the public use of a particular area to match the established carrying capacity. Rather, they are developed to establish maximum thresholds for public use of the respective area in order to protect the natural and historical resources on TWMA and to ensure that visitors will have a high-quality visitor experience. The public access carrying capacity will be periodically reevaluated, and additional capacity may be contemplated as part of the RMP development and implementation process.

5.6.4 Wildlife Viewing

The TWMA provides a wide variety of native wildlife species, both resident and seasonally migratory, that are available for visitors' enjoyment for observation and photography. The quality of habitat found on the TWMA attracts a suite of species including various birds, mammals, reptiles, and amphibians throughout the TWMA. The area's outstanding wildlife habitats, including managed wildlife openings and food plots, support significant populations of both rare and common wildlife. Additionally, TWMA is part of the Great Florida Birding Trail.

5.6.5 Hunting

As established in the lease agreement from the DSL, FWC may provide no more than 46 days of hunting per year, unless FWC receives prior written approval from the Board of Trustees for a longer hunting season. The TWMA currently offers limited entry hunting opportunities for deer, turkey, and wild hogs. Special youth hunting opportunities are also offered. An evaluation of the hunting opportunities offered on the TWMA is performed periodically by FWC.

5.6.6 Fishing

Fishing opportunities on TWMA are primarily found within Lake Charlie, Peek-a-boo Pond, and St. Johns River (Figure 11). Game species include largemouth bass, catfish, and bream.

5.6.7 Trails

The TWMA is part of the Great Florida Birding Trail and the FNST. Currently, 67 miles of multi-use trails are maintained within TWMA. As part of the TWMA RMP implementation, FWC will continue to evaluate the potential for additional trails, as well as trail connectivity opportunities to other conservation areas, and will monitor existing and new trails biannually for user impacts to natural communities.

Hiking is permitted on all areas of TWMA, and all roads are available for bicycling. Bicycling opportunities are of varying quality due to the soft, natural surfaces on some of the roads. Road conditions vary widely with weather conditions.

Horses are prohibited on TWMA during hunting seasons, but are otherwise allowed on all areas of TWMA with the exception of the FNST between Powerline Road and Fish Hole Road.

The existing designated trail system is comprised of a FNST segment of 11.6 miles with an additional 13.7 miles of side trails north of SR520, a 2.5- mile Florida Trail Association trail south of SR520, and a short interpretive trail located off of St. Nicholas Road near the Horse/Youth Camps. Additional trail segments may be constructed to connect existing trails in order to provide more hiking opportunities of varying lengths.

The existing interpretive trail at St. Nicholas Road is connected to trails around the youth camp. An interpretive trail has been constructed near the entrance to provide an opportunity for visitors desiring a shorter trail with easy access. The existing loops near the camps have been enhanced with signage route modifications tom provide the best hiking experience possible.

As contemplated in the RMP, there is a potential opportunity to develop a trailhead at the end of Beehead Road, with interpretive signage and a wildlife viewing structure. There is also a potential opportunity for incorporating a boardwalk into the Swamp Spur Trail.

5.6.7.1 Bicycling

As mentioned above, and all roads are available for bicycling. Bicycling opportunities are of varying quality due to the soft, natural surfaces on some of the roads. Road conditions vary widely with weather conditions.

5.6.7.2 Horseback Riding

As mentioned above, horseback riding is allowed within TWMA, except that horses are prohibited during archery, muzzleloading gun, general gun, wild hog-dog and spring turkey seasons. Additional horseback riding trails have been contemplated as part of the TWMA RMP development and implementation process.

5.6.8 Camping

Primitive camping is allowed on the FNST (currently one campsite; Tiger Branch campsite), the Equestrian and Youth Camp. There is currently a vault toilet at the Equestrian and Youth Camp. Camping visitation numbers have increased every year since 2010 when campground and trail improvements were initiated. Camping visitation has averaged over 850 campers per year over the last few years, a visitation number only exceeded by fishing, hiking, nature viewing, and scouting/hunting during the same time period. Improvements are likely to be made at the Tiger Branch campsite on the FNST to make it more accessible and usable during wetter periods of the year. The FWC staff will coordinate with the Florida Trail Association to determine and implement appropriate improvements.

5.6.9 Geocaching

Geocaching, also known as Global Positioning System (GPS) Stash Hunt and GeoStash, is a contemporary combination of orienteering and scavenger hunting generally utilizing a GPS receiver unit. Geocache websites routinely promote good stewardship. However, the potential exists for resource damage, user conflicts, or safety issues caused by inappropriately placed caches and/or links that do not provide adequate information about the area.

It is the policy of the FWC to allow placement of geocaches only in those locations that do not present the potential for resource damage, user conflicts, or threats to the safety of the activity participants. The placement of geocaches on FWC-managed lands is governed by specific guidelines. These guidelines may be found on the following FWC website: http://myfwc.com/media/1074886/FWC_Geocache_Guidelines.pdf .

5.6.10 Scenic Driving

Designated travel roads pass through a variety of natural communities on TWMA, and offer the exploring driver opportunities to observe wildlife, as well as the overall natural scenic beauty of the area's verdant landscape.

5.7 Hydrological Preservation and Restoration

5.7.1 Hydrological Assessment

The FWC will conduct or obtain an onsite hydrological and risk assessment to identify potential hydrology restoration needs. In the interim, in order to maintain and enhance the

current natural hydrological systems, FWC will continue to install and maintain low-water crossings and culverts as appropriate.

5.7.2 Water Resource Monitoring

Currently, FWC cooperates with the SJRWMD for ground water monitoring, including maintaining and sampling from a ground water monitoring well. In addition, the FWC will continue to cooperate with the SJRWMD and DEP to develop and implement any necessary surface water quality and quantity monitoring protocols for TWMA. In this capacity, FWC will primarily rely on the expertise of the SJRWMD and DEP to facilitate these monitoring activities. Also, the FWC will request a stream condition index assessment from DEP. As necessary, FWC may independently conduct or contract for water resource monitoring, as guided by DEP and the SJRWMD.

5.8 Forest Resource Management

An updated Timber Assessment of the timber resources of TWMA will be conducted by the FFS, or a contracted professional forester. The management of timber resources will be considered in the context of the Timber Assessment and the overall land management goals and activities.

Timber resources include some pine plantations (~10 acres) in need of thinning for habitat improvement. Thinning of the forest over-story, hydrological restoration and reintroduction of prescribed burning are the most important factors in re-establishment of natural communities and the enhancement of wildlife habitats in these areas. Upland pine forest planted with off-site pines will be reforested with longleaf pine or other on-site species as appropriate. Degraded or disturbed bottomland hardwood sites will be encouraged to reforest naturally with native wetland oaks, hardwoods, and other appropriate native plant species.

Pursuant to OBVM management goals, FWC will continue to manage timber resources for wildlife benefits and natural community restoration. Management activities including the use of timber thinning and harvesting may be utilized. The primary management technique for encouraging reforestation is protection of young trees and seedlings on these sites from damage. However, where natural regeneration is lacking, artificial reforestation may be implemented. Planting trees on these selected sites is used to increase the rate of reforestation and to ensure diversity. Forested wetlands are managed for stands with old growth characteristics. Snags will be protected to benefit cavity-nesting species.

5.8.1 Timber Management Plan

A comprehensive timber inventory of the forest resources of the TWMA, including a timber cruise and a forest inventory report with tree measurements, radial growth plots, stand and stock tables, and statistical analyses, will be completed. Using these assessments, a Forest Resource Management Plan will be developed by FWC. The management of timber

resources will be considered in the context of the Forest Resource Management Plan, as well as the overall land management goals and objectives expressed in this Management Plan.

