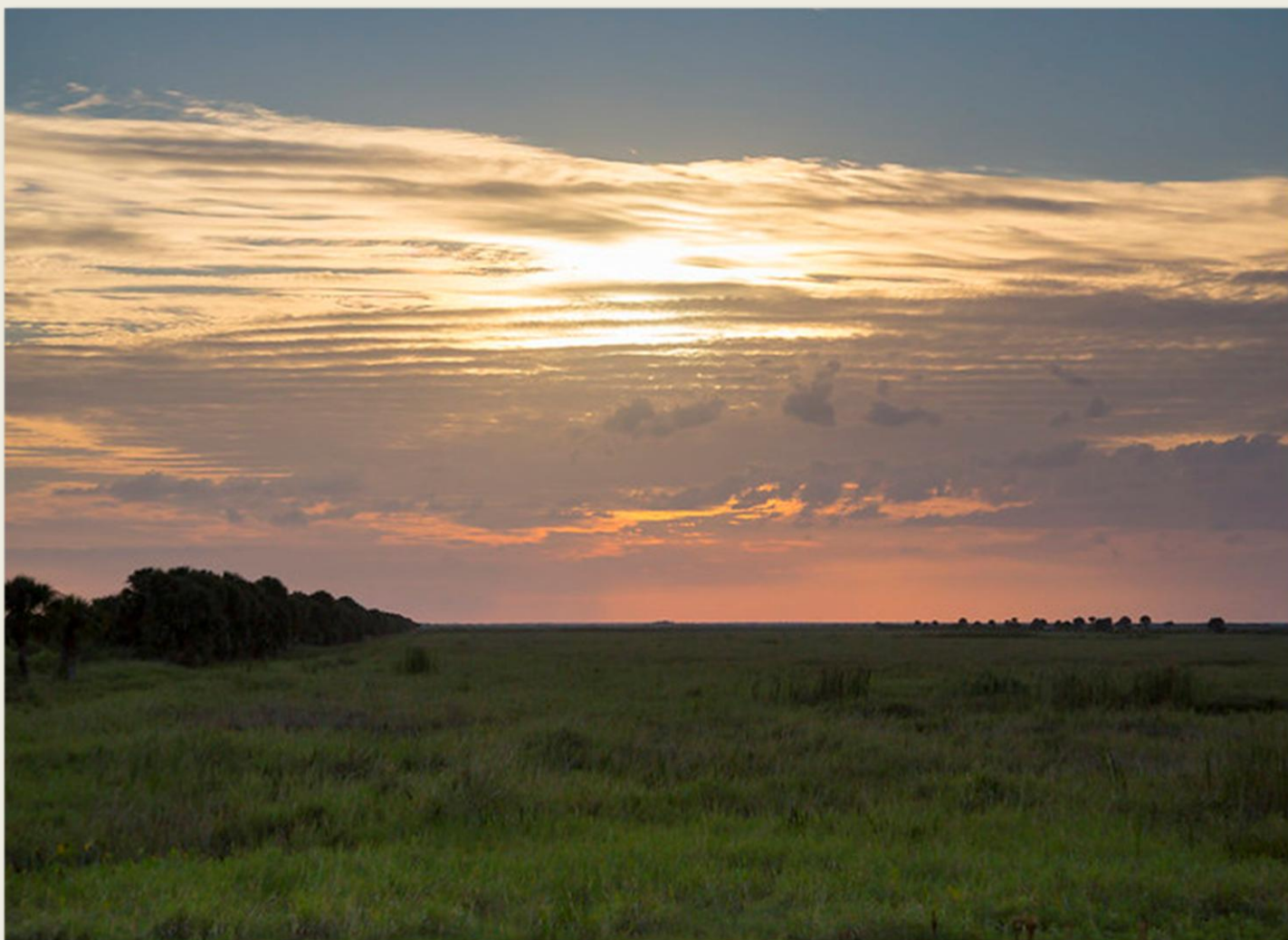


2025-2035

T.M. GOODWIN WATERFOWL MANAGEMENT AREA

10-YEAR MANAGEMENT PLAN
BREVARD COUNTY



**FLORIDA FISH AND WILDLIFE
CONSERVATION COMMISSION**

620 SOUTH MERIDIAN STREET
TALLAHASSEE, FL 32399-1600





St. Johns River Water Management District

Michael A. Register, P.E., Executive Director

4049 Reid Street • P.O. Box 1429 • Palatka, FL 32178-1429 • 386-329-4500 • www.sjrwmd.com

December 22, 2025

William Hansen
Land Conservation Planner
Florida Fish and Wildlife Conservation Commission
Division of Habitat and Species Conservation
Land Conservation and Planning
620 South Meridian Street
Tallahassee, FL 32399

Re: Approval of the Florida Fish & Wildlife Conservation Commission's Management Plan for
T.M Goodwin Waterfowl Management Area.

Dear Mr. Hansen:

On November 12, 2025 the Governing Board of the St. Johns River Water Management District
approved the 10-year management plan for the T.M. Goodwin Waterfowl Management Area.
Attached you will find the meeting minutes, indicating this action under Agenda Item 15.

We appreciate the Florida Fish & Wildlife Conservation Commission's continued partnership in
managing this significant area.

Sincerely,

Brent Bachelder

Brent Bachelder
Land Resource Specialist
Bureau of Land Resources

GOVERNING BOARD

Rob Bradley, CHAIR
FLEMING ISLAND

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WINTER PARK

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ST. AUGUSTINE

Ron Howse
COCOA

Cole Oliver, TREASURER
MERRITT ISLAND

Janet Price
FERNANDINA BEACH

**A Management Plan
for the
T.M. Goodwin Waterfowl Management Area**

Brevard County

Owned by the St. Johns River Water Management District
Managed by the Florida Fish and Wildlife Conservation Commission



August 2025

Approved

A handwritten signature in blue ink that reads "Melissa Tucker". The signature is written in a cursive style and is positioned above a horizontal line.

Melissa Tucker, Director
Division of Habitat and Species Conservation

LAND MANAGEMENT PLAN EXECUTIVE SUMMARY

Lead Agency: Florida Fish and Wildlife Conservation Commission (FWC)

Common Name of Property: T.M. Goodwin Waterfowl Management Area

Location: Brevard County, Florida

Acreage Total: 6,482 acres

Acreage Breakdown:

<u>Land Cover Classification</u>	<u>Acres</u>	<u>Percent of Total Area</u>
Impoundment	6,482	100%

*GIS-calculated acreage for land cover classification varies slightly from actual total acreage.

Lease/Management Agreement No.: 90106 and 01183 (Appendix 11.1)

Use: Single _____ Management Agency: FWC Management Responsibilities:
Multiple X LEAD, LESSEE (Waterfowl Management Area, resource protection, law enforcement)

Designated Land Use: Waterfowl Management Area

Sublease (s): None

Encumbrances: A 30-year NRCS WRP conservation easement, a perpetual drainage easement on Goodwin Unit granted to James Sartori, and a housing agreement with an FWC employee.

Type Acquisition: Save our Rivers Program, Preservation-2000, Wetlands Reserve Program.

Unique Features: Natural: Wetland habitat and wildlife that it supports.

Archaeological/Historical: One archaeological site and one linear resource.

Management Needs: Habitat restoration and improvement; public access and recreational opportunities; hydrological preservation and restoration; invasive and non-native species maintenance and control; imperiled species habitat maintenance, enhancement, and restoration.

Acquisition Needs/Acreage: 10,380 acres FWC Additions and Inholdings list; 1,747 acres remaining in the St. Sebastian-St. Johns River Greenway Florida Forever Project (Figure 1).

Surplus Lands/Acreage: None.

Public Involvement: Management Advisory Group consensus building meeting and Public Hearing (Appendix 11.3).

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	ii, 1
2	The land acquisition program, if any, under which the property was acquired.	18-2.018 & 18-2.021	8-9
3	Degree of title interest held by the Board, including reservations and encumbrances such as leases.	18-2.021	1, 8, 9, Appendix 11.1-11.2
4	The legal description and acreage of the property.	18-2.018 & 18-2.021	1, 8, Appendix 11.1
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	27
6	An assessment as to whether the property, or any portion, should be declared surplus. <i>Provide Information regarding assessment and analysis in the plan, and provide corresponding map.</i>	18-2.021	30
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. <i>Please clearly indicate parcels on a map.</i>	18-2.021	48-52
8	Identification of adjacent land uses that conflict with the planned use of the property, if any.	18-2.021	28
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)	9
10	Proximity of property to other significant State, local or federal land or water resources.	18-2.021	1-4

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	29-30
12	A description of past and existing uses, including any unauthorized uses of the property.	18-2.018 & 18-2.021	24-27
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	29-30
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	8, Appendix 11.1
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	23, 32, 45, 53, Appendix 11.17
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	2-3
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)	25-27
18	A finding regarding whether each planned use complies with the 1981 State Lands Management Plan, particularly whether such	18-2.021	29

Item #	Requirement	Statute/Rule	Page Numbers and/or Appendix
	uses represent "balanced public utilization," specific agency statutory authority and any other legislative or executive directives that constrain the use of such property.		
19	Letter of compliance from the local government stating that the LMP is in compliance with the Local Government Comprehensive Plan.	BOT requirement	Appendix 11.16
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	43-45
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	29-30
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	45
23	A statement regarding incompatible use in reference to Ch. 253.034(10).	253.034(10)	30

*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	10, Appendices 11.3-11.4
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)	10
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. <i>Include the advisory group members and their affiliations, as well as the date and location of the advisory group meeting.</i>	259.032(10)	10, Appendix 11.3-11.4
27	Summary of comments and concerns expressed by the advisory group for parcels over 160 acres	18-2.021	Appendix 11.3
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	253.034(5) & 259.032(10)	Appendix 11.3-11.4

Item #	Requirement	Statute/Rule	Page Numbers and/or Appendix
	scheduled meeting of the local governing body before the actual public hearing. <i>Include a copy of each County's advertisements and announcements (meeting minutes will suffice to indicate an announcement) in the management plan.</i>		
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. <i>Include manager's replies to the team's findings and recommendations.</i>	259.036	31, Appendix 11.8
30	Summary of comments and concerns expressed by the management review team, if required by Section 259.036, F.S.	18-2.021	Appendix 11.8
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	Appendix 11.8

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. <i>Use brief descriptions and include USDA maps when available.</i>	18-2.021	10,11, Appendix 11.7
33	Insert FNAI based natural community maps when available.	ARC consensus	15,16
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	14-18, Appendix 11.5
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	20-24
36	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding beaches and dunes.	18-2.021	23
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	23
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	18-20, 38
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	17,18
40	The identification or resources on the property that are listed in the Natural Areas Inventory. <i>Include letter from FNAI or consultant where appropriate.</i>	18-2.021	20, Appendix 11.10
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)	31,32
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.	↓	30-39, 57-62

Item #	Requirement	Statute/Rule	Page Numbers and/or Appendix
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.	↓	58
42-C.	The associated measurable objectives to achieve the goals.	↓	58
42-D.	The related activities that are to be performed to meet the land management objectives and their associated measures. <i>Include fire management plans - they can be in plan body or an appendix.</i>	↓	57, Appendix 11.13
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.		65,66, Appendix 11.12
43	***Quantitative data description of the land regarding an inventory of forest and other natural resources and associated acreage. <i>See footnote.</i>	253.034(5)	23, 45
44	Sustainable Forest Management, including implementation of prescribed fire management	18-2.021, 253.034(5) & 259.032(10) ↓	
44-A.	Management needs, problems and a desired outcome (see requirement for # 42-A).	↓	30-39, 57-62
44-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).	↓	57-62
44-C.	Measurable objectives (see requirement for #42-C).	↓	57-62
44-D.	Related activities (see requirement for #42-D).	↓	57-62, Appendix 11.13
44-E.	Budgets (see requirement for #42-E).		65,66, Appendix 11.12
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).	↓	30-39, 57-62
45-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).	↓	57-62
45-C.	Measurable objectives (see requirement for #42-C).	↓	57-62
45-D.	Related activities (see requirement for #42-D).	↓	57-62, Appendix 11.13
45-E.	Budgets (see requirement for #42-E).		65,66, Appendix 11.12
45-F	Assess the feasibility of managing the lands > 40 contiguous acres as a recipient site for gopher tortoises consistent with rules of the Fish and Wildlife Conservation Commission, as prepared by the agency or cooperatively with a Fish and Wildlife Conservation Commission wildlife biologist.	259.105	19
45-G	Economic feasibility of establishing a gopher tortoise recipient site, including the initial cost, recurring management costs and the revenue projections.	259.105	19
46	***Quantitative data description of the land regarding an inventory of invasive and non-native plants and associated acreage. <i>See footnote.</i>	253.034(5)	17-18, 39-40
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	Appendix 11.15
48	Invasive and non-native species maintenance and control	259.032(10) & 253.034(5)	
48-A.	Management needs, problems and a desired outcome (see requirement for # 42-A).	↓	30-39,57-62

Item #	Requirement	Statute/Rule	Page Numbers and/or Appendix
48-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).	↓	57-62
48-C.	Measurable objectives (see requirement for #42-C).	↓	57-62
48-D.	Related activities (see requirement for #42-D).	↓	57-62, Appendix 11.13
48-E.	Budgets (see requirement for #42-E).		65,66, Appendix 11.12

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. <i>If yes, provide a list of the appropriate managing agencies that have been notified of the proposed plan.</i>	18-2.018 & 18-2.021	20-22
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	20-22
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	20-22
52	***Quantitative description of the land regarding an inventory of hydrological features and associated acreage. <i>See footnote.</i>	253.034(5)	20-22
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).	↓	43,44
53-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).	↓	59
53-C.	Measurable objectives (see requirement for #42-C).	↓	59
53-D.	Related activities (see requirement for #42-D).	↓	59
53-E.	Budgets (see requirement for #42-E).		65,66, Appendix 11.12

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. <i>Include maps of all cultural resources except Native American sites, unless such sites are major points of interest that are open to public visitation.</i>	18-2.018, 18-2.021 & per DHR's request	23-24,
55	***Quantitative data description of the land regarding an inventory of significant land, cultural or historical features and associated acreage.	253.034(5)	23-24
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	23-24, 45

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).	↓	45
57-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).	↓	60
57-C.	Measurable objectives (see requirement for #42-C).	↓	60
57-D.	Related activities (see requirement for #42-D).	↓	60
57-E.	Budgets (see requirement for #42-E).		65-66, Appendix 11.12

**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)	27, 45-46
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).	↓	45-46, 60
59-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).	↓	60
59-C.	Measurable objectives (see requirement for #42-C).	↓	60
59-D.	Related activities (see requirement for #42-D).	↓	60
59-E.	Budgets (see requirement for #42-E).		65-66, Appendix 11.12
60	*** Quantitative data description of the land regarding an inventory of recreational facilities and associated acreage.	253.034(5)	45-46
61	Public Access and Recreational Opportunities	259.032(10) & 253.034(5)	41-43
61-A.	Management needs, problems and a desired outcome (see requirement for # 42-A).	↓	59
61-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).	↓	59
61-C.	Measurable objectives (see requirement for #42-C).	↓	59
61-D.	Related activities (see requirement for #42-D).	↓	59
61-E.	Budgets (see requirement for #42-E).		65-66, Appendix 11.12

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	iii-ix
63	Place the Executive Summary at the front of the LMP. Include a physical description of the land.	ARC and 253.034(5)	ii
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	37, 38, 41, 43, 44, 46, 53
65	Key management activities necessary to achieve the desired outcomes regarding other appropriate resource management.	259.032(10)	57-63

Item #	Requirement	Statute/Rule	Page Numbers and/or Appendix
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)	65-66, Appendix 11.12
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)	65-66, Appendix 11.12
68	A statement of gross income generated, net income and expenses.	18-2.018	28, Appendix 11.12

*** = 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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Acronym Key

ADA	Americans with Disabilities Act
DEP	Department of Environmental Protection
DHR	Division of Historical Resources
DSL	Division of State Lands
F.A.C.	Florida Administrative Code
FDACS	Florida Department of Agriculture and Consumer Services
FISC	Florida Invasive Species Council
FLAM	Florida Landscape Assessment Model
FMSF	Florida Master Site File
FNAI	Florida Natural Areas Inventory
F.S.	Florida Statute(s)
FWC	Florida Fish and Wildlife Conservation Commission
GIS	Geographic Information Systems
IMPP	Internal Management Policies and Procedures
IPCC	Intergovernmental Panel on Climate Change
LAP	Landowner Assistance Program
LMR	Land Management Review
MAG	Management Advisory Group
NRCS	Natural Resources Conservation Service
OBVM	Objective-Based Vegetation Management
OFW	Outstanding Florida Waters
SJRWMD	St. Johns River Water Management District
TMGWMA	T.M. Goodwin Waterfowl Management Area
USACOE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USJRB	Upper St. John River Basin
WCPR	Wildlife Conservation Prioritization and Recovery
WCS	Water Control Structure
WMA	Waterfowl Management Area

1 Introduction and General Information

The T.M. Goodwin Waterfowl Management Area (TMGWMA) is owned by St. Johns River Water Management District (SJRWMD) and leased to the Florida Fish and Wildlife Conservation Commission (FWC) for management as a waterfowl management area and public small game hunting area along with other compatible fish and wildlife-focused recreational uses. The FWC has lead management authority for all resources within the established boundary (Figures 1 and 2).