5.9 Historical Resources

Procedures outlined by DHR will be followed to preserve the historical sites of TWMA. The FWC will consult with DHR in an attempt to locate any additional historical features on the area. In addition, FWC will ensure management staff has DHR Archaeological Resources Monitoring training. The FWC will refer to and follow DHR's Management Procedures for Archaeological and Historical Sites and Properties on State-Owned or Controlled Properties for management of these resources, and prior to any facility development or other ground disturbing activities. Furthermore, as appropriate and necessary, FWC will contact professionals from DHR for assistance prior to any ground-disturbing activity on TWMA.

To date, the DHR Master Site File indicates 18 known historical sites on TWMA (Section 2.8). The FWC will submit subsequently located historic sites on TWMA to DHR for inclusion in their Master Site File. In cooperation with DHR, all 18 of the known historical sites on TWMA have been identified as meeting the DHR's special criteria for annual monitoring and reporting; FWC will continue to monitor and report on these sites annually.

5.10 Capital Facilities and Infrastructure

The FWC's land management philosophy is designed to conserve the maximum amount of wildlife habitat while providing the minimal number of capital facilities and infrastructure necessary to effectively conduct operational and resource management activities, and provide ample opportunities for fish and wildlife resource based public outdoor recreation. For these reasons, planned capital facilities and infrastructure will focus on improving access, recreational potential, hydrology, or other resource and operational management objectives.

Current capital facilities and infrastructure on TWMA include 38 facilities, 42.2 miles of maintained roads, and 67 miles of multi-use trails (Figure 12). Facilities include an entrance check station and kiosk, a fishing platform, two foot bridges, interpretive kiosks and signage, a picnic pavilion, two picnic shelters, two vault toilets, and 17 administrative structures used for management operations and equipment maintenance and storage. As described in Section 2.4.1 of this Management Plan, for any public facilities that are developed on areas managed by FWC, every effort is made to comply with the Americans with Disabilities Act (Public Law 101-336).

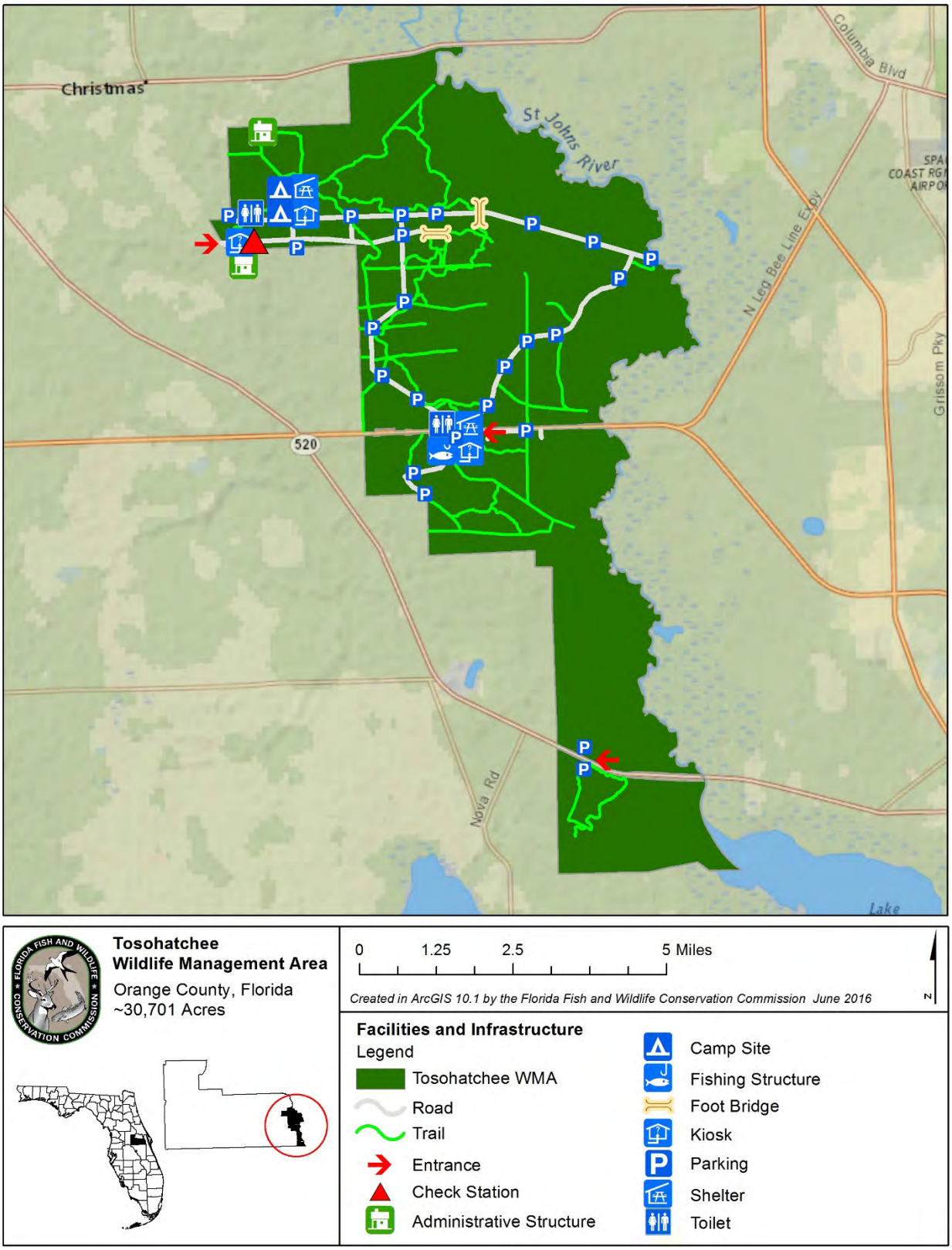

Figure 12. Facilities and Infrastructure

5.11 Land Conservation and Stewardship Partnerships

The FWC utilizes a three-tiered approach to identifying, acquiring or otherwise protecting important conservation lands adjacent to or in proximity to existing FWC-managed areas. This involves development of an Optimal Resource Boundary (ORB), Optimal Conservation Planning Boundary (OCPB) and associated Conservation Action Strategy (CAS). Increasingly, cooperative land steward partnership efforts with private landowners plays an integral role in this effort as does ongoing land conservation, either through fee-simple or less-than-fee conservation easements. In combination, this tiered model helps FWC to further the regional conservation of important fish and wildlife habitats through a proactive, comprehensive, and cooperative approach towards conservation.

5.11.1 Optimal Resource Boundary

This three tiered model begins with the development of an ORB, which is a resource-based analysis on a regional scale that integrates important FWC conservation research and analysis into practical planning, acquisition, and management efforts through GIS analysis. The ORB focuses on critical and important wildlife species or habitat considerations such as rare and imperiled species habitat within a particular region or ecosystem-like area on a landscape scale within which an FWC managed area is contained while eliminating urban areas or lands that have already been conserved or protected.

5.11.2 Optimal Conservation Planning Boundary

The second tier is known as the OCPB (Figure 13). The OCPB combines the regional natural resources identified in the ORB, as well as regional and local area conservation planning, including habitat conservation and restoration, habitat linkages, management challenges, land use and zoning issues, infrastructure including roads and developments, improving access, eliminating inholdings, providing prescribed burn buffers, resolving boundary irregularities, water resource protection, and conserving other important natural and historical resources.

The OCPB provides the basis for development of a broader CAS for TWMA. Although the OCPB provides the basis for potential future voluntary, willing-seller conservation acquisitions, it is designed to function primarily as a conservation planning boundary. The OCPB identifies surrounding lands and natural resources that may be important to the continued viability of fish and wildlife populations in the region. As they are currently managed, these lands appear to contribute to regional conservation and may support conservation landscape linkages.

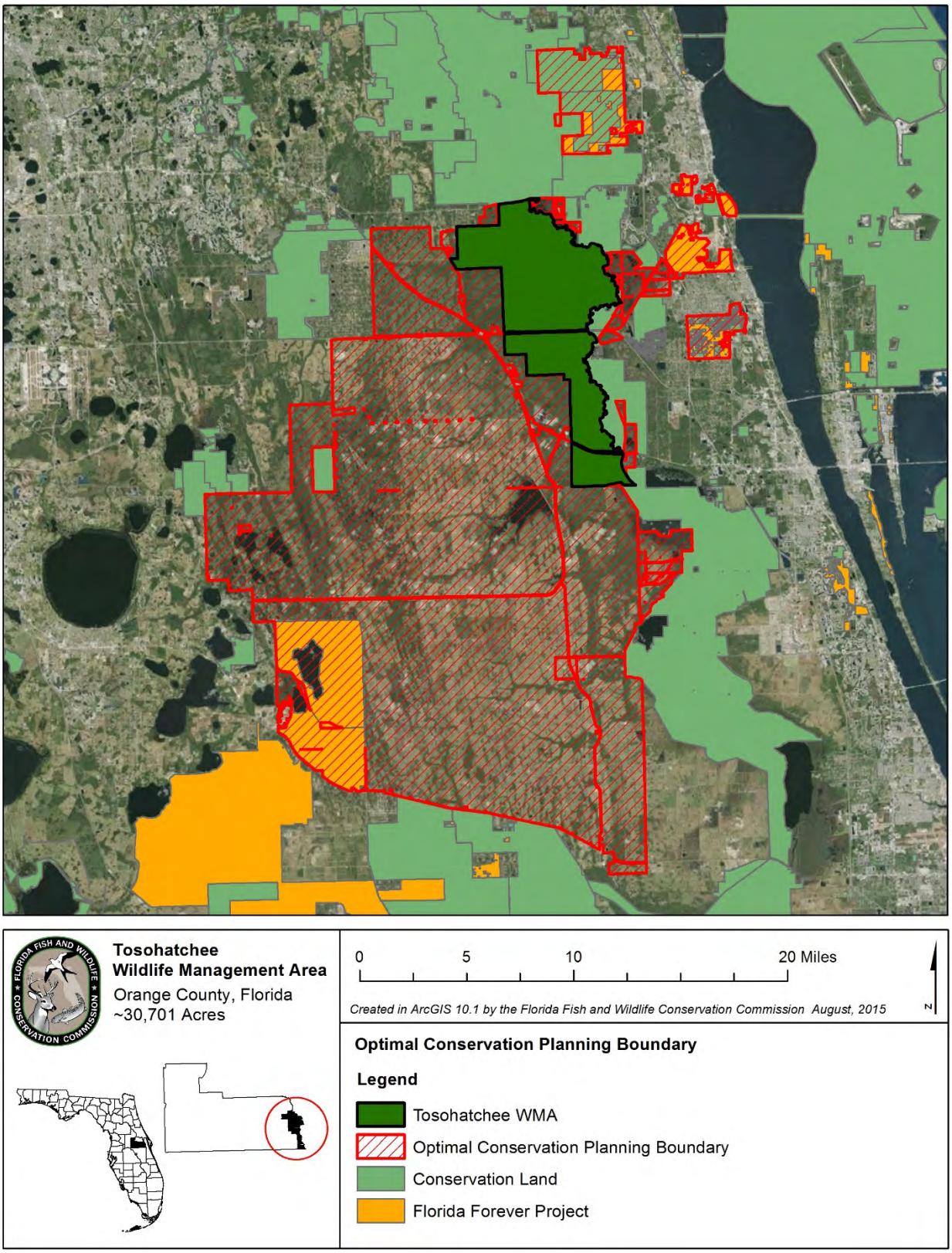

Figure 13. Optimal Conservation Planning Boundary

5.11.3 Conservation Action Strategy

The CAS is the third tier, and implements the results of the ORB and OCPB tiers. This element of the process incorporates the conservation planning recommendations into an action strategy that prioritizes conservation needs. The CAS is integral to the development of conservation stewardship partnerships and also implements the current approved process for establishing the FWC Florida Forever Inholdings and Additions acquisition list.

Primary components of the CAS may include:

- FWC Landowner Assistance Program (LAP)
- FWC Conservation Planning
- FWC Additions and Inholdings Program Land Conservation Work Plan
- Forest Stewardship Program proposals
- Florida Forever project proposals and boundary modifications
- Conservation easements
- Federal or State grant conservation proposals
- Regional or local conservation proposals
- Local, state, and federal planning proposals
- Non-governmental organization conservation proposals

Continued conservation of these lands may be aided by available voluntary landowner stewardship programs, conservation easements, and in some cases, potential voluntary conservation acquisitions. Participation in any FWC conservation effort is entirely voluntary and at the sole choice of willing landowners.

Private landowners seeking assistance with habitat management will likely find it offered within FWC's LAP. The FWC employs biologists who are available to provide wildlife-related assistance with land-use planning and habitat management. There are many forms of assistance that include technical, financial, educational, and various forms of recognition that seek to award landowners who manage their wildlife habitat responsibly. More information on FWC's LAP program and online habitat management tools are available online at: http://myfwc.com/conservation/special-initiatives/lap/ .

5.11.4 FWC Florida Forever Additions and Inholdings Acquisition List

Currently on TWMA, FWC has not identified any addition or inholding parcels for potential conservation acquisition. Upon completion of the CAS, which includes recommendations from the TWMA OCBP development process, additions to FWC's Florida Forever Additions and Inholdings acquisition list for TWMA may be recommended.

5.12 Research Opportunities

The FWC intends to cooperate with researchers, universities, and others as feasible and appropriate. For TWMA, the FWC will continue to assess and identify research needs, and pursue research and environmental education partnership opportunities as appropriate. Research proposals involving the use of the area are evaluated on an individual basis. All research activities on TWMA must have prior approval by FWC.

5.13 Cooperative Management and Special Uses

5.13.1 Cooperative Management

The FWC is responsible for the overall management and operation of TWMA as set forth in the lease agreements with the Board of Trustees. In keeping with the lease agreements, and in order to conduct its management operations in the most effective and efficient manner, the FWC cooperates with other agencies to achieve management goals and objectives described in this management plan. These include cooperating with DHR to ensure the requirements of the Management Procedures Guidelines - Management of Archaeological and Historical Resources document (Appendix 12.7) are followed with regard to any ground-disturbing activities. Also, the FFS assists FWC by providing technical assistance on forest resource management. In addition, FWC cooperates and consults with the SJRWMD and DEP for the monitoring and management of both ground and surface water resources and the overall management of TWMA.

5.13.2 First Responder and Military Training

First-responder (public governmental police department or agency, fire and emergency medical service personnel) training and military training are conditionally allowed on TWMA. Such activities are considered allowable uses only when undertaken intermittently for short periods of time, and in a manner that does not impede the management and public use of TWMA, and causes no measurable long-term impact to the natural resources of the area. Additionally, FWC staff must be notified and approve the training through issuance of a permit prior to any such training taking place on TWMA. Any first-responder or military training that is not low-impact, intermittent and occasional would require an amendment to this management plan, and therefore will be submitted by FWC to DSL and ARC for approval consideration prior to authorization.

5.13.3 Apiaries

Currently, there are no apiaries operating on TWMA. However, use of apiaries is conditionally approved for TWMA, and is deemed to be consistent with purposes for acquisition, is in compliance with the Conceptual State Lands Management Plan, and is consistent with the FWC agency mission, goals, and objectives as expressed in the agency Strategic Plan and priorities document (Appendix 12.8). Location, management, and

administration of apiaries on TWMA will be guided by the FWC Apiary Policy (Appendix 12.9).

5.14 Climate Change

Because of Florida's unique ecology and topography, any potential impacts as a result of climate change may be particularly acute and affect multiple economic, agricultural, environmental, and health sectors across the state. The impact of climate change on wildlife and habitat may already be occurring, from eroding shorelines and coral bleaching to increases in forest fires and saltwater intrusion into inland freshwater wetlands.