This Management Plan serves as the basic statement of policy and direction for the management of the TMGWMA and has been developed to guide each aspect of the TMGWMA's resource and operational management for the 10-year planning period. It provides information including the past usage, conservation acquisition history, and descriptions of the natural and cultural resources found on the TMGWMA. Furthermore, it identifies the FWC's management intent, goals, and objectives, as well as challenges and potential solutions.

This Management Plan is submitted for review to the Governing Board of the SJRWMD, in compliance with Chapters 253 and 259, Florida Statutes (F.S.), and Chapters 18-2 and 18-4, Florida Administrative Code (F.A.C.). Format and content were drafted in accordance with SJRWMD requirements for management plans. Terms (Appendix 11.9) used in this Management Plan describing management activities conform to those developed for the Land Management Uniform Accounting Council Biennial Land Management Operational Report.

1.1 Location

The TMGWMA is in Central Florida in southern Brevard County and encompasses approximately 6,482 acres (Figures 1 and 2). The TMGWMA lies in all or parts of Sections 4, 5, 8, 9, 16, 17, 20, 21, 22, 28, 29, 32, 33, and 34 of Township 30 South, Range 36 East (Figure 3). The TMGWMA is located approximately seven miles northwest of Fellsmere, Florida. Larger cities including Palm Bay, Melbourne, and Vero Beach are located approximately 11 miles northeast, 16 miles northeast, and 23 miles southeast of the TMGWMA, respectively. The TMGWMA is not located within a designated Area of Critical State Concern.

1.1.1 Proximity to other Public Conservation Lands

The TMGWMA is in the vicinity of an extensive network of conservation lands, including lands managed by the SJRWMD, the Department of Environmental Protection (DEP), and Brevard County. Federally owned properties in the vicinity include Malabar Transmitter Annex managed by the United States Department of Defense. Several Florida Forever projects are also located in the vicinity (Figure 4).

Tables 1 and 2 list the Florida Forever projects and conservation lands within a 10-mile radius of the TMGWMA, including lands managed by public and private entities that conserve historical and natural resources within this region of Florida. Most of the conservation lands listed in Table 2 are owned by a public entity. However, some of these areas fall within a less-than-fee ownership classification 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.

Table 1. Florida Forever Projects within a 10-mile Vicinity

Project Name	GIS Acres
Brevard Coastal Scrub Ecosystem	18,454.70
Osceola Pine Savannas	422.14
Ranch Reserve	16,877.40

Table 2. Conservation Lands within a 10-mile Vicinity

Federal Government	Managing Agency/ Easement Holder
Malabar Transmitter Annex	USDOD
State of Florida	
Micco Expansion	FWC
Ox Creek Agricultural and Conservation Easement	FDACS
St. Sebastian River Preserve State Park	DEP
Ten Mile Ridge	FWC
Water Management District	
Blue Cypress Conservation Area	SJRWMD
Escape Ranch Conservation Easement	SJRWMD
Far Reach Ranch Conservation Easement	SJRWMD
Fellsmere Water Management Area	SJRWMD
Jane Green Creek Less-than-fee Easement Additions	SJRWMD
Kempfer Property Conservation Easement	SJRWMD
Mills Ranch Conservation Easement	SJRWMD
Three Forks Conservation Area	SJRWMD
Willowbrook Conservation Easement	SJRWMD
Wolf Creek Ranch Conservation Easement	SJRWMD

Table 2. Conservation Lands within a 10-mile Vicinity

Local Government	
Fellsmere Trailhead Preserve	City of Fellsmere
Grant Flatwoods Sanctuary	Brevard County
Malabar Scrub Sanctuary	Brevard County
Micco Scrub Sanctuary	Brevard County
Pressley Ranch NAWCA Tract	Indian River County
South Babcock	Brevard County
Valkaria Expansion	Brevard County
Valkaria Scrub Sanctuary	Brevard County
Private/Public Conservation Organization	
Mary A Ranch Mitigation Bank	B.K.I., Inc., Consulting Ecologists
Putnam Land Conservancy Brevard Parcels	Putnam Land Conservancy, Inc.

Acronym Key	Agency Name
USDOD	United States Department of Defense
DEP	Florida Department of Environmental Protection
FWC	Florida Fish and Wildlife Conservation Commission
SJRWMD	St. Johns River Water Management District
FDACS	Florida Department of Agriculture and Consumer Services

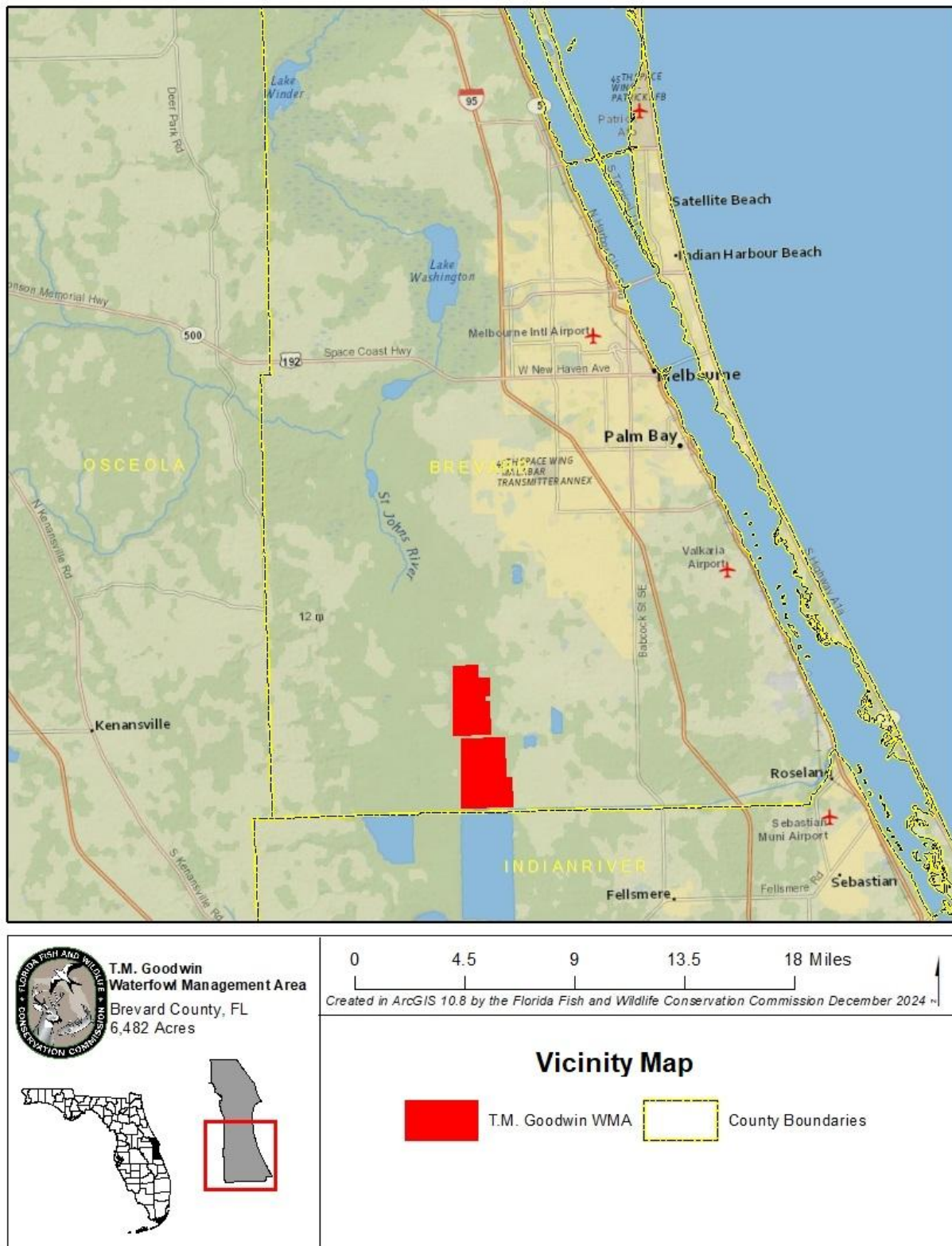


Figure 1. Vicinity Map

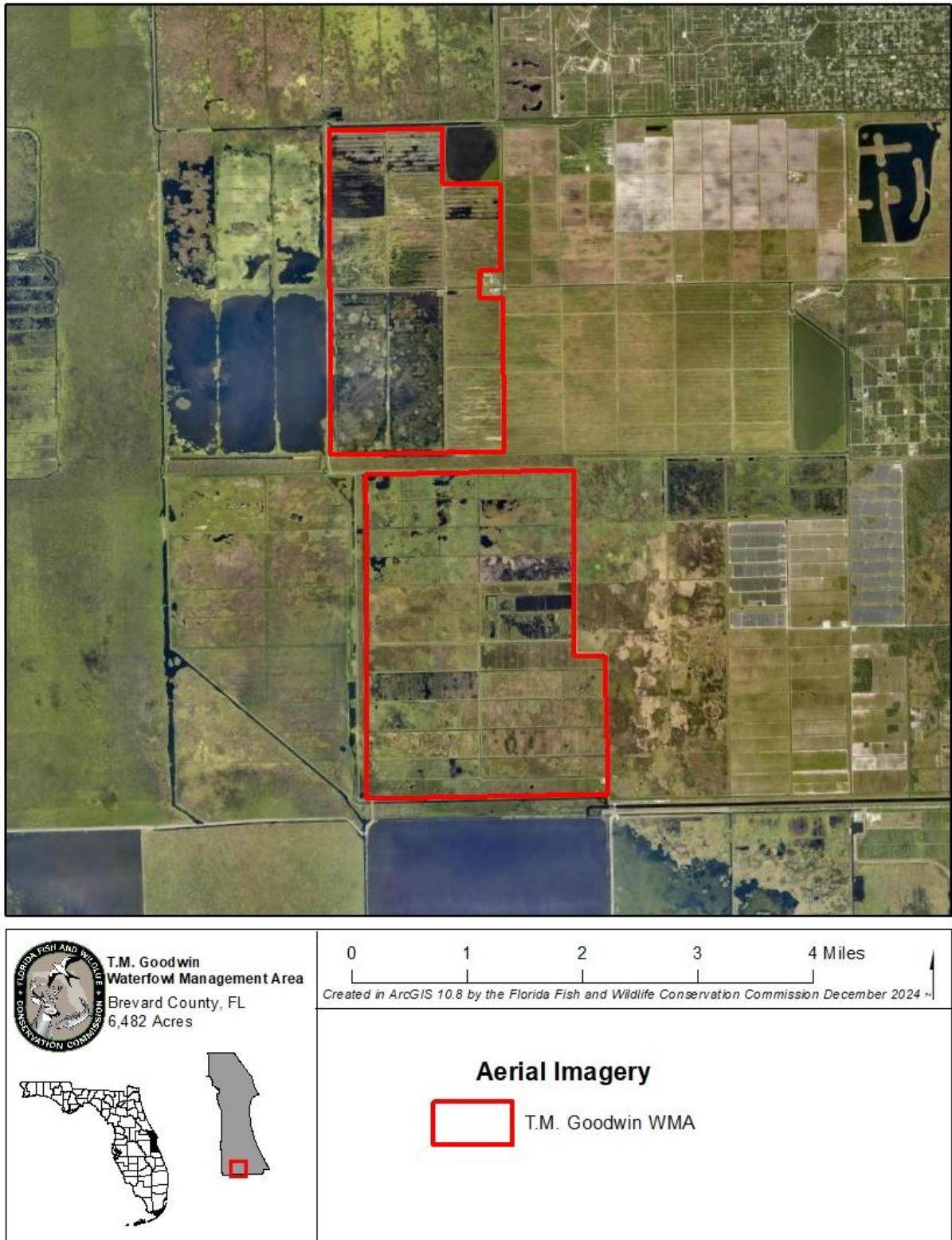


Figure 2. Aerial Imagery

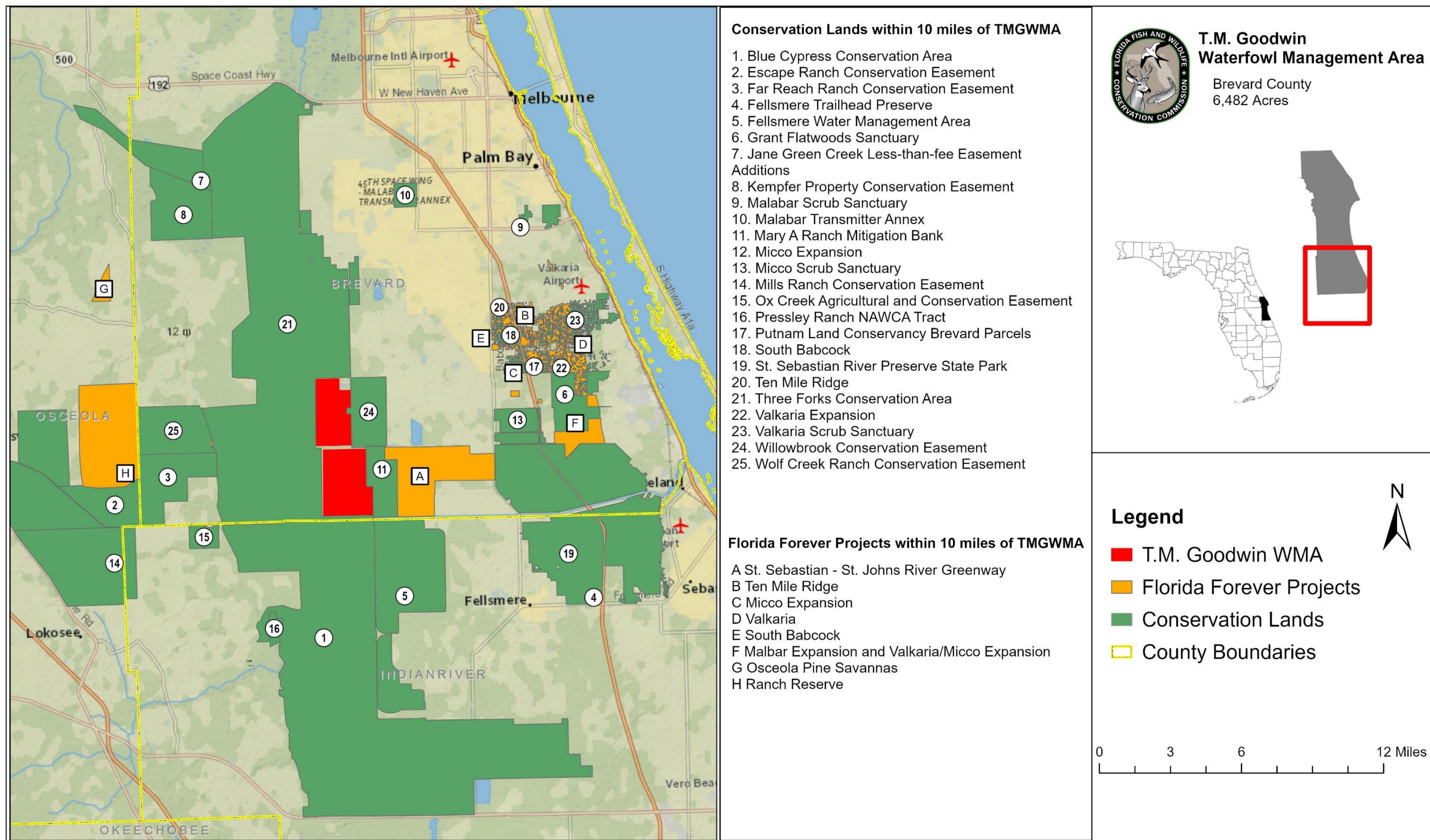


Figure 4. Nearby Conservation Lands and Florida Forever Projects

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1.2 Title Interest and Management Authority