The Intergovernmental Panel on Climate Change (IPCC), a multi-national scientific body, reports that climate change is likely proceeding at a rate where there will be unavoidable impacts to humans, wildlife, and habitat. Given current levels of heat-trapping greenhouse gas emissions, shifts in local, regional, and national climate patterns including changes in precipitation, temperature, increased frequency and intensity of extreme weather events, rising sea levels, tidal fluctuations, and ocean acidification are projected. The current trend of global temperature increase has appeared to accelerate in recent decades, and continued greenhouse gas emissions may result in projected global average increases of 2 - 11.5° F by the end of the century.[6]

This apparent change in global climate has the potential to disrupt natural processes; in some areas, climate change may cause significant degradation of ecosystems that provide services such as clean and abundant water, sustainable natural resources, protection from flooding, as well as hunting, fishing and other recreational opportunities. Consequently, climate change is a challenge not only because of its likely direct effects, but also because of its potential to amplify the stress on ecosystems, habitats, and species from existing threats such as exponential increases in surface and ground water use, habitat loss due to increased urbanization, introduction of invasive species, and fire suppression.

Potential impacts that may be occurring as a result of climate change include: change in the timing of biological processes, such as flowering, breeding, hibernation, and migration; [7, 8, 9] more frequent invasions and outbreaks of exotic invasive species;[10] and loss of habitat in coastal areas due to sea level rise.[11] Some species are projected to adjust to these conditions through ecological or evolutionary adaptation, whereas others are projected to exhibit range shifts as their distributions track changing climatic conditions. Those species that are unable to respond to changing climatic conditions are projected to go extinct. Some estimates suggest that as many as 20% - 30% of the species currently assessed by the IPCC are at risk of extinction within this century if global mean temperatures exceed increases of 2.7 – 4.5° F.[12] A number of ecosystems are projected to be affected at temperature increases well below these levels.

At this time, the potential effects of climate change on Florida's conservation lands are just beginning to be studied and are not yet well understood. For example, FWC has begun a

process for currently developing climate change adaptation strategies for monitoring, evaluating, and determining what specific actions, if any, may be recommended to ameliorate the projected impacts of climate change on fish and wildlife resources, native vegetation, and the possible spread of exotic and invasive species. Currently, FWC is continuing its work on the development of these potential adaptation strategies. However, as noted above, the effects of climate change may become more frequent and severe within the time period covered by this Management Plan.

For these reasons, there is a continuing need for increased information and research to enable adaptive management to cope with potential long-term climate change impacts. The most immediate actions that FWC can take are to work with partners to gather the best scientific data possible for understanding natural processes in their current state, model possible impacts and subsequent changes from climate change, develop adaptive management strategies to enhance the resiliency of natural communities to adapt to climate change, and formulate criteria and monitoring for potential impacts when direct intervention may be necessary to protect a species. To this end, when appropriate, FWC will participate in organizations such as the Peninsular Florida Land Conservation Cooperative or similar organizations so that FWC continues to gain understanding and share knowledge of key issues related to potential climate change. In addition, FWC will consider the need for conducting vulnerability assessments to model the potential effects of climate change, especially sea level rise and storm events, on imperiled species and their habitats on FWC managed land.

Elements of climate change that may potentially affect TWMA include inundation and saltwater intrusion from sea level rise (Figure 14), more frequent and more potent storm events, alteration of vegetation reproductive cycles, and changes in the fire regime. The results of a Sea Level Affecting Marsh Model for the TWMA shows habitats that may potentially be impacted. The low-lying coastal habitats, such as salt marsh and hardwood swamp natural communities are projected to face the most direct and dramatic impacts of climate change, particularly from a projected rising sea level and from the projected increased frequency and intensity of coastal storms.[13, 14, 15, 16] The effects of sea level rise in the recent past have been observed on in the vicinity of TWMA, including documentation of cabbage palms have been dying on coastal islands due to salinity increases. The potential loss of habitat may result in the loss of species using that habitat, including migrating and nesting birds. Storm events also cause considerable physical damage to native vegetation along vulnerable shorelines, impacting nesting habitat for sea life and shorebirds. The projected rise in sea levels may decrease the availability and abundance of prey for wading birds that forage in shallow waters on the expansive tidal flats of the Atlantic Coast. Climate change may amplify and hasten these effects, potentially at rates that exceed the normal resiliency of plant communities to recover, shift or adapt accordingly.[17, 18] Projected salt water intrusion into the subsurface freshwater lens from potential sea level rise and saltwater inundation of surface freshwaters from storm surges may alter coastal

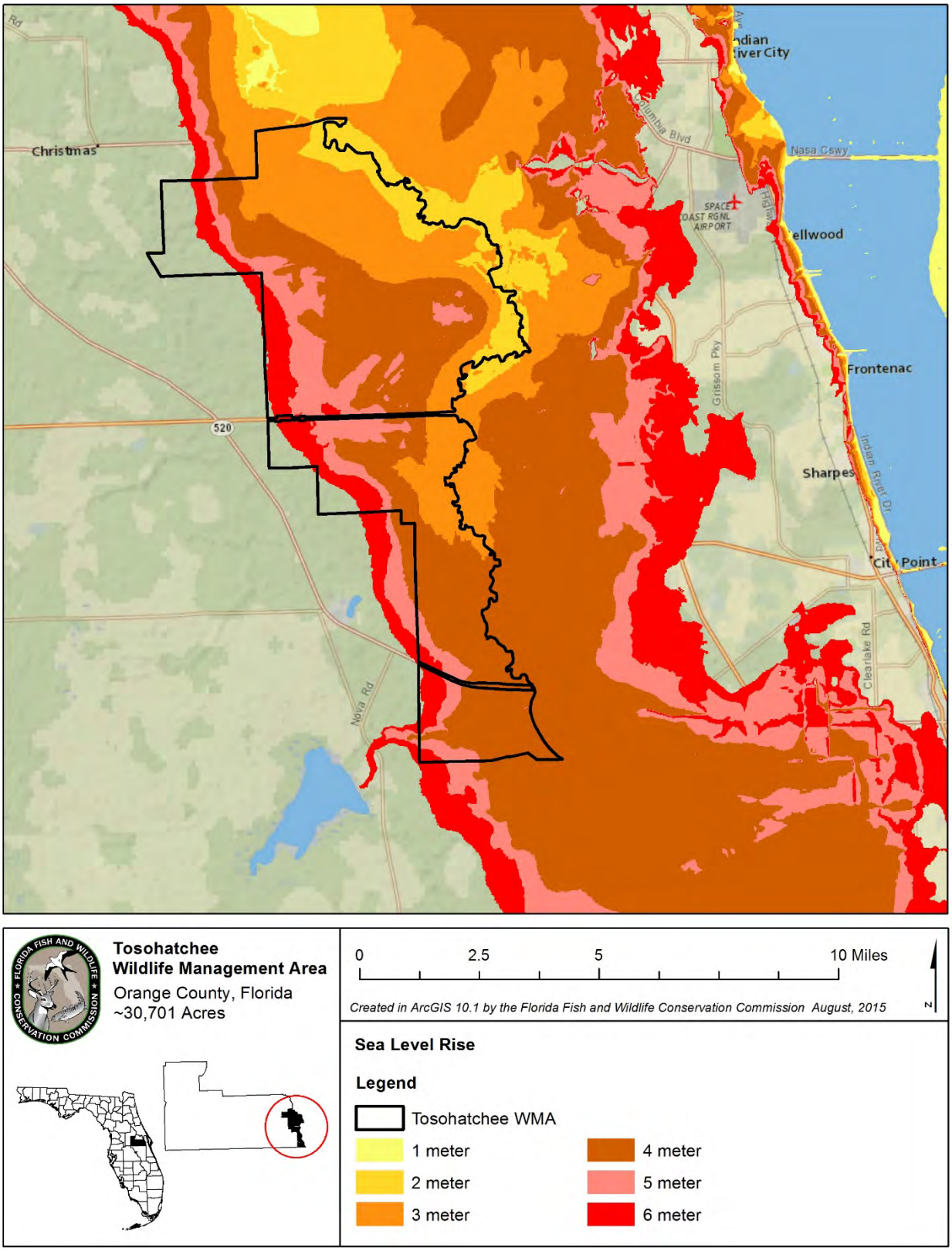

Figure 14. Sea Level Rise

ecosystems and freshwater marshes, possibly resulting in more salt-tolerant aquatic plant communities.