As State-owned lands, title to the TMGWMA is vested in the SJRWMD. In May 1991, the Governing Board of the SJRWMD entered a 30-year lease agreement (Lease Agreement No. 90106) granting the FWC management authority for the Goodwin Unit. In 2021, this agreement was renewed for a 20-year term with an automatic five-year renewal. In April 2002, the Governing Board of the SJRWMD entered in Management Agreement 01183 granting FWC management authority for the Broadmoor Marsh Unit. 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, 597, and 870 of the F.S. These constitutional provisions and laws provide the FWC with the authority to protect, conserve, and manage the State's fish and wildlife resources.

The SJRWMD agreements provide authority to the FWC to manage the TMGWMA “for the purpose of the construction, establishment, and operation of a waterfowl management area and associated wildlife management, habitat management, recreational, research, and educational activities and other compatible uses as mutually agreed upon between [the SJRWMD and the FWC].”

1.3 Acquisition

1.3.1 Acquisition History

In January 1988, the SJRWMD acquired 3,682 acres from the Fellsmere Farm Company for \$6.3 million with funding from the State's Save Our Rivers program. This tract of land was originally called the C-54 Retention Area in recognition of its intended purpose to serve as a water storage and flood control area within the upper St. Johns River Basin (USJRB) Project. The C-54 Retention Area was later renamed the Goodwin Unit. The SJRWMD and the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) acquired 2,800 acres of land that became the Broadmoor Marsh Unit in 1998 for approximately \$11.5 million. The SJRWMD contributed \$7.3 million toward the overall acquisition project cost using the State's Preservation 2000 program funds and the NRCS contributed \$4.2 million using federal Wetland Reserve Program (WRP) funds. The use of federal funds to acquire the Broadmoor Marsh Unit resulted in the NRCS obtaining a 30-year conservation easement on the unit.

Recreational users in the area recommended that the newly acquired properties should be available for public use. After discussing this subject with the FWC's Waterfowl Management Section, in April 1988, the SJRWMD endorsed the concept of managing one of the tracts for wetland wildlife. After evaluation of several options, the Waterfowl Management Section concluded that the C-54 Retention Area had the best potential for intensive wetland management. The SJRWMD's Governing Board approved the concept of the FWC managing the C-54 Retention Area in January 1989. A site-specific agreement to use Matching Aid to Restore States Habitat program funds from Ducks Unlimited was signed in December 1990. State matching funds for development were approved by the 1990 Florida Legislature. In May 1991, the FWC entered into an agreement with the SJRWMD thereby designating the FWC as the lead management agency.

During construction of the Broadmoor Marsh Unit, the SJRWMD and the NRCS expressed interest in having the FWC manage the Broadmoor Marsh Unit for wetland wildlife similar to its management of the Goodwin Unit. The SJRWMD and the NRCS provided cost-share funding for restoration activities for the first three years after development, and the Florida Legislature allotted funding for a full-time staff position for the Broadmoor Marsh Unit. In 2002, the FWC entered into a three-party agreement with the SJRWMD and the NRCS to designate the FWC as the lead management agency. Through the WRP, the NRCS allocated funding to modify the Broadmoor Marsh Unit's existing drainage system into a wetland management system similar to the Goodwin Unit's. In doing so, the NRCS consulted with FWC and SJRWMD staff for operational design and contracted with Ducks Unlimited for the overall engineering design and project construction.

1.3.2 Purpose for Acquisition of the Property

The C-54 Retention Area (known as the Goodwin Unit) was purchased to provide 11,600 acre-feet of flood storage capacity within the USJRB, alleviate inter-basin diversion and discharge to the Indian River Lagoon, and serve as a wetland restoration and conservation site. The SJRWMD and the NRCS purchased the Broadmoor Marsh Unit jointly as part of the SJRWMD's ongoing efforts to restore wetlands in the USJRB. Unlike the Goodwin Unit, however, the Broadmoor Marsh Unit was not acquired for flood storage. The Broadmoor Marsh Unit was acquired for wetland restoration and conservation and the management of waterfowl habitat and other wetland wildlife.

1.3.3 Encumbrances

Encumbrances include a 30-year NRCS WRP conservation easement placed on the Broadmoor Marsh Unit as part of the federal funding grant covenants to ensure the land is protected, conserved, and managed for the original purpose of acquisition that expires in 2028. Additionally, there is a perpetual drainage easement on the Broadmoor Marsh Unit granted to James Sartori and Willowbrook Farms (Appendix 11.2) as well as one indefinite housing agreement with an FWC employee.

1.4 Planning Philosophy

The FWC emphasizes consensus-building to engage, understand, and incorporate the ideas of the various interests, user groups, and communities that it serves. To achieve this, the FWC convenes a Management Advisory Group (MAG) meeting which engages stakeholders from various user groups at the beginning of FWC's planning process, and a public hearing in which the public can provide formal testimony.

The FWC maintains transparency and accountability throughout the development and implementation of the Management Plan by following a "living document" concept which links each plan with the previous plan by reporting on the objectives, management activities, and projects accomplished over the last planning timeframe (see Section 4). The Management Plan serves as the guiding framework to implement an adaptive management process and content will be evaluated throughout the planning period to achieve comprehensive conservation goals (Section 4.2). As needed, amendments to Management Plans are presented to the SJRWMD for review and consideration.

1.5 Public Involvement

The FWC conducted a MAG meeting in Palm Bay, Florida on February 26, 2025, to obtain input from both public and private stakeholders regarding management of the TMGWMA. Results of this meeting were used by the FWC to develop management goals and objectives and to identify opportunities and strategies for management to include in the update to the Management Plan. Further, a public hearing, as required by Chapter 259.032(10), F.S., was held in Cocoa, Florida on April 29, 2025, to solicit input and comments from the public regarding the upcoming update to the Management Plan. The Management Prospectus was made available to the public in advance of the hearing as well as for an extended period of public comment following. A report of that hearing is included in the Management Plan (Appendix 11.4). At any time regardless of public hearing dates, the public may provide input on Management Plans in development by visiting the FWC [website](#). Input received from all public involvement efforts are considered in the development of the update to the Management Plan.

2 Natural and Cultural Resources

2.1 Physiography

2.1.1 Topography and Geologic Formations

The State of Florida is a part of the Florida platform that extends into the Atlantic Ocean and extends over 100 miles into the Gulf of America. Florida has a mosaic of geologic formations and soil types and is part of the Coastal Plain physiographic province which stretches from Cape Cod to the Mexican border. The Coastal Plain is divided into six physiographic sections, and Florida lies between two of these sections: the Floridian section, which encompasses most of peninsular Florida, and the East Gulf Plain section, which encompasses the panhandle of Florida. Additionally, there are a total of 10 physiographic divisions within Florida. The TMGWMA is primarily located in the Barrier Island Sequence District, as well as a region that contains Holocene sediments. These sediments are characterized by quartz sands, carbonate sands, muds, and organics and shallow elevations that range from six feet above mean sea level to 20 feet National Geodetic Vertical Datum of 1929 (NGVD29). Specifically, on the TMGWMA the maximum elevation is 25 feet NGVD29.

2.1.2 Soils

The NRCS data was used to identify the TMGWMA soil series and depth-to-water table. The map units described in the soil survey of the TMGWMA are distributed as shown in Figure 5. Analyses of depth-to-water table on the TMGWMA are also provided in Figure 6. The NRCS defines a soil map unit as: “a collection of soil areas or non-soil areas (miscellaneous areas) delineated in a soil survey.”¹ Soil map units may contain multiple soil components, which are given names that are unique identifiers. Appendix 11.7 lists the names and official map unit descriptions as determined by the NRCS. Analysis of depth to water table for map units occurring within the TMGWMA are also provided in Appendix 11.7. Specific soils found on the TMGWMA are generally associated with swamps, marshes, and floodplains in poorly drained marine terraces and primarily consist of organic soils derived from decaying hydrophytic plant materials. Everglades mucky peat makes

up approximately half of the TMGWMA with Micco mucky peat making up nearly 29% and Canova muck making up 15%. Various other soil types that each make up less than 10% of the area include Oldsmar sand and Canova mucky peat.

2.1.3 Weather Conditions

In general, moderate climates occur in Brevard County. The TMGWMA is characterized by long, warm summers and mild winters. The average daily winter temperature over the last 10 years has been 67° Fahrenheit (F), with an average minimum temperature of approximately 58°F. The average daily summer temperature is 81°F with an average maximum temperature of approximately 89° F.² Over the last 10 years, the TMGWMA has seen an average annual rainfall of 53 inches with the majority occurring in the summer season.

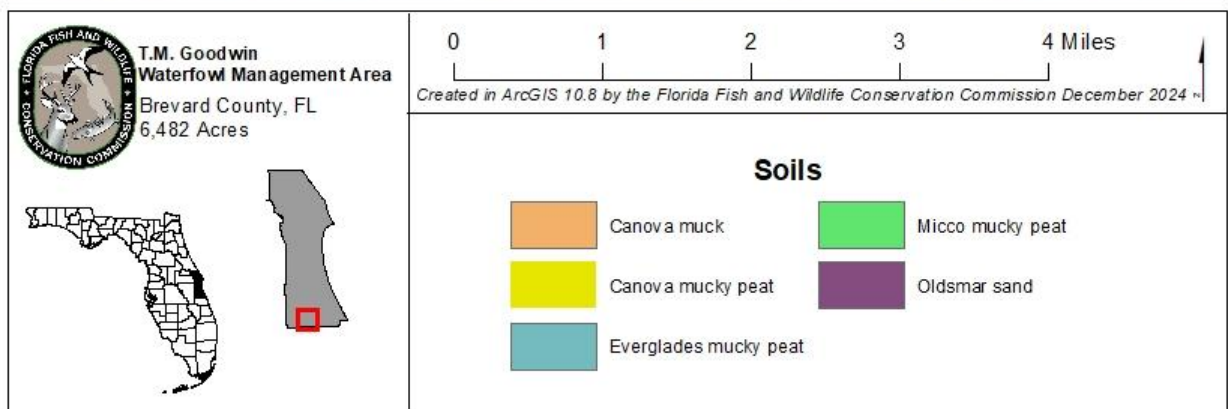
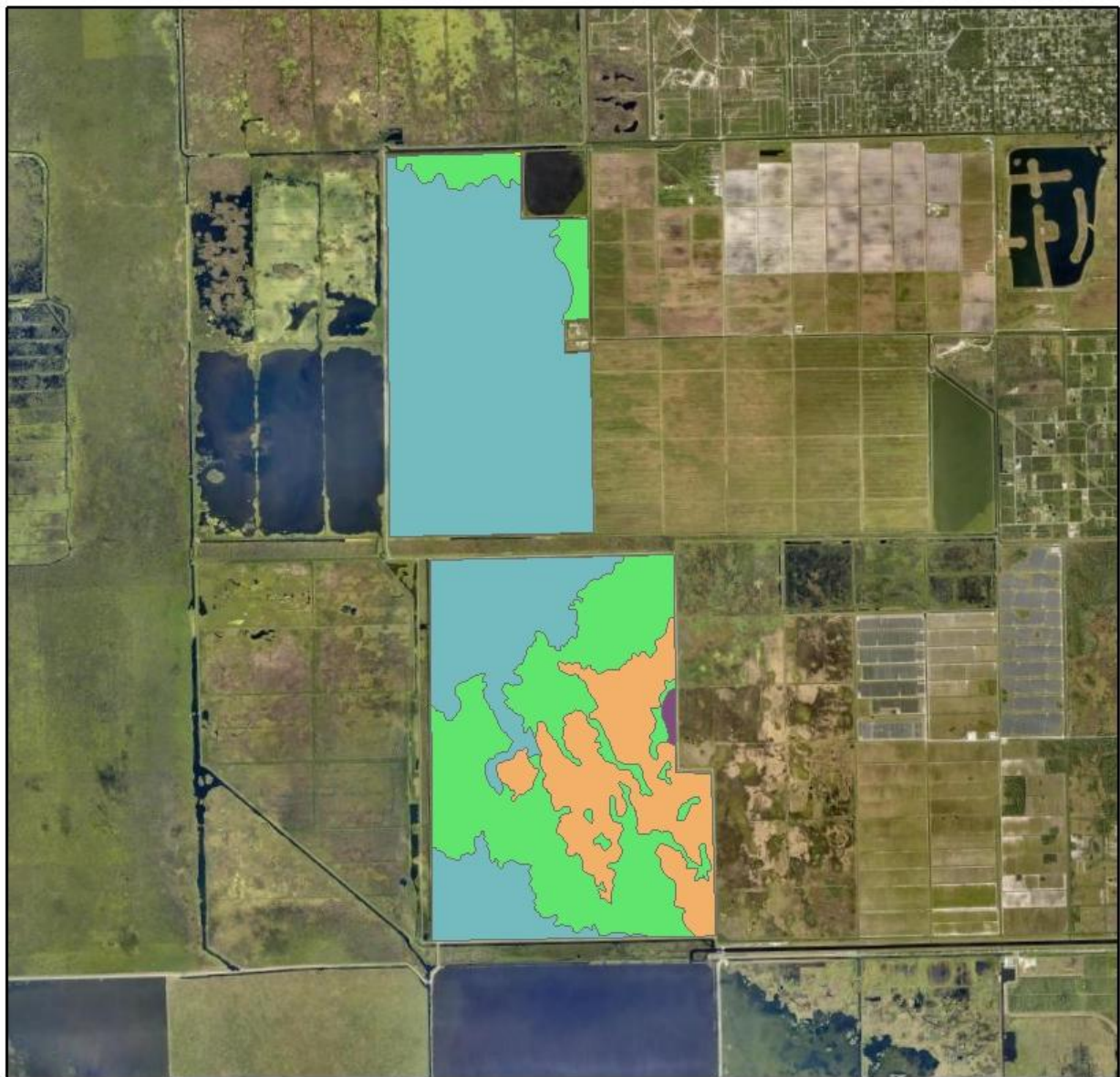


Figure 5. Soil Types

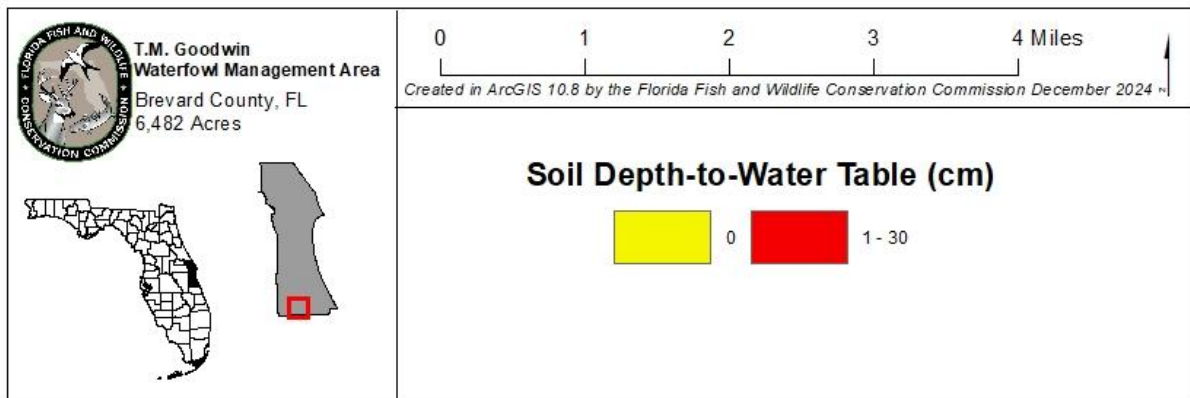
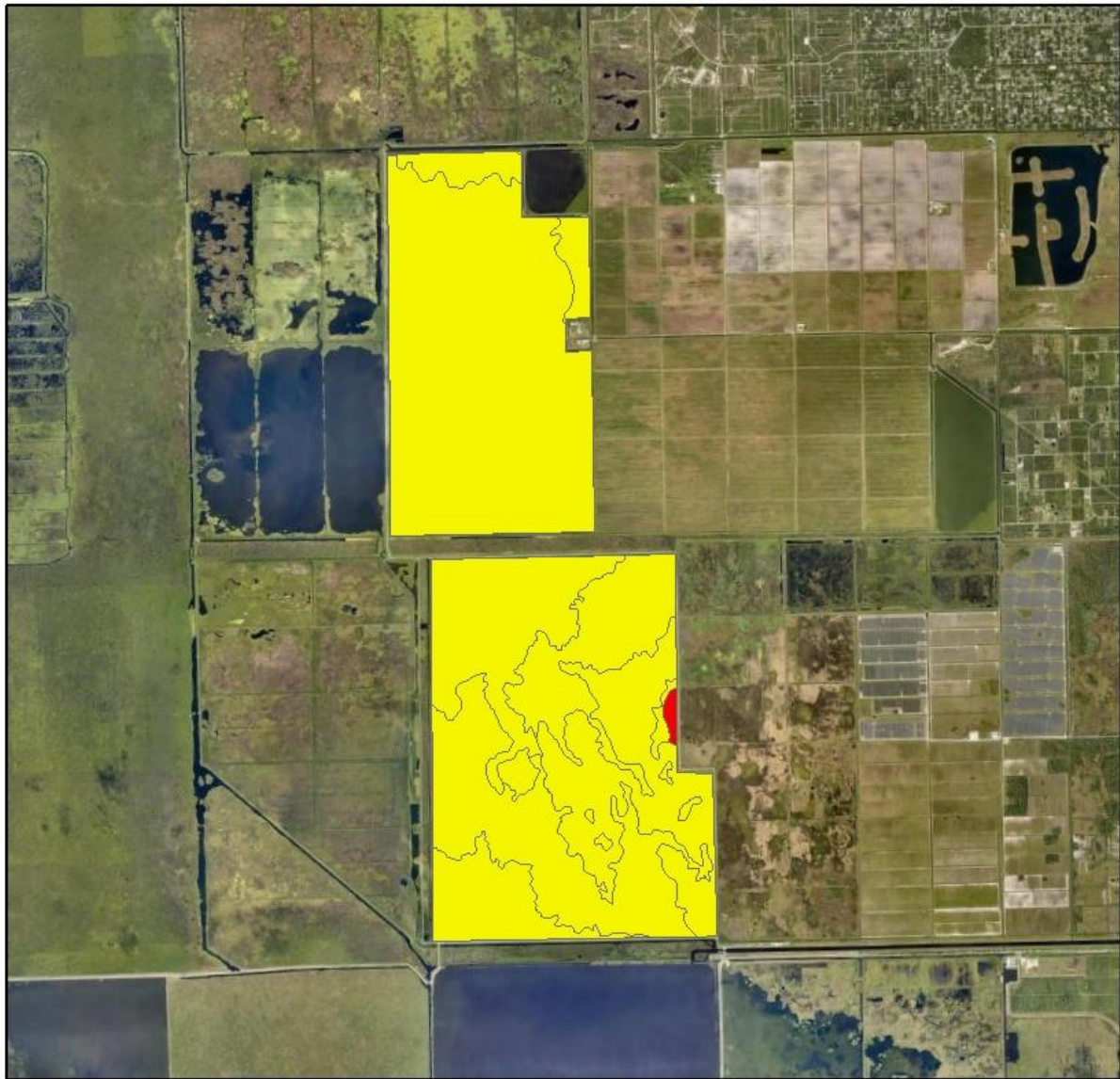


Figure 6. Soil Depth-to-Water Table

2.2 Vegetation

Through the services of the Florida Natural Areas Inventory (FNAI), the FWC has mapped the current and historic natural community and altered landcover types of the TMGWMA and documented one altered landcover type existing on the TMGWMA which is impoundment (Table 3, Figures 7 - 8). An impoundment is a stream, river, or watershed that contains artificial structures that retain water at unnatural levels. The TMGWMA is located entirely in the floodplain of the St. Johns River. The TMGWMA contains numerous hydrology alterations such as ditch and water control structures to manipulate water levels with the goal of waterfowl management. The impoundment contains a patchwork of habitats including open water, aquatic bed, emergent marsh, and shrub marsh.

Additionally, native plant species (not including imperiled and non-native species) found on the TMGWMA have been documented and recorded by either FWC staff or contractors (Appendix 11.5). Currently, no imperiled plant species and 20 non-native plant species have been documented on the area (Table 4, Sections 2.2.1-2.2.2).

Table 3. Natural Communities and Altered Landcover Type

Community Type	GIS Acres	Percentage
Impoundment	6,482	100%



Figure 7. FNAI Natural Communities and Altered Landcover Type

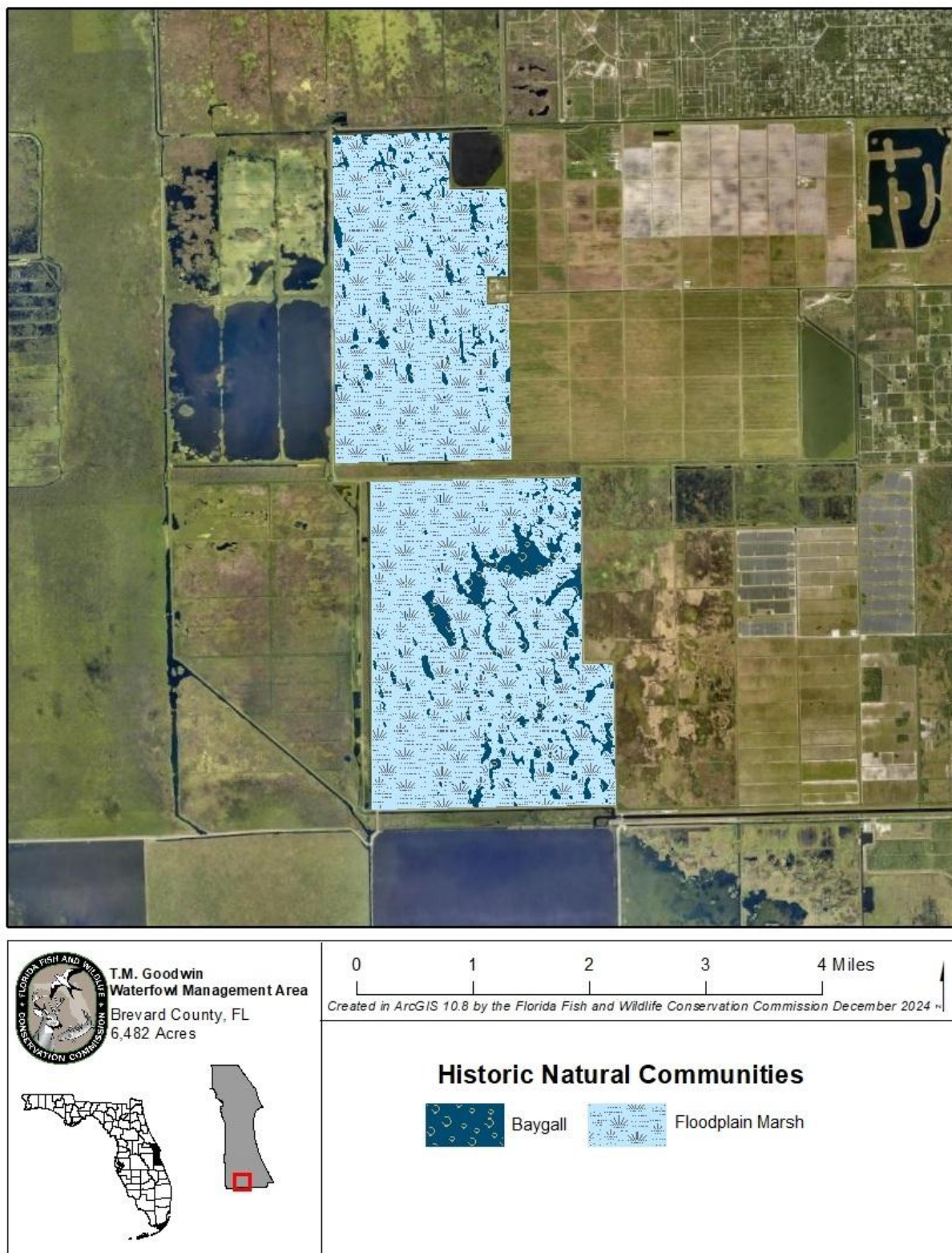


Figure 8. Historic Natural Communities

2.2.1 Imperiled Plants

For the purposes of this Management Plan, the term “imperiled species” as it relates to plants refers to plant species that Florida Department of Agriculture and Consumer Services (FDACS) or the United States Fish and Wildlife Service (USFWS) has designated as Endangered or Threatened. This designation is commonly known as “listed species”, and all names and status determinations were derived from Florida’s Regulated Plant Index rule (5B-40.0055, F.A.C.) that is maintained by FDACS.

There has been no formal rare plant inventory on the TMGWMA, and there are no imperiled plant species known to occur. It is possible that imperiled species occur, and, if encountered, staff will document these occurrences. Florida’s imperiled species are adapted to natural communities and should continue to benefit from the FWC’s ongoing and planned management to maintain and enhance natural community structure and function. Under the FWC’s management, these species have a higher probability of persistence than in the absence of this management. However, while habitat management provides overall benefits to a host of species reliant upon these natural communities, imperiled species sometimes require specific attention.

2.2.2 Non-native Plants

FWC biologists and contractors have documented 20 non-native plant species on the TMGWMA, of which 12 are invasive (Table 4). Species that are considered invasive are species that (a) are non-native to a specified geographic area; (b) were introduced by humans (intentionally or unintentionally); and (c) do or can cause environmental, economic, or human harm. The FWC relies on the Florida Invasive Species Council (FISC) for the categorization of invasive plant species.

Table 4. Non-native Plant Species

Scientific Name	Common Name	FISC Category
<i>Alternanthera philoxeroides</i>	Alligatorweed	II
<i>Azolla pinnata</i>	Feathered mosquitofern	-
<i>Ceratopteris thalictroides</i>	Watersprite	-
<i>Cynodon dactylon</i>	Bermudagrass	-
<i>Cynodon nlemfuensis</i>	African bermudagrass	-
<i>Cyperus alopecuroides</i>	Foxtail flatsedge	-
<i>Cyperus blepharoleptos</i>	Cuban bulrush	I
<i>Eichhornia crassipes</i>	Water hyacinth	I
<i>Hemarthria altissima</i>	Limpograss	II
<i>Hydrilla verticillata</i>	Hydrilla	I
<i>Imperata cylindrica</i>	Cogongrass	I
<i>Ludwigia peruviana</i>	Peruvian primrose-willow	I
<i>Lygodium microphyllum</i>	Old world climbing fern	I
<i>Panicum repens</i>	Torpedo grass	I
<i>Paspalum notatum</i>	Bahiagrass	-
<i>Pistia stratiotes</i>	Water-lettuce	I

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<i>Salvinia minima</i>	Water spangles	I
<i>Schinus terebinthifolia</i>	Brazilian pepper	I
<i>Sorghum halepense</i>	Johnsongrass	-
<i>Urochloa mutica</i>	Para grass	I

2.3 Fish and Wildlife Resources

The TMGWMA supports a wide array of imperiled and more common wildlife species. Active wildlife management practices make the TMGWMA an excellent place to observe wildlife. The TMGWMA's one altered community type, impoundment, contains a patchwork of habitats including open water, aquatic bed, emergent marsh, and shrub marsh which provide critical habitat for resident and migratory wildlife. The FWC maintains an inventory of fauna that has been documented on the TMGWMA listed in Appendix 11.5, including mammals, birds, reptiles, and fish. This inventory will continue to be updated with new observations as they occur.

2.3.1 Imperiled Fish and Wildlife

For the purposes of this Management Plan, the term “imperiled fish and wildlife” refers to animal species that are currently designated as federally-Threatened or Endangered by the USFWS or state-Threatened by the FWC. This designation is also commonly known as “listed species.” Table 5 outlines all imperiled fish and wildlife that have been observed on the TMGWMA. In instances where the currently accepted scientific name differs from the scientific name listed in the Florida Endangered and Threatened Species List rule (68A-27.003, F.A.C.), the F.A.C. name is denoted in brackets.

Table 5. Imperiled Fish and Wildlife Species

Scientific Name ¹	Common Name	Status	FNAI Ranks*
<i>Antigone canadensis pratensis</i>	Florida sandhill crane	ST	G5T2, S2
<i>Egretta caerulea</i>	Little blue heron	ST	G5, S4
<i>Egretta tricolor</i>	Tricolored heron	ST	G5, S4
<i>Laterallus jamaicensis jamaicensis</i>	Eastern black rail	FT	G3, S2
<i>Mycteria americana</i>	Wood stork	FT	G4, S2
<i>Platalea ajaja</i>	Roseate spoonbill	ST	G5, S2
<i>Caracara plancus cheriway</i>	Crested caracara	ST	G5, S2
<i>[Polyborus plancus audubonii]</i>			
<i>Rostrhamus sociabilis plumbeus</i>	Everglade snail kite	FE	G4G5, S2

*FNAI Ranking System descriptions can be found in Appendix 11.6

¹ Currently accepted name [name as listed in 68A-27.003 F.A.C. when it differs]

Acronym	Status
FE	Federally Endangered
FT	Federally Threatened
ST	State Threatened

At its November 2016 Commission meeting, the FWC approved Florida's [Imperiled Species Management Plan](#), which included changes to the listing status for many wildlife species. Subsequent rule changes (68A-27.003 and 68A-27.005, F.A.C.) have come into effect since the Imperiled Species Management Plan was approved and those changes have been incorporated into this Management Plan. All federally listed species that occur in Florida are included in [Florida's Endangered and Threatened Species list](#) as federally-designated Endangered or Threatened. Species that are not federally listed, but which have been identified by the FWC as being at some level of risk of extinction, are state designated as Threatened.