To address the potential impacts of climate change on the TWMA, Goals and Objectives have been developed as a component of this Management Plan (Section 6.12). Depending on the recommendations of the adaptive management strategies described above, additional specific goals and objectives to mitigate potential climate change impacts may be developed for the TWMA Management Plan in the future.

5.15 Soil and Water Conservation

Soil disturbing activities will be confined to areas that have the least likelihood of experiencing erosion challenges. On areas that have been disturbed prior to acquisition, 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.

6 Resource Management Goals and Objectives

The management goals described in this section are considered broad, enduring statements designed to guide the general direction of management actions to be conducted in order to achieve an overall desired future outcome for TWMA. The objectives listed within each management goal offer more specific management guidance and measures, and are considered the necessary steps to be completed to accomplish the management goals. Many of the objectives listed have specific end-of-the-calendar-year target dates for completion and all of them are classified as having either short-term (less than two years) or long-term (up to ten years) timelines for completion.

6.1 Habitat Restoration and Improvement

Goal: Improve extant habitat and restore disturbed areas.

Short-term

6.1.1 Conduct prescribe burning on 4,000 acres of fire-adapted communities per year.

6.1.2 Maintain 17,000 acres (75% of the area's fire-adapted communities) within the 3 - 5 year target fire return interval.

6.1.3 Develop and implement a Prescribed Fire Plan.

6.1.4 Continue to conduct habitat/natural community restoration on 1,000 acres per year including roller-chopping, chemical treatments, mechanical hardwood control, and wildlife openings.

6.1.5 Utilizing existing data, implement OBVM on TWMA.

6.1.6 Continue to inform and cooperate with adjacent landowners regarding TWMA land management activities including prescribed fire and exotic plant control.

Long-term

6.1.7 Continue to prescribe burn 4,000 acres of fire-adapted communities per year.

6.1.8 Continue to maintain 22,000 acres (100% of fire-adapted communities) within the 3 - 5 year target fire return interval.

6.1.9 Continue to implement OBVM on TWMA.

6.1.10 Continue to conduct habitat/natural community restoration on 1,000 acres per year including roller-chopping, chemical treatments, mechanical hardwood control, and wildlife openings.

6.1.11 Continue to inform and cooperate with adjacent landowners regarding TWMA land management activities including prescribed fire and exotic plant control.

6.2 Imperiled and Focal Species Habitat Maintenance, Enhancement, Restoration, or Population Restoration

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

Short-term

6.2.1 Implement the WCPR Species Management Strategy.

6.2.2 As described in the WCPR Species Management Strategy, monitor 17 selected imperiled and focal species and one focal species group (wading birds), including gopher tortoise, Bachman's sparrow, brown-headed nuthatch, Cooper's hawk, crested caracara, Florida mottled duck, Florida sandhill crane, limpkin, Northern bobwhite, red-cockaded woodpecker, short-tailed hawk, Southern bald eagle, swallow-tailed kite, wading birds (multiple species), Florida black bear, and Sherman's fox squirrel (Section 5.4.3).

6.2.3 As described in the WCPR Species Management Strategy, by 2018, evaluate habitat conditions with species experts to determine TWMA's potential role in supporting red-cockaded woodpeckers.

6.2.4 As described in the WCPR Species Management Strategy, expand and continue annual callback surveys for Bachman's sparrow and brown-headed nuthatch on TWMA.

6.2.5 Continue to collect opportunistic wildlife species occurrence data.

6.2.6 Continue to conduct surveys for cutthroat grass and hand fern.

6.2.7 Continue to opportunistically record occurrences of hooded pitcher plants.

Long-term

6.2.8 Continue to implement the WCPR Species Management Strategy.

6.2.9 As described in the WCPR Species Management Strategy, continue to monitor 17 selected imperiled and focal species and one focal species group (wading birds), including gopher tortoise, Bachman's sparrow, brown-headed nuthatch, Cooper's hawk, crested caracara, Florida mottled duck, Florida sandhill crane, limpkin, Northern bobwhite, red-cockaded woodpecker, short-tailed hawk, Southern bald eagle, swallow-tailed kite, wading birds (multiple species), Florida black bear, and Sherman's fox squirrel (Section 5.4.3).

6.2.10 As described in the WCPR Species Management Strategy, expand and continue annual callback surveys for Bachman's sparrow and brown-headed nuthatch on TWMA.

6.2.11 Continue to collect opportunistic wildlife species occurrence data.

6.2.12 Continue to conduct surveys for cutthroat grass and hand fern.

6.2.13 Continue to opportunistically record occurrences of hooded pitcher plants.

6.3 Other Wildlife (Game and Nongame) Habitat Maintenance, Enhancement, Restoration, or Population Restoration.

Goal: Monitor, maintain, improve, or restore game and non-game species populations and habitats.

Short-term

6.3.1 Continue to conduct annual spotlight monitoring surveys for white-tailed deer.

6.3.2 Continue to collect biological harvest data at check station.

6.3.3 Continue to collect opportunistic wildlife occurrence data.

6.3.4 Continue to maintain ~25 wood duck boxes, three bat houses, and ~33 bluebird boxes.

Long-term

6.3.5 Continue to conduct annual spotlight monitoring surveys for white-tailed deer.

6.3.5 Continue to collect biological harvest data at check station.

6.3.6 Continue to collect opportunistic wildlife occurrence data.

6.3.7 Continue to maintain ~25 wood duck boxes, three bat houses, and ~33 bluebird boxes.

6.4 Exotic and Invasive Species Maintenance and Control

Goal: Remove exotic and invasive plants and animals and conduct needed maintenance- control.

Short-term

6.4.1 Annually treat at least 1,000 acres of EPPC Category I and Category II invasive exotic plant species (Table 5).

6.4.2 Implement control measures on one exotic and nuisance animal species (feral hog).

6.4.3 Continue to seek grants and other funding sources for exotic plant control treatments.

6.4.4 To the extent possible, continue to fund FWC OPS staff and/or contractors dedicated to exotic plant control treatment.

6.4.5 Continue opportunistic observations for occurrences of potential new invasive exotic plant and animal species.

Long-term

6.4.6 Continue to annually treat at least 1,000 acres of EPPC Category I and Category II invasive exotic plant species (Table 5).

6.4.7 Implement control measures on one exotic and nuisance animal species (feral hog).

6.4.8 Continue to seek grants and other funding sources for exotic plant control treatments.

6.4.9 To the extent possible, continue to fund FWC OPS staff and/or contractors dedicated to exotic plant control treatments.

6.4.10 Continue opportunistic observations for occurrences of potential new invasive exotic plant and animal species.

6.5 Public Access and Recreational Opportunities

Goal: Provide public access and recreational opportunities.

Short-term

6.5.1 Maintain public access and recreational opportunities to allow for a recreational carrying capacity of 1,028 visitors per day.

6.5.2 Continue to provide website, five kiosks, Recreational Guide, trail brochure, bird and other species list, Space Coast Birding and Wildlife Festival field trips for interpretation and education.

6.5.3 Continue to maintain one interpretive/education program at the TWMA Administrative Office.

6.5.4 Explore the feasibility of developing new interpretive education programs through the FWC regional volunteer coordinator.

6.5.5 Continue to maintain 67 miles of trails (Figure 15).

6.5.6 Continue to implement the RMP.

6.5.7 Explore the feasibility of constructing viewing structures at Mud Lake, Duck Field Pond, and the terminus of Beehead Road (Figure 15).

6.5.8 Continue to provide paddling opportunities on appropriate bodies including Lake Charlie, Peek-a-boo Pond, and the St. Johns River (Figure 15).

6.5.9 Continue to provide fishing opportunities on appropriate water bodies including Lake Charlie, Peek-a-boo Pond, and the St. Johns River (Figure 15).

6.5.10 Continue to provide hunting opportunities for deer, turkey, and wild hogs.

6.5.11 Develop additional interpretive publications (e.g., What's Blooming, Rack Card).

Long-term

6.5.12 As described in the RMP, develop additional public access and recreational opportunities including additional trails and viewing structures to allow for a carrying capacity of 1,073 visitors/day.

6.5.13 If determined to be feasible and as described in the RMP, design and construct three viewing platforms to be located at Mud Lake, Duck Field Pond, and the terminus of Beehead Road (Figure 15).

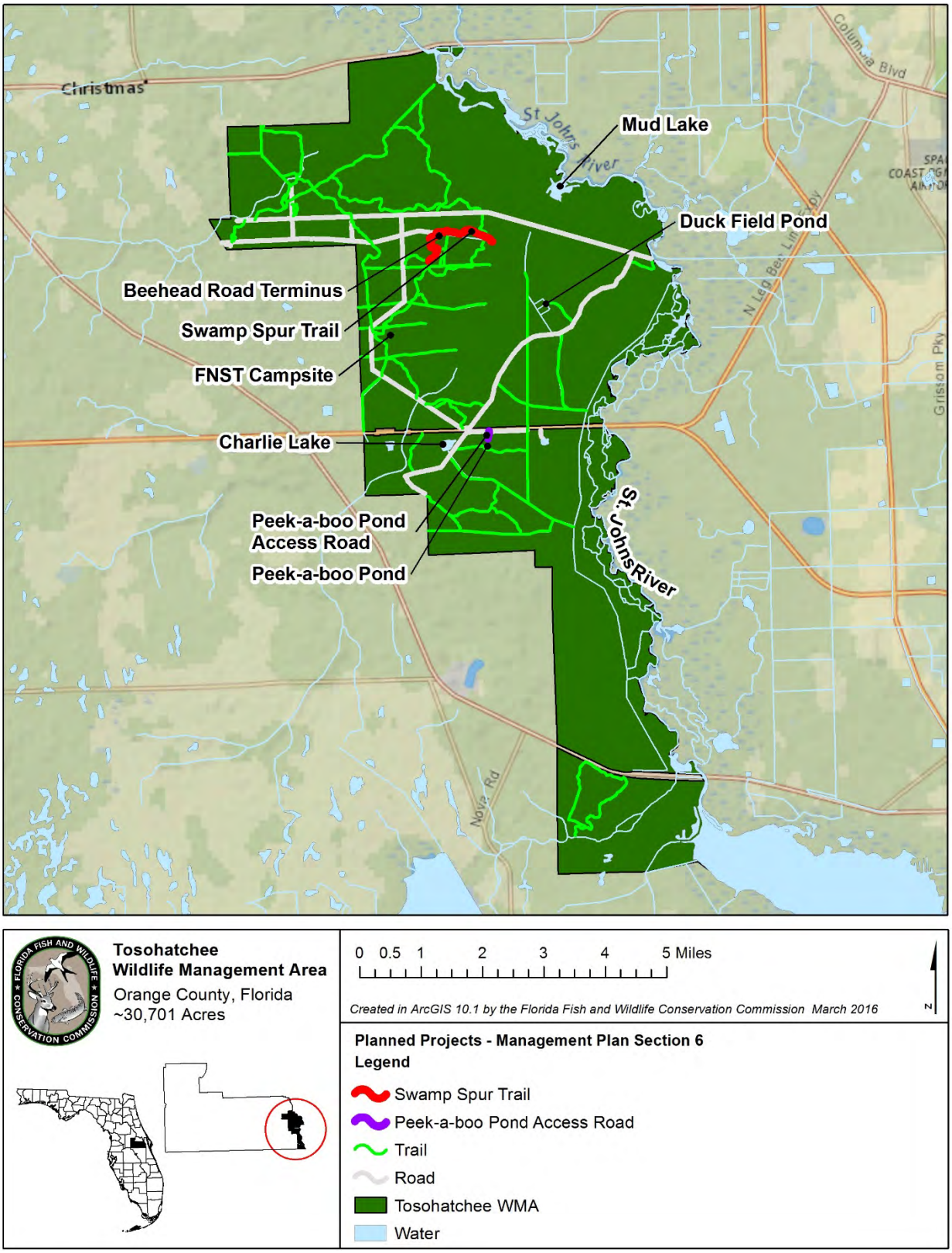

Figure 15. Planned Projects - Mangement Plan Section 6

6.5.14 As described in the RMP, improve access to Peek-a-boo Pond, including parking and boat hand-launch (Figure 15).

6.5.15 As described in the RMP, design and construct an elevated walkway at Swamp Spur Trail (Figure 15).

6.5.16 As described in the RMP, design and construct a camping platform at the FNST campsite (Figure 15).

6.5.17 Continue to maintain 67 miles of trails (Figure 15).

6.5.18 Monitor trails annually for visitor impacts.

6.5.19 Reassess recreational opportunities every three years and continue to implement the RMP.

6.5.20 Continue to provide hunting opportunities for deer, turkey, and feral hogs.

6.5.21 Within the constraint established in the Lease Agreement to provide no more than 46 hunting season days per year (unless FWC receives the Board of Trustees prior written approval for a longer hunting season), assess the potential for adding small game and youth hunting opportunities.

6.5.22 Continue to provide paddling opportunities on appropriate bodies including Lake Charlie, Peek-a-boo Pond, and the St. Johns River (Figure 15).

6.5.23 Continue to provide fishing opportunities on appropriate water bodies including Lake Charlie, Peek-a-boo Pond, and the St. Johns River (Figure 15).

6.5.24 Cooperate with other agencies, County, stakeholders, and regional landowners to investigate regional recreational opportunities including linking hiking, and multi-use trail systems between adjacent public areas.

6.5.25 Continue to identify partnerships that could provide for environmental educational programs and outreach.

6.5.26 Design and develop an educational activity guide for families and organized youth groups.

6.5.27 Design and develop a “What to do at TWMA” publication.

6.6 Hydrological Preservation and Restoration

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

Short-term

6.6.1 Conduct or obtain a site-specific Hydrological Assessment to identify potential hydrology restoration needs.

6.6.2 To maintain and enhance natural hydrological functions, install and maintain low-water crossings and culverts as appropriate.

6.6.3 Continue to cooperate with the DEP and SJRWMD for the monitoring of surface and ground water quality and quantity; or as necessary, independently conduct or contract for water resource monitoring, as guided by DEP and the SJRWMD.

Long-term

6.6.4 To enhance natural hydrological functions, continue to install and maintain low-water crossings and culverts as appropriate.

6.6.5 Continue to cooperate with the DEP and SJRWMD for the monitoring of surface and ground water quality and quantity; or as necessary, independently conduct or contract for water resource monitoring, as guided by DEP and the SJRWMD.

6.6.6 As feasible, implement the recommendations of the site-specific Hydrological Assessment.

6.7 Forest Resource Management

Goal: Manage timber resources to improve or restore natural communities for the benefit of wildlife.