Gopher Tortoise Recipient Site Eligibility

Per Chapter 259.01 F.S., the FWC has evaluated the TMGWMA for eligibility as a recipient site for gopher tortoises. Based on a preliminary GIS analysis conducted by the FWC, the TMGWMA does not meet the April 2024 [Gopher Tortoise Permitting Guidelines](#), and, therefore, would not be permissible as a gopher tortoise recipient. This determination is due to the site's soil composition being primarily wet, poorly drained soil types, which are not conducive to supporting viable gopher tortoise populations and do not meet the recipient site criteria of the guidelines.

2.3.2 Non-native Wildlife Species

In addition to the native wildlife species listed in Appendix 11.5, five non-native wildlife species have been documented on the TMGWMA (Table 6). The FWC will continue to document any occurrences of non-native species. More information on monitoring and management of non-native wildlife can be found in Section 4.5 and Section 5.4.

Table 6. Non-native Wildlife Species

Scientific Name	Common Name
<i>Agama agama</i>	African redhead agama
<i>Agama picticauda</i>	Peter's rock agama
<i>Iguana iguana</i>	Green iguana
<i>Porphyrio poliocephalus</i>	Gray-headed swampphen
<i>Python molurus</i>	Burmese python
<i>Sus scrofa</i>	Wild hog

2.3.3 FNAI Element Occurrences

A diversity of wildlife species is found on the TMGWMA. The FWC uses the FNAI Natural Heritage Database to assist in identifying and recording resources on FWC-managed areas. This database also supplemented the development of the species tables found in Appendix 11.5. FNAI's Natural Heritage Database is a comprehensive compilation of records documenting the location and ecological status of rare plant and animal species in the state. The database consists of "element occurrences", where an "element" is any exemplary or rare component of the natural environment, such as a species, natural community, or other ecological feature; and an "element occurrence" is an area of land and/or water where an element is, or was, present. FNAI scientists "track"

(collect information on) approximately 233 vertebrates, 562 invertebrates, and 492 plants representing approximately 13% of the state's vertebrate species, less than 5% of the invertebrates, and about 12% of the plants. The status of each tracked element is assessed using standardized methodology; each tracked element is assigned ranks that reflect its rarity and degree of imperilment at the global and state level. These ranks are applied using a standardized methodology that incorporates many factors, including geographic range; number, size, and condition of known occurrences; population size and trends; life history characteristics; and threats. The Natural Heritage ranking system definitions are in Appendix 11.6 and may be found [online](#).

The FNAI element occurrence records include two occurrences of wildlife species in the vicinity of the TMGWMA. Several of the imperiled species discussed in Section 2.3.1 in this report are tracked by FNAI. These species and their ranks are listed in Table 5. In addition to the imperiled species listed in Table 5, FNAI also tracks the following rare and/or vulnerable species that occur on the TMGWMA: American alligator (*Alligator mississippiensis*) G5 S4, caspian tern (*Hydroprogne caspia*) G5 S2, glossy ibis (*Plegadis falcinellus*) G5 S3, limpkin (*Aramus guarauna*) G5 S3, peregrine falcon (*Falco peregrinus*) G4 S2, swallow-tailed kite (*Elanoides forficatus*) G5 S2, and yellow-crowned night-heron (*Nyctanassa violacea*) G5 S3. Appendix 11.10 contains a letter from FNAI authorizing the FWC to utilize their database for the purpose of identifying known plant and animal resources.

2.4 Water Resources

All surface waters of the State are classified by the DEP according to designated uses as described in Chapter 62-302.400, F.A.C. The surface waters of the TMGWMA are designated as Class III and classified for fish consumption; recreation or limited recreation; as well as propagation and maintenance of a healthy, well-balanced population of fish and wildlife. Additionally, it is the policy of the DEP to afford the highest protection to Outstanding Florida Waters (OFW) and Outstanding National Resource Waters (Chapter 62-302.700, F.A.C.). No portions of the TMGWMA are designated as OFW. The TMGWMA is located adjacent to the Indian River-Malabar to Vero Beach Aquatic Preserve.

At TMGWMA, water resources include shallow impoundments, Goodwin Lake, and a reservoir on the Goodwin Unit and Broadmoor Marsh Unit. The TMGWMA was designed to allow for the movement of water from the reservoirs to the impoundments as drawdowns and re-watering are needed to achieve management objectives. Two water control structures (WCS) are installed in each impoundment; one being connected to the central canal and the other connected to a canal extending around the Goodwin Unit's perimeter. In addition, two-10,000 gallon per minute, electric, bi-directional pumps are located on the southern end of the central canal to move and control water.

The northern half of the Goodwin Unit is used as a reservoir to store water for managing the impoundments. The reservoir is directly connected to the canal extending around the perimeter of the impoundments on the southern half. Two WCS also connect the reservoir to the central

canal; one on the northern end of the central canal, and the other on the southern end of the central canal.

The Broadmoor Marsh Unit is divided into 10 impoundments, each averaging about 214 acres. A central canal bisects the Unit with eight impoundments to the north and two impoundments plus an 875-acre reservoir to the south. Previous farming practices on the property dictated the need for numerous lateral drainage ditches, oriented in an east-west direction and spaced approximately 220 feet apart, for precise water level manipulations within each impoundment. The ditches have been left intact and are used to facilitate the conveyance of water. Two WCS are installed in each impoundment. The WCS convey water to a slightly deeper secondary drainage ditch that is connected to the central canal and the pump station.

The water levels in the Goodwin Unit and the Broadmoor Marsh Unit reservoirs are managed to maintain a semi-permanent flooded marsh, with water levels ranging between 24 to 36 inches. The Goodwin Unit serves as a storm water retention area for use by the SJRWMD so water levels in its reservoir cannot exceed an overall mean elevation of 22 feet NGVD29. Maintaining water levels at or below this elevation will provide approximately 11,610 acre-feet of floodwater storage when the Goodwin Unit is flooded to an elevation of 25 feet NGVD29. No water level restrictions exist for the Broadmoor Marsh Unit.

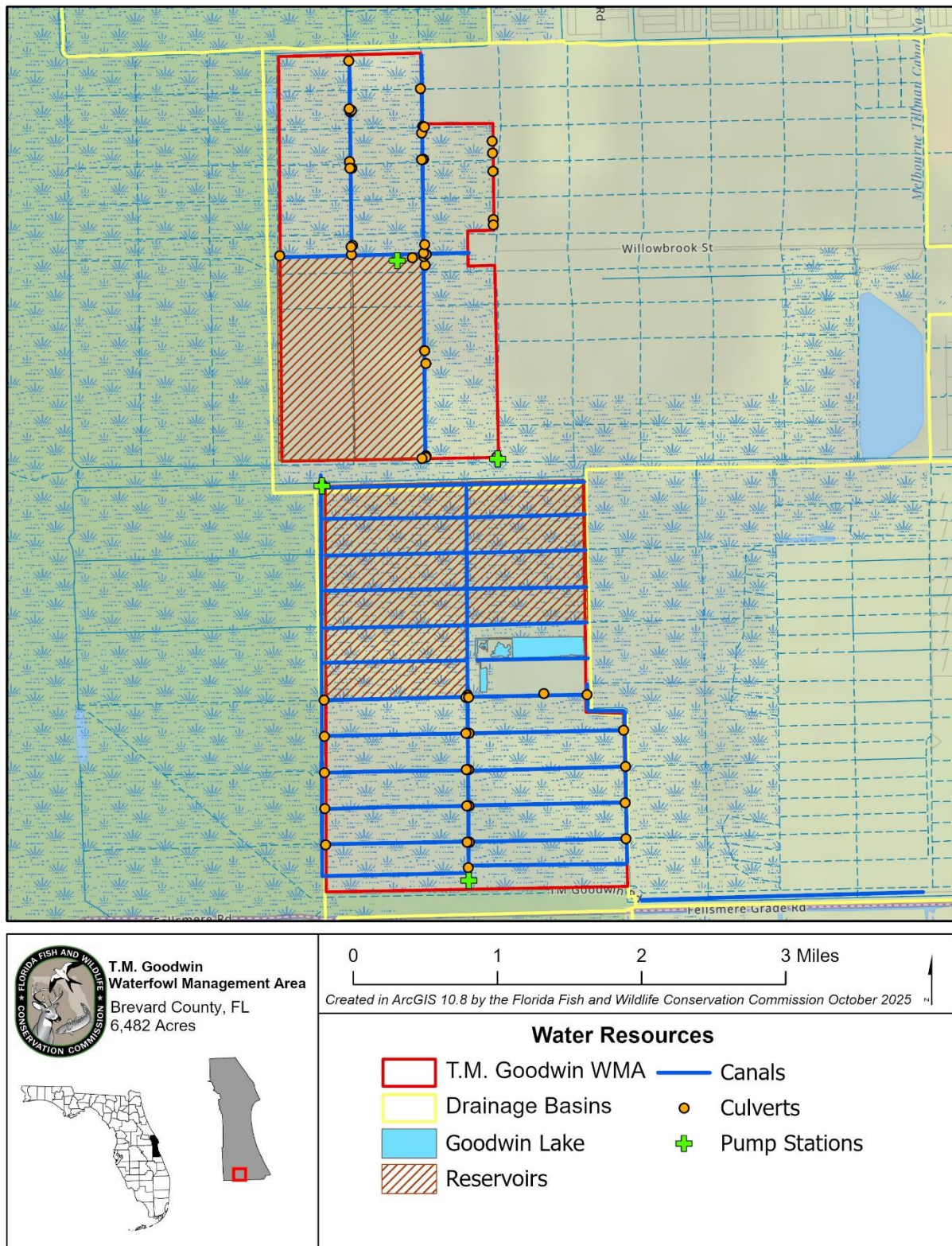


Figure 9. Water Resources

2.5 Forest Resources

There are no timber resources on the TMGWMA. As a result, the FWC and the Florida Forest Service (FFS) have determined that a professional forest assessment for the TMGWMA is unnecessary. The FWC will cooperate with the FFS or a qualified professional forestry consultant regarding any forestry management activities, should they become necessary or appropriate.

2.6 Beaches and Dunes

There are no beaches or dunes located at TMGWMA.

2.7 Mineral Resources

Mineral operations in Brevard County have included mining of limestone-coquina, sand, gravel, fill, clay, stone, heavy metals, aluminum, phosphates, fluorine-fluorite, iron, magnesite, uranium, and titanium. No minerals are commercially mined at TMGWMA. There is a 184-acre borrow pit on the east-central portion of the Goodwin Unit, south of Goodwin Lake. The SJRWMD retains the right for use of borrow material in maintaining and constructing levees in the USJRB Project and allows the FWC to use fill material for maintenance of levees on the TMGWMA.

2.8 Cultural Resources

The Florida Master Site File (FMSF), maintained by the Florida Department of State's Division of Historical Resources (DHR), is the State of Florida's official inventory of cultural resources, archaeological and historical survey reports, and other manuscripts relevant to historic preservation in Florida. Categories of resources recorded at the FMSF include archaeological sites, historical structures, historical cemeteries, historical bridges, and historical resource groups (comprised of historic districts, landscapes, and linear features).

To date, the FMSF indicates that two previous cultural resource surveys have been conducted on the TMGWMA. Additionally, one archaeological site and one resource group have been recorded on the TMGWMA, neither of which have been determined eligible for inclusion in the National Register of Historic Places (Table 7). The FWC consults with the DHR to determine the necessary actions for resource inventory and preservation. All identification, assessment, and preservation strategies are developed in consultation with the DHR.

Table 7. Cultural Resources

FMSF No.	Resource Category	Resource Title	Acres	National Register of Historic Places Eligibility
BR1614	Archaeological site	TM Goodwin Waterfowl Site	6.22	No
BR1957	Linear resource	Main Sottile Canal	3.0	No

2.9 Scenic Resources

The TMGWMA is part of the USJRB Project, which is a unique, important resource management effort that has ecological, agricultural, and historical significance. As a result of the project, wetland management and protection in the USJRB has provided excellent wildlife habitat at

TMGWMA and many forms of recreational activities for the public. Scenic resources include views of wetland habitat and the variety of wildlife it supports including waterfowl, wading birds, and shorebirds. The TMGWMA is part of the Great Florida Birding and Wildlife Trail, and observers have documented more than 90 species of birds during fall and spring migrations. Visitors can observe wildlife in the impoundments and reservoirs from the area's network of levees.

3 Uses of the Property

3.1 Previous Use and Development

During the 1960s, Gulf Western Food Products, a division of Gulf Western Industries, purchased approximately 58,000 acres of freshwater marshlands, including present day TMGWMA, from South Puerto Rican Sugar Corporation. Most of this land was within Brevard and Indian River counties. Gulf Western Industries began draining much of this land for agricultural purposes, primarily citrus, sod, and cattle production. Between 1972 and 1980, the Goodwin Unit was quarter-drained, which involved dredging lateral ditches in an east-west direction every one-quarter mile. These ditches connect to larger, slightly deeper ditches dredged in a north-south direction every mile. This facilitated the quick removal of surface and shallow ground water, which was pumped offsite to keep the area relatively dry. The area was planted with numerous pasture grasses [i.e., bahiagrass (*Paspalum notatum*), para grass (*Urochloa mutica*), and bermudagrass (*Cynodon dactylon*)] and stocked with cattle at a rate of about one cow per two acres for a total of about 2,000 head of cattle.

In January 1988, the SJRWMD acquired the property from the Fellsmere Farm Company and subsequently named the tract the C-54 Retention Area in recognition of its intended purpose within the USJRB Project. Like the Goodwin Unit, the Broadmoor Marsh Unit was quarter-drained beginning in the mid-1950s by the Sottile family. In the late 1970s, the Sartori family bought the property, known as Willowbrook Farms, which included the present-day Broadmoor Marsh Unit. The Broadmoor Marsh Unit was not farmed until 1981, when the Sartori family began clearing the area and constructing additional lateral drainage ditches for row crop production, primarily feed corn for dairy cows. In the mid- to late-1980s, portions of the Broadmoor Marsh Unit were leased to A. Duda and Sons for vegetable production. The Broadmoor Marsh Unit was farmed until the SJRWMD and the NRCS purchased the property in March 1998 as part of wetland restoration efforts in the USJRB.

3.2 Current Use

Currently, the TMGWMA is managed for the conservation and protection of fish and wildlife habitat and fish and wildlife-focused public outdoor recreation. A wide range of operational and resource management actions are conducted on the TMGWMA each year, including activities such as prescribed burning; wildlife habitat management and improvement; invasive species maintenance and control; road repairs and maintenance; imperiled and locally important species management, monitoring, and protection; facilities and infrastructure maintenance; conservation acquisition and stewardship activities; cultural resources monitoring and protection; and research related activities.

The TMGWMA is being managed as a multiple-use conservation land. Multiple-use management strategies incorporate uses related to wildlife, fisheries, forest management, and fish and wildlife-focused public outdoor recreation. Current and anticipated resource uses of the property are diverse. Fish and wildlife-focused public outdoor educational and recreational opportunities are provided that are compatible with the original purposes for acquisition of the TMGWMA. Hunting continues to be a popular recreational activity. The area also offers excellent opportunities for wildlife watching. The area is managed for waterfowl and provides for high quality bird watching. Additional uses include hiking, fishing, boating, photography, bicycling, nature study, and horseback riding. Due to the proximity of population centers in Brevard County, public use can be expected to increase as public awareness of opportunities increases.