Short-term

6.7.1 Cooperate with the FFS or professional forestry consultant to complete an updated Timber Assessment.

6.7.2 Consult with the FFRS or a professional forestry consultant regarding forest management activities as appropriate.

Long-term

6.7.3 Prepare and implement a Forest Management Plan including inventory, reforestation, harvesting, and prescribed burning activities based on restoration and maintenance needs of the natural communities and other goals established for management of TWMA.

6.7.4 Continue to consult with the FFS or a professional forestry consultant regarding forest management activities as appropriate.

6.8 Historical Resources

Goal: Protect, preserve and maintain historical resources.

Short-term

6.8.1 Ensure all known sites are recorded in DHR's Master Site file.

6.8.2 Continue to monitor, protect, and preserve 18 identified sites as recommended by DHR.

6.8.3 Coordinate with DHR to assess the need for conducting additional historical resource surveys.

6.8.4 If determined to be necessary by DHR, contract for a historical resources survey.

6.8.5 Ensure FWC management staff has DHR Archaeological Resources Monitoring training.

6.8.6 Follow DHR's Management Procedures for Archaeological and Historical Sites and Properties on State-Owned or Controlled Properties for the management of historical resources.

6.8.7 Cooperate with DHR or trained FWC staff in designing site plans for development of facilities and infrastructure.

Long-term

6.8.8 Continue to monitor, protect, and preserve 18 identified sites as recommended by DHR.

6.8.9 Continue to ensure FWC management staff has DHR Archaeological Resources Monitoring training.

6.8.10 Continue to follow DHR's Management Procedures for Archaeological and Historical Sites and Properties on State-Owned or Controlled Properties for the management of historical resources.

6.8.11 Continue to cooperate with DHR or trained FWC staff in designing site plans for development of facilities and infrastructure.

6.9 Capital Facilities and Infrastructure

Goal: Develop the capital facilities and infrastructure necessary to meet the goals and objectives of this Management Plan.

Short-term

6.9.1 Continue to maintain 38 facilities (Figure 12).

6.9.2 Continue to maintain 42 miles of roads (Figure 12).

6.9.3 Continue to maintain 67 miles of on site existing trails (Figure 15).

6.9.4 Assess all TWMA facilities and develop a long-term schedule for repair and maintenance.

Long-term

6.9.5 As identified in the facilities assessment, maintain, improve, or repair facilities as appropriate.

6.9.6 Monitor trails and infrastructure annually for visitor impacts.

6.9.7 Continue to maintain 38 facilities (Figure 12).

6.9.8 Continue to maintain 42 miles of roads (Figure 12).

6.9.9 Continue to maintain 67 miles of on site existing trails (Figure 15).

6.9.10 Improve ~0.5 miles of access roads to Peek-a-boo Pond (Figure 15).

6.9.11 Improve two miles of designated trails at the east end (terminus) of Beehead Road (Figure 15).

6.10 Land Conservation and Stewardship Partnerships

Goal: Enhance fish and wildlife conservation, resource, and operational management through development of an optimal boundary.

Short-term

6.10.1 Identify potential important wildlife habitat, landscape-scale linkages, wildlife corridors, and operational/resource management needs.

6.10.2 Identify and develop conservation stewardship partnerships.

6.10.3 Identify and pursue conservation acquisition needs.

6.10.4 Develop and maintain a GIS shapefile and other necessary data to facilitate nominations from the FWC OCPB and for FWC's LAP and Land Acquisition Programs.

6.10.5 Develop a CAS.

6.10.6 Contact and inform adjoining landowners about the FWC LAP to pursue non-acquisition conservation stewardship partnerships.

6.10.7 Determine which parcels should be added to the FWC acquisition list.

6.10.8 Identify potential non-governmental organization partnerships and grant program opportunities.

6.10.9 Determine efficacy of conducting an adjacent landowner's assistance/conservation stewardship partnership workshop.

6.10.10 Identify potential conservation easements donations.

6.10.11 Evaluate and determine if any portions of TWMA are no longer needed for conservation purposes, and therefore may be designated as surplus lands.

Long-term

6.10.12 To minimize fragmentation of the area, continue to identify strategic parcels to revise the completed OCPB for TWMA as appropriate and necessary.

6.10.13 Continue to identify and develop conservation stewardship partnerships.

6.10.14 Continue to identify and pursue conservation acquisition needs.

6.10.15 Continue to maintain a GIS shapefile and other necessary data to facilitate nominations from the FWC OCPB and for the FWC LAP and Land Acquisition Program.

6.10.16 Continue to propose nominations of selected properties as additions to the FWC acquisition list.

6.10.17 Continue to pursue acquisition of parcels added to the FWC acquisition list as acquisition work plan priorities and funding allow.

6.10.18 As feasible, continue to periodically contact and meet with adjacent landowners for willingness to participate in the CAS, and coordinate landowner assistance/conservation stewardship partnership workshops as deemed appropriate.

6.10.19 Coordinate and conduct landowner assistance/conservation stewardship partnership workshop(s) as necessary and appropriate.

6.10.20 Continue to identify potential conservation easements donations.

6.10.21 Continue to evaluate and determine if any portions of TWMA are no longer needed for conservation purposes, and therefore may be designated as surplus lands.

6.11 Cooperative Management and Special Uses

Goal: Provide access and use of TWMA to current cooperative managers and continue collaborative management efforts.

Short-term

6.11.1 Continue to cooperate with FFS, DEP, and the SJRWMD and others as appropriate in the operation and natural resource management of TWMA.

6.11.2 As appropriate and compatible with the conservation of TWMA, coordinate and cooperate with first responders and DOD military branches to allow for training opportunities for personnel.

Long-term

6.11.3 As appropriate and compatible with the conservation of TWMA, continue to coordinate and cooperate with first responders and DOD military branches to allow for training opportunities for personnel.

6.11.4 Continue to cooperate with FFS, DEP, and the SJRWMD and others as appropriate in the operation and natural resource management of TWMA.

6.12 Climate Change

Goal: Develop appropriate adaptation strategies in response to projected climate change effects and their potential impacts on natural resources, including fish and wildlife, and the operational management of the TWMA.

Short-term

6.12.1 Coordinate with FWRI Climate Change Adaptation Initiative to identify potential impacts of projected climate change on fish and wildlife resources and operational management of the TWMA.

Long-term

6.12.2 Continue to coordinate with FWRI Climate Change Adaptation Initiative to identify potential impacts of projected climate change on fish and wildlife resources and operational management of the TWMA.

6.12.3 Incorporate climate change adaptation strategies into updates of the WCPR Strategy for the TWMA.

6.12.4 Incorporate appropriate climate change monitoring protocols and management strategies into the OBVM program for the TWMA.

6.12.5 As appropriate, update the TWMA Prescribed Fire Plan to incorporate new scientific information regarding projected climate change, such as increased frequency of drought, on the fire regime of TWMA's fire-adapted habitats.

6.12.6 As science, technology, and climate policy evolve, educate natural resource management partners and the public about the agency's policies, programs and efforts to study, document and address potential climate change, and assess the need to incorporate public education about climate change into updates of the TWMA RMP, and public education curriculum.

6.13 Research Opportunities

Goal: Explore and pursue cooperative research opportunities.

Short-term

6.13.1 Continue to cooperate with researchers, universities (e.g., University of Central Florida, University of Florida, University of South Florida, and Stetson University), FWRI, and others as appropriate.

Long-term

6.13.2 Continue to cooperate with researchers, universities (e.g., University of Central Florida, University of Florida, University of South Florida, and Stetson University), FWRI, and others as appropriate.

6.13.3 Continue to assess the need for and pursue research and environmental education partnership opportunities as appropriate.

7 Resource Management Challenges and Strategies

The following section identifies and describes further management needs and challenges associated with TWMA and provides solution strategies that will address these issues. These specific challenges may not be fully addressed in the broader goals and objectives of Section 6 above, and are therefore in provided here.