3.2.1 Hunting

The TMGWMA is one of the premier duck hunting locations in Florida. Late fall through winter, its open marsh habitat, mudflats, and impoundments contain the full spectrum of duck species. Currently, hunting opportunities at TMGWMA include seasons for waterfowl and snipe. Alligator hunting is also allowed on the area. For more information on hunting opportunities at the TMGWMA visit the following link: [Hunting in Florida | FWC](#).

3.2.2 Fishing

Fishing is authorized year-round at the TMGWMA.

3.2.3 Paddling and Boating

Goodwin Lake is open to boats (40 horsepower or less) on Sundays and Thursdays from 9am to 4pm. Boating and paddling opportunities are also available in the Goodwin Unit and Broadmoor Marsh Unit reservoirs when water levels are adequately high. There is a boat ramp and dock at Goodwin Lake, a boat ramp in the northwest corner of the Goodin Unit, and one unimproved boat ramp on the Broadmoor Marsh Unit. Motorized vessels are not permitted in the Goodwin impoundments.

3.2.4 Trails and Roads

Eight miles of the SJRWMD's Three Forks trail follow the western exterior levee of the Broadmoor Marsh Unit and the eastern exterior levee of the Goodwin Unit. Hiking, bicycling, and horseback riding are allowed on the area's levees. Horses and horseback riding are not permitted on L-75 and L-74 North. There are approximately 42 miles of roads and levees on the TMGWMA that are managed by FWC. Of those 42 miles, approximately 10.3 miles are open to the public for vehicular travel. There are an additional 8.1 miles of levees open for public vehicular travel that are managed by the USACOE or the SJRWMD.

3.2.5 Camping

Camping is conditionally allowed only during FWC coordinated events.

3.2.6 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 the FWC-managed lands is governed by specific guidelines. These guidelines may be found on the FWC [website](#).

3.2.7 Wildlife Watching

Wildlife watching is excellent at TMGWMA, particularly for waterfowl, wading birds, and shorebirds. The area is part of the Great Florida Birding and Wildlife Trail, a 2,000-mile, self-guided highway trail that connects and unifies 515 birding and wildlife watching sites throughout Florida. Visitors can expect to observe 100 different bird species on the area during fall and spring migrations. Marshlands next to the levees are good spots to observe great blue herons (*Ardea herodias*), glossy ibis, roseate spoonbills (*Platalea ajaja*), mottled ducks (*Anas fulvigula*), and alligators. Visitors can view the area's wildlife by following the series of levees around the impoundments.

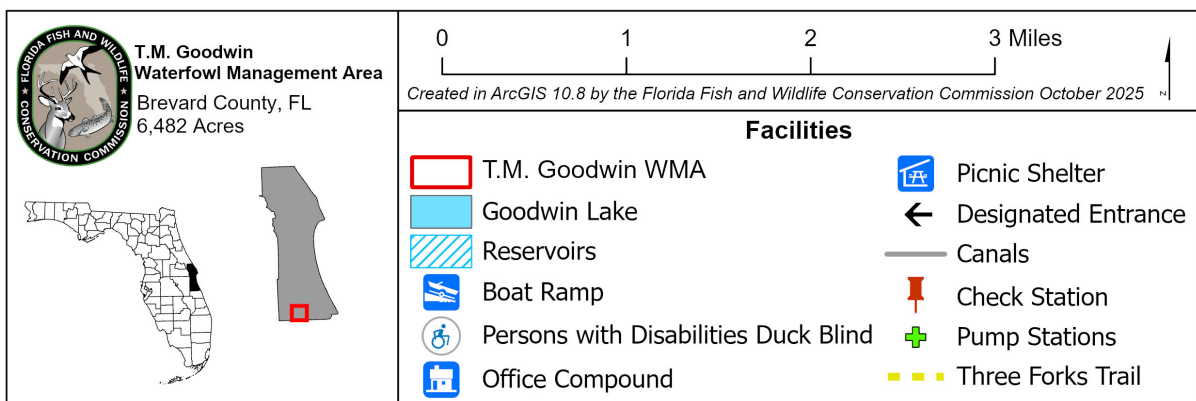
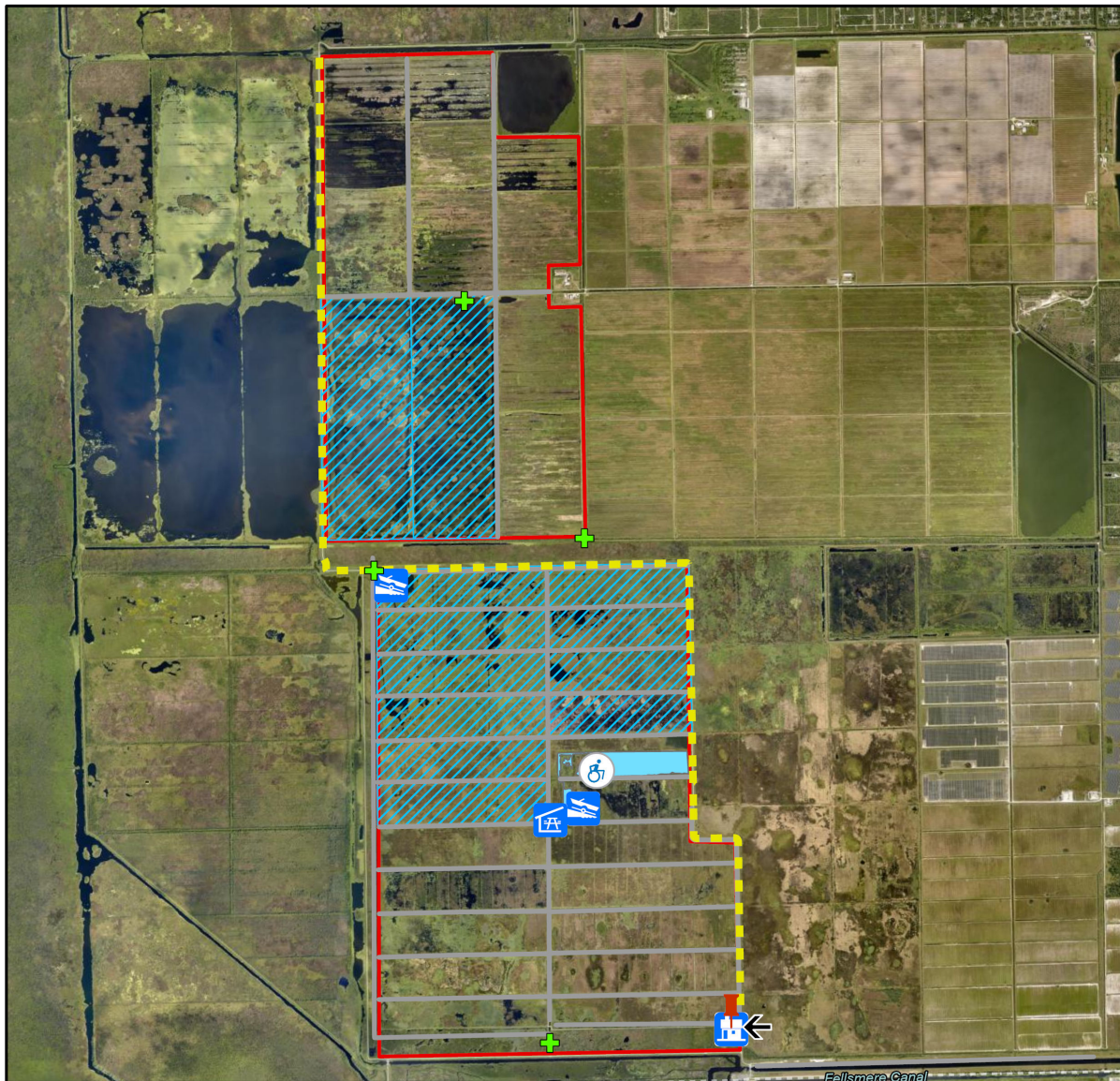


Figure 10. Facilities

3.3 Adjacent Land Uses

The TMGWMA is in southern Brevard County near the County's border with Indian River County to the south. Over the last 50 years, the economy of this area has been based primarily on citrus, and to a lesser extent, cattle and fertilizer. The urban areas of Melbourne and Palm Bay have been growing in the westerly and southerly directions, which will likely influence future development in the area. The 2023 U.S. Census estimates that there are 643,979 people living in Brevard County. The Department of Economic Affairs, Bureau of Economic and Business Research's medium-range population projection indicates that in the year 2030, there will be 678,300 people living in Brevard County.

The current zoning ordinance for the TMGWMA is primarily General Use. According to Brevard County's Comprehensive Plan, this designation encompasses rural single-family residential development or unimproved lands for which there is no definite current proposal for development, or land in areas lacking specific development trends. Portions of the TMGWMA located in Sections 08 and 09, Township 30, South Range 36 East are zoned as Agricultural Residential, a classification which encompasses lands devoted to agricultural pursuits and single-family residential development of spacious character. Brevard County's future land use maps indicate that the TMGWMA will be designated and zoned as Public Conservation. Lands immediately adjacent to the TMGWMA are classified as General Use and Agricultural Residential.

3.4 Visitation, Economic Benefits, and Revenue-generating Potential

Visitation and public use of the area for fish and wildlife-focused public outdoor recreational opportunities is the primary source of economic benefits from the TMGWMA, which contributes to the overall economy for the Northeast region of Florida. In Fiscal Year 2023-24, an estimated 19,972 people visited the TMGWMA. Primarily because of this visitation and use of the area, the FWC economic analysis estimates that the TMGWMA generated an annual economic impact of \$3,902,329 for the State and the Northeast region of Florida. This estimated annual economic impact has aided in the support or creation of an estimated 40 jobs.*

Further revenue generating potential of the TMGWMA will depend upon future uses described in the Management Plan and may include sales of various permits, recreational user fees, or other ecotourism activities, if such projects are feasible. The annual area regulations can be consulted to clarify the necessary and required permits, fees, and regulations.

**The above figures are based on expenditure data from the 2006 National Survey of Fishing, Hunting and Wildlife-Associated Recreation (USFWS) and 2006 IMPLAN economic models assembled by Southwick Associates and the USFWS. The results were updated in 2010 based on hunting and fishing license trends and inflation. The results were combined and weighted based on the numbers of hunters, anglers, and wildlife viewers statewide. The results assume participants' expenditures and the values used to calculate these expenditures are consistent throughout the state. Users applying these results to local situations should be aware that differences might exist between these statewide averages and the site in question and make adjustments, if needed.*

3.5 Single- or Multiple-use Management

As mentioned previously, the TMGWMA will be managed under the multiple-use concept as a WMA. The TMGWMA will provide fish and wildlife-focused public outdoor recreation and educational opportunities, while providing water storage and protecting the natural and cultural resources found on the area. Any natural and cultural resources on the TMGWMA will be managed under the guidance of the SJRWMD, the Conceptual State Lands Management Plan, and as outlined in the original purposes for acquisition. A detailed assessment of the benefits and potential impacts of planned uses and activities on natural and cultural resources was an integral part of the development of the management activities and intent, goals, objectives, challenges, and strategies sections of this Management Plan.

3.5.1 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 the TMGWMA. Uses classified as “Approved” are in accordance with the purposes for acquisition; the Conceptual State Lands Management Plan; and the FWC agency mission, goals, and objectives as expressed in the FWC Agency Strategic Plan. 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, 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		✓	
Archery		✓	
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 cultural resources	✓		
Primitive camping		✓	
Protection of imperiled species	✓		
Off-road vehicle use			✓
Shooting sports park			✓

Soil and water conservation	✓		
Timber harvest		✓	
Wildlife observation	✓		

3.5.2 Incompatible Uses and Linear Facilities

Consideration of incompatible uses and linear facilities on the TMGWMA are made in accordance with the requirements of Section 253.034(10), F.S.; various applicable Florida statute, rule, and policy requirements; and other provisions governing applications for proposed incompatible uses or linear facilities on state-owned conservation lands. Upon approval and implementation of the 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 Division of State Lands (DSL) and the SJRWMD prior to any incompatible use or linear facility being authorized on the TMGWMA.

3.6 Potential Surplus Review

On conservation lands where the FWC is the lead manager, the FWC evaluates and identifies recommended areas for a potential surplus designation by the DSL and SJRWMD. The 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 the TMGWMA by the 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 good fish and wildlife-focused public outdoor recreational opportunities. Therefore, no portion of the TMGWMA is recommended for potential surplus review.

4 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 non-renewable cultural resources. In general, the FWC management intent for the TMGWMA is to manage and improve wetland habitats for various waterfowl and wetland dependent species, including wading birds, shorebirds, and rare and more common wildlife species. In conjunction with this primary emphasis, it is the FWC's intent to provide quality fish and wildlife-focused public outdoor recreational opportunities on the TMGWMA. As noted previously, the management activities described in this section comply with those of the Conceptual State Lands Management Plan.

4.1 Land Management Review

On-site reviews of conservation and recreation lands that exceed 1,000 acres and are titled in the name of the SJRWMD are required every five years by Section 259.036, F.S. These reviews determine whether the lands are managed for the purposes for which they were acquired and whether they are being managed in accordance with their land management plan adopted

pursuant to Section 373.591, F.S. According to statute, the review team will “determine whether conservation, preservation, and recreation lands titled in the names of the water management districts are being managed for the purposes for which they were acquired and in accordance with land management objectives, the water management districts shall establish land management review teams to conduct periodic management reviews.”

4.2 Adaptive Management

Adaptive management is "learning by doing";³ it is the adjustment or modification of conservation actions to achieve a desired conservation goal, which is practiced on the TMGWMA. 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.^{3, 4, 5}

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.^{3, 4, 5} 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.^{4, 5} The FWC will monitor conservation actions, species, habitats, and major threats to the conservation of the natural and cultural resources of the TMGWMA.

4.2.1 Monitoring

A well-developed monitoring protocol is also one of the required criteria for the management of the TMGWMA. 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 the essential data for evaluating the costs, benefits, and effectiveness of planned conservation actions, whereby those evaluations can then be used to modify management actions as necessary to meet longer-term management goals.³

For natural communities, monitoring protocols are generally established through the FWC's Objective Based Vegetation Management (OBVM) program which monitors how specific vegetative attributes are responding to FWC management. However, OBVM is not implemented on TMGWMA which is further described in Section 4.3.1. FWC staff may also monitor additional fish and wildlife species when deemed appropriate. Volunteer monitoring opportunities that support community engagement and the goals and objectives of the TMGWMA may be developed in collaboration with land managers, key biologists, and/or partners and could include projects ranging in focus from single-day events like bioblitzes to longer term programs assisting in species monitoring. Invasive plant and animal species are monitored as needed and appropriate (Section 4.5). Recreational uses are monitored through the FWC's Public Access Services Office and work

in conjunction with the establishment and adjustment of public access carrying capacities (Section 4.6.3). Cultural resources are monitored with guidance from the DHR (Section 4.9).

4.2.2 Florida Landscape Assessment Model

The FWC has developed the Florida Landscape Assessment Model (FLAM) as a Geographic Information Systems (GIS)-based assessment tool that incorporates a wide variety of landscape and wildlife species data. The FLAM evaluates the Florida landscape based upon important natural resources and habitat needs of wildlife to identify ecologically significant lands in the state and to assess the potential impacts of management and land-use changes. The FLAM was developed to provide technical assistance to various local, regional, state, and federal agencies and entities interested in wildlife needs and conservation 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 FLAM ranks habitat from a 0-10; a rank of 10 being of greatest value. The FLAM (2021) indicates that the TMGWMA has a moderate mean wildlife value of 5.1 (Figure 11).

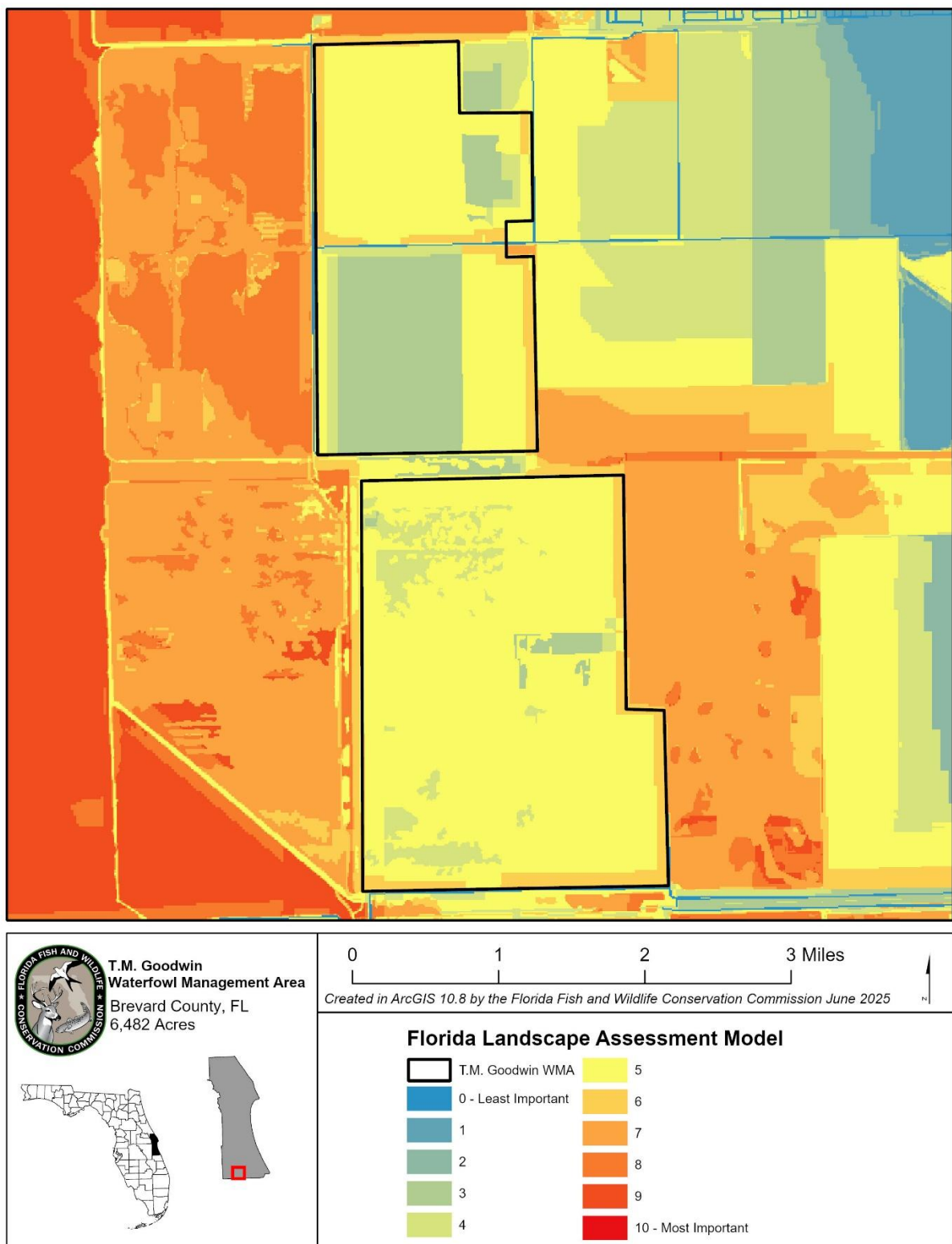


Figure 11. Florida Landscape Assessment Model

4.2.3 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.

4.2.4 Implementation

The TMGWMA Management Plan serves as the guiding framework to implement this adaptive management process. It serves as the underpinning for the integration of management programs underway to accomplish needed conservation actions that are planned to manage the natural resources of the TMGWMA 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.

4.3 Habitat Restoration and Improvement

On the TMGWMA, the FWC will emphasize habitat management that maintains early successional, predominately wetland plant communities to provide habitat and food sources for waterfowl, shorebirds, and other wetland wildlife species. Management and maintenance may be achieved using prescribed fire, water level management, and mechanical and chemical vegetation management activities. Water level management is the primary habitat management tool used on the area. Habitat management is accomplished by manipulating water levels in the impoundments to promote the production of native, moist-soil, wetland plants. The FWC will continue to manage and protect the marsh, open water, and aquatic beds within the area's impoundments and reservoirs using integrated wetland management techniques.

4.3.1 Objective-Based Vegetation Management

The FWC often uses a comprehensive resource management approach to improving FWC-managed areas. OBVM is a monitoring tool used by the FWC to monitor how specific structural vegetative attributes, that characterize a natural community, are responding to management.

Because the TMGWMA is maintained and managed as an impoundment, an altered community, there are no natural communities to be monitored by the OBVM program. Due to the specific composition of artificial wetlands and associated management objectives, the area is managed to provide habitat for waterfowl and other wetland species.

The FNAI mapped TMGWMA in 2012 and classified the entire area as impoundment. The impoundment classification includes the TMGWMA's open water, aquatic bed, emergent marsh, shrub marsh, levees, and managed impoundments. Using aerial photography from 1943 that was geo-rectified and merged to create a mosaic covering all of the property and some of the surrounding lands, the FNAI mapped two historic natural communities on the area, consisting of

floodplain marsh and South Florida bayhead, a variant of baygall. Instead of focusing management activities to restore the historic natural communities that occurred at TMGWMA, FWC staff uses moist soil management techniques to establish and perpetuate pre-emergent aquatic wetland vegetation to provide a diversity of wintering and breeding habitats for various waterfowl species, wading and shore birds.

After communities have been mapped, management units are delineated. Management units on the area consist of the impoundments and reservoirs on the Goodwin and Broadmoor Marsh Units. Area staff assess the current vegetation in each impoundment and reservoir, including documenting plant species by impoundment and reservoir. Staff then develop management actions by impoundment that are needed to achieve the desired vegetative conditions and composition as well as ideal water level. These actions include water level manipulation, chemical and manual treatment of non-native vegetation, roller chopping, disking, and prescribed burning. Through these management regimes, the area's aquatic vegetation normally regenerates naturally without any reseeding necessary to provide abundant pre-emergent aquatic vegetation for waterfowl and wading birds as well as other fish and wildlife species that occur on the area.

4.3.2 Prescribed Fire and Fire Management

As noted earlier, prior to acquisition by the SJRWMD, the TMGWMA was used for agriculture and pastureland which involved installing water control structures, ditches, and levees to facilitate conditions favorable for farming and grazing. Site preparation, drainage, and lack of fire have all combined to alter the plant species composition of the area and had inhibited the natural fire return interval for the area's freshwater marshes. Since the area was acquired by the SJRWMD and leased to the FWC, the FWC has been engaged in site-specific combinations of prescribed fire, mechanical and chemical vegetation control, and management of water regimes to maintain the area's network of marsh, open water, and varying vegetative cover.

The FWC employs a fire management regime to maintain or increase species and plant diversity and will continue a prescribed burning program on the TMGWMA in accordance with management objectives. At TMGWMA, the network of levees and canals are used as firebreaks.

In addition to the general prescribed fire management guidelines described above, an area-specific Prescribed Burn Plan (Appendix 11.13) has been developed and implemented. This plan includes, but is not limited to, delineation of burn management units, descriptions of prescribed fire methodology, safety, and smoke management guidelines. Since TMGWMA is made up of impoundments, which are not considered fire-maintained communities, prescribed burns occur as needed. Challenges that continue to impact the implementation of prescribed fire are described further in Section 7. The continuing benefits of prescribed fire on the area's wildlife habitats, along with other ongoing habitat management activities that are being implemented, are described in more detail in Section 5.1.

4.3.3 Habitat Restoration and Improvement Activities and Accomplishments

As described earlier, the natural vegetative community on TMGWMA was severely altered due to past drainage practices and previous land use. Previous and ongoing management activities include application of prescribed fire on the area's freshwater marshes, water level management,

removal and treatment of non-native vegetation, and mechanical vegetation treatment to control plant succession and maintain the marsh in an early successional state.

Every aspect of the day-to-day operation of the area has wetland habitat management and enhancement as its primary goal. For example, culvert maintenance, properly functioning pumps and structures, and ditches clear of vegetation all aid in water level manipulation and movement. The quicker and more efficient water can move around the area, the higher the quality and quantity of habitat staff can provide.

Continuing a rigorous non-native plant management program on the area has proved extremely beneficial in improving conditions for wetland dependent plant species that were lost by previous management activities prior to SJRWMD acquisition. Chemical treatments of non-native vegetation coupled with follow-up burning, disking, chopping, or a combination of the three and followed by flooding has greatly increased the number of usable acres by waterfowl and wading birds on the area.

Finally, the most important aspect of habitat management at TMGWMA is maintenance. By maintaining a proper fire return interval and performing mechanical treatment such as disking and chopping, TMGWMA staff ensures a robust and diverse vegetative composition in the managed areas. While in drawdown, spot spraying of non-natives will continue to be a standard operating procedure, but the overall management goal is to use high water level manipulation, prescribed fire, and mechanical soil disturbance to promote native vegetation.

Following is a list of the primary habitat management and improvement activities that have occurred since 2015.

- The Prescribed Burn Plan was updated in 2025.
- Approximately 8,703 acres have been mechanically treated including roller chopping, mowing, disking, or cookie cutting to maintain early successional habitat conditions. This includes treatment of the same areas multiple times over the 10-year period to continue to provide early successional habitat.

Continuing habitat management activities will focus on enhancing natural communities, utilizing prescribed fire to promote the growth of wetland dependent plant species, treating and removing invasive plant species, and managing vegetation through mowing and roller chopping as needed. Invasive species management is more extensively discussed in Section 5.5. Further specific habitat management and improvement objectives planned for the TMGWMA are described in Section 5.

4.4 Fish and Wildlife Management, Enhancement, and Population Restoration

Due to the active wildlife and moist soil management practices at TMGWMA, a diversity of wildlife, including waterfowl, rare, imperiled, game, and nongame species, can be found on the area. In

managing for the conservation of wildlife species, an emphasis is placed on migrating, wintering, and resident waterfowl.

The size, location, and management of TMGWMA creates a habitat mosaic for a wide variety of wildlife species. The diverse habitats range from mud flats to moist-soil and shallow water impoundments to more deeply flooded marsh. Resident wildlife will be managed for optimum species richness, diversity and abundance. In addition to resident wildlife, TMGWMA 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. Water management schedules for selected impoundments are specifically designed to provide shallow feeding areas (one to three inches) and exposed mud flats during migratory periods.

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 watching opportunities. Hunting opportunities are regulated through quotas to ensure the persistence of viable game species populations, as well as hunter safety and satisfaction.

The primary emphasis of wildlife management is on managing habitat for waterfowl and other wetland wildlife species. The FWC also places an emphasis on documenting the occurrence and abundance of rare and imperiled species as well as some species of waterfowl. 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 will include prescribed burning, water level management, roller chopping, disking, and native and invasive vegetation treatment.

4.4.1 Game Populations

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 populations will be managed to provide continued recreational sport hunting and wildlife watching opportunities. However, 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.

4.4.2 Fish and Wildlife Management Activities and Accomplishments

The FWC will continue to monitor and manage for game and nuisance animal species. Following is a list of activities and monitoring outcomes that have occurred since 2015 to further FWC's mission for managing fish and wildlife on the TMGWMA.

- Fish attractors were installed in Goodwin Lake.
- Fifteen wood duck (*Aix sponsa*) nest boxes were installed and maintained on the area.

4.5 Non-native Species Maintenance and Control

With invasive species populations continuing to grow in Florida, the FWC takes a proactive and comprehensive approach to the monitoring and management of non-native plants and animals, as well as pests and pathogens, on FWC-managed areas. Non-native species are those species that do not originate from Florida. These species are often introduced because of human activities and are closely monitored by the FWC for potential future impacts. If a non-native species is found to cause or is likely to cause environmental or economic harm to humans, it is classified as an invasive; as such, the Plan uses the term “invasive” where appropriate. On the TMGWMA, the FWC has established a variety of control measures for the management of any non-native plant and animal species found on the area, as further outlined in Section 5.4 of this Management Plan.

4.5.1 Non-native Plant Species

The FWC will continue efforts to manage the establishment and spread of FISC Category I and II plants while using the most current control technologies (CCT) which may include mechanical, herbicide, and biological control. Treatments utilizing herbicides will comply with instructions found on the herbicide label and employ the Best Management Practices and CCT for their application. More information regarding herbicides used on FWC’s lead managed areas can be found [here](#).

During the previous planning period, several management activities have occurred (Section 4.5.3). FWC staff strive to either eradicate infestations or achieve maintenance rotation. Maintenance rotation is defined as having a given area/acreage with invasive species infestations reduced to a level where no ecological harm will occur by skipping any treatment for a period of one- to several-years, depending on the species. Maintenance rotation is not necessarily synonymous with eradication, which is usually impractical to achieve.

Maintenance rotation intervals for invasive plants vary greatly by species. Generally, woody species that form canopies will need a thorough initial treatment and a follow-up treatment the next growing season. Thereafter, the maintenance rotation treatment will need to follow seed germination and seedling/sapling regrowth patterns, with subsequent treatments being necessary every two- to 10-years, depending on initial infestation level, seed bank presence, and likely new dispersal into the area from neighboring populations of these species. Woody species that dominate the midstory will need a treatment regimen like those that form canopies, except the subsequent retreatment rotation would be every two- to-five years.

Herbaceous species that can affect the midstory and canopy, including vines and climbing ferns, need to be detected and treated as early as possible. These need to have an aggressive initial treatment, followed by yearly treatments, until the populations no longer affect the midstory. At this point, a two- to three-year rotation, with treatment as necessary, will keep these infestations in maintenance rotation.

Herbaceous and weakly woody species that only dominate the groundcover can be particularly challenging. Treatment strategies for invasive plants will be adjusted over time as conditions change on the TMGWMA. Changes may include hydrological management, wildfire, and reintroduction of endangered plant/animal species.

Additionally, the FWC will continue efforts to manage the introduction of non-native species, as well as pests and pathogens, on the TMGWMA by requiring all personnel, both contracted and internal, to follow the FWC Decontamination Protocol. The TMGWMA has a designated site which can be used for decontamination of both equipment and personnel to allow for a proactive approach to managing new introductions.

The FWC area staff will continue to work closely with FWC's Invasive Plant Management Section for guidance and assistance on treatments and management of invasive species on the area. For areas on the TMGWMA that require treatments for aquatic based invasive species, FWC area staff will work closely with both FWC's Invasive Plant Management Section and FWC's Aquatic Habitat Conservation and Restoration Section for assistance and guidance on aquatic plant management. Level of infestation will be monitored and managed as practicable to allow recreational use as well as providing valuable ecological resources for wintering waterfowl, wading birds, shorebirds, fish and other wetland-dependent species.