7.1 Challenge: Optimally manage for wildflower diversity and associated pollinators.

7.1.1 Strategy: To increase diversity and create a mosaic of herbaceous groundcover and wildflowers, vary the seasonality, scale, and location of mowing.

7.2 Challenge: A significant segment of the FNST traversing TWMA requires management maintenance.

7.2.1 Strategy: Work with USFS to obtain funding to maintain this trail segment.

7.2.2 Strategy: Continue to coordinate with volunteers and contract to maintain the FNST.

7.3 Challenge: The FNST lacks connections to the south.

7.3.1 Strategy: Work with the USFS and adjacent landowners to provide a connection to other segments of the FNST.

7.4 Challenge: TWMA is uniquely situated to provide a conservation education destination for youth and families. However, there is insufficient staff and resources to provide this service.

7.4.1 Strategy: Work with the regional volunteer coordinator and the Florida Youth Conservation Centers Network to provide youth and family educational opportunities.

7.5 Challenge: The natural status of cabbage palm monocultures is unknown.

7.5.1 Strategy: Explore the feasibility of conducting cabbage palm monoculture research.

7.6 Challenge: Impacts of the proposed "All Aboard Florida" high-speed rail corridor through TWMA are not fully known.

7.6.1 Strategy: Continue to engage in meetings and planning and provide reviews of potential impacts for the expanded rail corridor.

7.7 Challenge: A complete boundary survey of TWMA is lacking.

7.7.1 Strategy: Explore the feasibility of contracting for boundary survey.

7.8 Challenge: While currently at minimal levels, unauthorized access, illegal dumping, vandalism, poaching, and unauthorized off-road vehicle (ORV) use may pose an increased threat in the future.

7.8.1 Strategy: Continue to provide area-wide security through FWC law enforcement patrols.

8 Cost Estimates and Funding Sources

The following represents the actual and unmet budgetary needs for managing the lands and resources of TWMA. This cost estimate was developed using data developed by FWC and other cooperating entities, and is based on actual costs for land management activities, equipment purchase and maintenance, and for development of fixed capital facilities. Funds needed to protect and manage the property and to fully implement the recommended program are derived primarily from the Land Acquisition Trust Fund and from State Legislative appropriations. However, private conservation organizations may be cooperators with the agency for funding of specific projects. Alternative funding sources, such as monies available through mitigation, may be sought to supplement existing funding.

The cost estimate below, although exceeding what FWC typically receives through the appropriations process, is estimated to be what is necessary for optimal management, and is consistent with the current and planned resource management and operation of TWMA. Cost estimate categories are those currently recognized by FWC and the Land Management Uniform Accounting Council. More information on these categories, as well as the Fiscal Year 2014 - 2015 operational plan showing detailed cost estimates by activity and categories of expenditures, may be found in Appendix 12.11.

Tosohatchee WMA Management Plan Cost Estimate
Maximum expected one year expenditure

Resource Management	Expenditure	Priority
Exotic Species Control	$308,201	(1)
Prescribed Burning	$49,639	(1)
Cultural Resource Management	$9,729	(1)
Timber Management	$7,120	(1)
Hydrological Management	$50,177	(1)
Other (Restoration, Enhancement, Surveys, Monitoring, etc.	$179,191	(1)
Subtotal	**$604,057**	
Administration		
General administration	**$24,039**	(1)
Support		
Land Management Planning	$35,995	(1)
Land Management Reviews	$9,250	(3)
Training/Staff Development	$43,143	(1)
Vehicle Purchase	$187,763	(2)
Vehicle Operation and Maintenance	$72,217	(1)
Other (Technical Reports, Data Management, etc.)	$4,992	(1)
Subtotal	**$353,360**	
Capital Improvements		
New Facility Construction	$0	(2)
Facility Maintenance	$182,761	(1)
Subtotal	**$182,761**	
Visitor Services/Recreation		
Info./Education/Operations	**$38,415**	(1)
Law Enforcement		
Resource protection	**$30,814**	(1)
Total	**$1,233,447 ***	

Priority schedule:

Bold	**(1) Immediate (annual)**
Normal	(2) Intermediate (3-4 years)
Italic	*(3) Other (5+ years)*

* Based on the characteristics and requirements of this area, 8 FTE positions would be optimal to fully manage this area. All land management funding is dependent upon annual legislative appropriations.

Tosohatchee WMA Management Plan Cost Estimate
Ten-year projection

Resource Management	**Expenditure**	**Priority**
Exotic Species Control	$2,707,890	(1)
Prescribed Burning	$436,132	(1)
Cultural Resource Management	$85,482	(1)
Timber Management	$62,554	(1)
Hydrological Management	$440,862	(1)
Other (Restoration, Enhancement, Surveys, Monitorin	$1,574,394	(1)
Subtotal	**$5,307,313**	
Administration		
General administration	**$211,213**	(1)
Support		
Land Management Planning	$316,259	(1)
Land Management Reviews	$18,495	(3)
Training/Staff Development	$379,058	(1)
Vehicle Purchase	$660,745	(2)
Vehicle Operation and Maintenance	$634,507	(1)
Other (Technical Reports, Data Management, etc.)	$43,863	(1)
Subtotal	**$2,052,926**	
Capital Improvements		
New Facility Construction	$465,478	(2)
Facility Maintenance	$1,605,756	(1)
Subtotal	**$2,071,233**	
Visitor Services/Recreation		
Info./Education/Operations	**$337,517**	(1)
Law Enforcement		
Resource protection	**$270,738**	(1)
Total	**$10,250,940 ***	

Priority schedule:
(1) Immediate (annual)
(2) Intermediate (3-4 years)
(3) Other (5+ years)

* Based on the characteristics and requirements of this area, 8 FTE positions would be optimal to fully manage this area. All land management funding is dependent upon annual legislative appropriations.

9 Analysis of Potential for Contracting Private Vendors for Restoration and Management Activities

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 FWC 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 "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. Items selected as "rejected" represent those for which FWC has in-house expertise and/or which the agency has found it can accomplish at less expense than through contracting with outside sources:

	Approved	**Conditional**	**Rejected**
• Dike and levee maintenance			✓
• Exotic species control			✓
• Mechanical vegetation treatment			✓
• Public contact and educational facilities development			✓
• Prescribed burning			✓
• Timber harvest activities	✓		
• Vegetation inventories			✓

10 Compliance with Federal, State, and Local Governmental Requirements

The operational functions of FWC personnel are governed by the agency's Internal Management Policies and Procedures (IMPP) Manual. The IMPP Manual provides internal guidance regarding many subjects affecting the responsibilities of agency personnel including personnel management, safety issues, uniforms and personal appearance, training, as well as accounting, purchasing, and budgetary procedures.

When public facilities are developed on areas managed by FWC, every effort is made to comply with Public Law 101 - 336, the Americans with Disabilities Act. As new facilities are developed, the universal access requirements of this law are followed in all cases except where the law allows reasonable exceptions (e.g., where handicap access is structurally

impractical or where providing such access would change the fundamental character of the facility being provided).

Uses planned for TWMA are in compliance with the Conceptual State Lands Management Plan and its requirement for "balanced public utilization," and are in compliance with the mission of FWC as described in its Agency Strategic Plan (Appendix 12.8). Such uses also comply with the authorities of the FWC as derived from Article IV, Section 9 of the Florida Constitution as well as the guidance and directives of Chapters, 253, 259, 327, 370, 379, 403, 870, 373, 375, 378, 487, and 597 FS.

The FWC has developed and utilizes an Arthropod Control Plan for TWMA in compliance with Chapter 388.4111 F.S. (Appendix 12.13). This plan was developed in cooperation with the local TWMA County arthropod control agency. This plan is also in conformance with the Local Government Comprehensive Plan as approved and adopted for Orange County, Florida, (Appendix 12.14).

11 Endnotes

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