4.5.2 Non-native Fish and Wildlife Species

The FWC continues to work towards minimizing the adverse impacts of non-native fish and wildlife species in Florida. A non-native species may be considered invasive if it causes or is likely to cause adverse impacts to Florida's ecology, economy or human health and safety. Minimizing adverse impacts is accomplished through prevention, early detection, rapid response, control and management, and education and outreach. Early detection and rapid response are a critical defense against the establishment of non-native fish and wildlife. The FWC monitors and removes these species, responds to new invasions, and continues to assess the risk of species not yet present in our state. Rule 68-5, F.A.C., Federal Lacey Act, and certain F.S. govern the importation, possession, and use of invasive fish and wildlife. Rule 68-5, F.A.C., identifies Conditional and Prohibited invasive species in Florida. More information on these regulations can be found [here](#) and the rule may be found [here](#). Conditional species (formerly referred to as restricted species) and Prohibited species are dangerous to Florida's native species and habitats and could pose threats to health and welfare of the people of Florida or the economy. The FWC relies on monitoring efforts and current science including risk determination, supplemental documentation, and research to identify possible invasive species. To further assist the FWC's effort on non-native fish and wildlife identification and removal, the FWC encourages the public to utilize the FWC's Invasive Species Hotline at 888-Ive-Got1 (483-4681) or report observations of non-native species [here](#). More information on these public reporting options and other components of the Wildlife Impact Management Section's Non-native Fish and Wildlife Program can be found [here](#).

To address the presence of non-native fish and wildlife on the TMGWMA, FWC area staff will continue to work closely with FWC's Wildlife Impact Management Section for guidance and assistance. The FWC also relies on public assistance and participation in the management of

non-native fish and wildlife species. Executive order 23-16 authorizes the lethal take and removal of non-native reptiles on 32 FWC-managed lands. Trappers and nuisance wildlife control operators can also apply for an eradication and control permit to assist in the capture of Prohibited species on private and public lands including WMAs. More information on this permit process can be found [here](#). Due to the growing concern related to the impacts of several invasive species, the FWC and partners take a proactive and coordinated approach towards the removal of these harmful non-native species.

An invasive animal of concern throughout the state and on the TMGWMA is the wild hog. These animals have high reproductive rates, and when populations reach high densities, wild hogs can significantly degrade vegetative communities through foraging activity (rooting). The FWC will consult with other regional natural resource managing agencies and private landowners to coordinate wild hog control measures as necessary. Wild hog populations may also be managed by trapping, as necessary, to aid in minimizing the negative impacts caused by wild hog populations on the area.

4.5.3 Non-native Activities and Accomplishments

Invasive plant species known to occur are shown in Table 4. During the previous planning period, FWC staff worked to survey and manage non-native plant and wildlife species. Following is a list of activities the FWC accomplished during the last planning period as well as activities that are still ongoing. Non-native species objectives and challenges for the TMGWMA for the next 10 years are further detailed in Sections 5-6.

- Approximately 13,785 acres have been treated for native nuisance species and invasive non-native species, including water hyacinth (*Eichhornia crassipes*), water-lettuce (*Pistia stratiotes*), para grass, Brazilian pepper (*Schinus terebinthifolia*), Cuban bulrush (*Cyperus blepharoleptos*), cattails (*Typha sp.*), yellow pondlily (*Nuphar advena*), etc. This includes several areas that have received multiple treatments over the 10-year period.

4.6 Public Access and Recreational Opportunities

To facilitate wildlife-focused outdoor recreational opportunities on the area, the FWC has continued to establish and maintain a picnic shelter, boat ramps, levees, shooting blind, and youth hunts.

In addition to recreational opportunities on the TMGWMA, the FWC offers a variety of recreation and environmental education programs throughout the state. The FWC has several summer camp locations that provide programming on the theme of conservation-centered recreation. The FWC also hosts events that encourage Florida residents and visitors to get outdoors and enjoy the Wildlife Management Area system. For more information on the numerous recreation opportunities the FWC offers on all areas visit MyFWC.com/Recreation.

Further planned public access, recreational, and educational opportunities on the area are detailed in Section 5. Ongoing public access and recreational opportunity management challenges are addressed in Section 6.

4.6.1 Americans with Disabilities Act

When public facilities are developed on areas managed by the FWC, every effort is made to comply with the Americans with Disabilities Act (ADA) (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 ADA⁶ 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.

4.6.2 Public Access Assessments

The FWC has adopted a comprehensive approach to the planning and administration of fish and wildlife-focused public outdoor recreational opportunities for the TMGWMA. To accomplish this, the FWC will develop a Public Access Assessment for the TMGWMA that will be used to further guide the design and development of appropriate infrastructure and interpretive materials that will support the recreational use of the area by the public. This Public Access Assessment will include information on local area demographics, natural features, and wildlife characteristics of the TMGWMA that contribute to high-quality sustainable outdoor recreation experiences, assessment of current infrastructure, volunteer program opportunities, and interpretive themes.

4.6.3 Public Access Carrying Capacity

Baseline carrying capacities for users on the 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 the 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 fish and wildlife-focused 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, the FWC has determined that the TMGWMA can currently support 341 visitors per day. 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 to protect the natural and cultural resources and to ensure that visitors will have a high-quality visitor experience while minimizing impacts to environmentally sensitive communities. The public access carrying capacity will be periodically reevaluated, and additional or reduced capacity may be contemplated.

4.6.4 Public Access and Recreational Activities and Accomplishments

During the previous 10-year planning period, the FWC completed the following public access and recreational improvements and enhancements on the TMGWMA:

- Vehicular public use access days were modified to increase recreational use of the area. Moved from Monday and Thursday to Sunday and Thursday to include a weekend day for vehicular access.
- Access on hunt days was modified to include additional vehicular access on Goodwin units.

4.7 Hydrological Preservation and Restoration

As noted above, water level management is the primary habitat management tool used on TMGWMA. Habitat management is accomplished by manipulating water level in the impoundments to promote the production of native, moist-soil, wetland plants. Moist soil conditions created during the growing season promote the establishment of native seed producing plants. The timing, speed, and length of the drawdowns and subsequent reflooding influence the species of plants that respond and grow in moist soil conditions. Different manipulations among the impoundments promote specific types of plant response, provide diverse habitat, and result in favorable conditions for a variety of wetland wildlife. Shallow reflooding occurs in late summer followed by a gradual increase in water levels up to about 18 inches in the fall and winter.

The manipulation of water levels in the impoundments is accomplished either by adding or removing flashboards from the WCS or by raising or lowering a screwgate on the WCS to permit the gravity flow of water into or out of the impoundments. If gravity flow is not possible, the pump station is operated to facilitate gravity flow within the central canal. For instance, if water levels in the reservoir pool and the central canal are too low to permit the flooding of an impoundment, the pump station will be operated to discharge water from the reservoir pool into the central canal. The appropriate WCS can then be adjusted to permit the gravity flow of water from the central canal into the selected impoundments. Conversely, if water levels in the reservoir and the central canal are too high to permit the dewatering of an impoundment, water from the central canal can be discharged into the reservoir pool. By either opening the screwgate or removing flashboards from the selected WCS, water can then gravity flow from the impoundment into the central canal. Excess water in the central canal is then discharged into the reservoir.

The precise manipulation of water level within each impoundment is the most important technique used to effectively manage plant communities. Water levels in and among the impoundments vary seasonally, particularly during the growing season, and range from about zero to 18 inches. As a general guide, the impoundments are flooded at the higher end of the range (approximately nine to 18 inches) from late fall through the winter and at the lower end of the range (approximately zero to nine inches) during the spring and summer season.

For the reservoirs, water level will fluctuate based on the amount of rainfall the TMGWMA receives and management of water levels in the impoundments. Generally, water level is highest during the summer because of seasonal rainfall and lower water levels maintained in the impoundments.

Water level in the reservoir is typically lowest during the spring when evapotranspiration exceeds rainfall.

Currently, staff continue to communicate and collaborate as needed with the SJRWMD and the DEP on any ground or surface water quality or quantity monitoring and any monitoring protocols needed. In this capacity, the FWC will primarily rely on the expertise of the SJRWMD and the DEP to facilitate these monitoring activities as needed. If necessary, the FWC may independently conduct or contract for water resource monitoring on the TMGWMA, as guided by the DEP and the SJRWMD.

4.7.1 Hydrological Preservation and Restoration Activities and Accomplishments

During the previous 10-year planning period, the FWC completed several hydrological improvement activities on the TMGWMA, including:

- Four riser/culverts were replaced and two culverts were repaired.
- Two pumps on the Goodwin Unit and three pumps on the Broadmoor Marsh Unit were rebuilt.
- One electric motor on a Goodwin Unit pump was replaced.
- Enhanced the levee system through vegetation clearing and stabilization
- Approximately 56 miles of ditches/canals were maintained to enhance and maintain water movement capabilities on the area.

4.8 Forest Resource Management

There are no timber resources on the TMGWMA. As a result, the FWC and the FFS have determined that a professional forest assessment for the TMGWMA is unnecessary. The FWC will cooperate with the FFS or a qualified professional forestry consultant regarding any forestry management activities should they become necessary or appropriate.

4.9 Cultural Resources

A review of the FMSF indicates that two cultural resources have been recorded on the TMGWMA (Section 2.8). Additionally, two cultural resource surveys have been conducted on the area. In cooperation with the DHR, the FWC will continue to monitor and report on archaeological site BR1614 annually. The Sottile Canal, site BR1957, is monitored frequently through area staff's daily operations

The FWC will consult with the DHR to determine the procedures necessary to identify, assess, and preserve any unrecorded or unevaluated cultural resources that may be present within the TMGWMA. In addition, the FWC will ensure area management staff have the latest DHR Archaeological Resource Management (ARM) training. The FWC will follow the DHR's *Management Procedures for Archaeological and Historical Sites and Properties on State-Owned or Controlled Properties*, and, in accordance with Sections 267.061(2)(a,b), F.S., the FWC will consult with and allow the DHR a reasonable opportunity to comment prior to any undertaking that may impact historic properties. Furthermore, should any previously unidentified resources be

located on the TMGWMA, the FWC will prepare and submit all necessary documentation to the FMSF.

4.9.1 Cultural Resource Management Activities and Accomplishments

During the previous planning period, no significant management activities or changes to the existing cultural resources on the area have occurred.

4.10 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-focused 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 the TMGWMA include three pump stations; the Goodwin Lake boat ramp, dock, and accessible parking; a viewing structure with a picnic shelter; the L-75 boat ramp; a FWC office and equipment storage compound; a Persons with Disabilities duck blind; approximately 30.5 miles of levees; and an entrance sign. As described in Section 4.6.1 of this Management Plan, for any public facilities that are developed on areas managed by the FWC, every effort is made to comply with the ADA Act (Public Law 101-336). Maintenance and improvement activities of current and future capital facilities are further outlined in Section 5.9 and Figure 10.

4.10.1 Capital Facilities and Infrastructure Activities and Accomplishments

During the previous 10-year planning period, the FWC completed several capital facilities and infrastructure improvements on the TMGWMA, including:

- The Goodwin Lake boat ramp was improved including replacing the dock and updating the parking area with accessible parking.
- The office building and equipment storage shed were replaced.
- A trailer hook up for the employee residence was added.
- The Persons with Disabilities duck blind was refurbished.
- A new entrance sign was installed.
- The Broadmoor Marsh Unit pole barn was removed to comply with NRCS easement.
- The office septic area was improved to increase capacity and meet County requirements.

4.11 Land Conservation and Stewardship Partnerships

Landscape conservation can create a resilient and adaptive landscape and economy that can support future generations of Florida. Thriving landscapes and habitats produce a range of benefits such as protecting our water and air, mitigating climate change, and providing habitat for fish, wildlife, and plants. In addition, productive landscapes power local and regional economies

by supporting sustainable activities including fishing, farming, ranching, forestry, recreation, and tourism. Maintaining these benefits as Florida is facing ever-increasing significant land and water issues is paramount. Population growth, habitat loss and fragmentation, land use changes, invasive species, water crises, and climate change can threaten Florida's future. To successfully manage these challenges for the long term, there is a growing need for conservation work to be done at a larger scale and with multiple partners that can pool their resources and incorporate best scientific practices.

4.11.1 Decision Support Tools

Florida Conservation Blueprint

The Florida Conservation Blueprint (Blueprint) is a spatial plan that identifies shared conservation priorities across Florida. The Blueprint was developed by the Peninsular Florida Landscape Conservation Cooperative for the cooperative incorporation of strategies from a suite of partners and supports spatial conservation planning to inform conservation actions and investment. The FWC uses the Blueprint to help guide and prioritize landscape conservation actions and acquisition opportunities (Figure 12).

Other Decision Support Tools

There are additional data and tools that have been developed as decision support tools for identifying and prioritizing areas for conservation action as well as to guide resource (i.e., time, staff, and funding) allocation. These tools include, but are not limited to, FLAM (Section 4.2.2), Critical Lands and Water Identification project, the Florida Ecological Greenways Network, FNAI element occurrences database, Simple Map Viewer, Fire Map Viewer, Florida Springs Dashboard, Climate Adaptation Explorer, and the Florida Ecological Report Cards. Tools and supporting data can be found at www.FNAI.org or on the Florida Conservation Planning Atlas.

4.11.2 Conservation Stewardship and Partnership Opportunities

Private Lands Partnerships

The FWC recognizes the interconnected needs of protecting and enhancing private property values and rights and creating new markets and economies that support the conservation value of private working lands. Private landowners seeking assistance with habitat management will likely find it offered within the FWC Landowner Assistance Program (LAP). The FWC LAP program provides many opportunities for conservation minded landowners to obtain assistance and advice of FWC staff and programs for improving land conservation practices on their lands. The LAP routinely conducts workshops for interested landowners to interact with FWC staff and learn how they may participate in the program. The FWC employs biologists who are available to provide wildlife-related assistance with land use planning and habitat management. In addition, the LAP works with landowners to enroll in NRCS conservation cost-share programs to assist with implementation of wildlife friendly practices. 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. At the time of the plan development, no specific land stewardship workshops had been conducted for landowners adjacent to the TMGWMA. The

FWC will continue to evaluate the level of interest and efficacy of providing technical assistance to adjacent private landowners to enhance the conservation management of their lands. More information on the FWC's LAP program and online habitat management tools are available [online](#).

Landscape Conservation Partnerships

The FWC will continue to work with partners including government entities, private organizations, and academic institutions on collaborative landscape conservation efforts and acquisition opportunities. Potential partners for the TMGWMA and surrounding areas include SJRWMD, FDACS-FFS, USFWS, NRCS, USACOE, Brevard County, DEP, Conservation Florida, and other organizations and potential grant program opportunities. The FWC will continue to commit staff time and other resources to regularly providing information to partners regarding landscape conservation science, opportunities, and progress. At the TMGWMA, water will continue to be shared with the neighboring Willowbrook Farms.

4.11.3 Land Acquisition

Using identified tools outlined previously, the FWC works to identify lands within or adjacent to FWC-managed areas that are important for the conservation of fish and wildlife, serve as a link or corridor to other publicly owned property, enhance the protection or management of the property, create a more manageable boundary configuration, or have a high resource value that would otherwise be unprotected. Preservation of these lands can be accomplished through fee-simple or less-than-fee acquisition. The FWC works to pursue these opportunities through the FWC Additions and Inholdings Acquisition program, supporting Board of Trustees acquisition and addition of lands within the Florida Forever program and continued partnership with other agencies and private organizations on acquisition of identified lands.

Less-Than-Fee Acquisition

Less-than-fee acquisitions, also known as conservation easements, are voluntary agreements between a landowner and government agency or conservation organization that acquires certain rights to a landowner's property for long-term conservation of the land, while the landowner still retains ownership of their property. The agreement is designed for landowners to continue to manage their land to maintain a working landscape in a manner that also enhances the conservation benefits provided by their land. These voluntary agreements to conserve land support the goals of landscape conservation. Less-than-fee acquisition is not only a means of conserving land but is also a cost-effective means for governmental and non-governmental organizations to protect land, while also providing economic and tax benefits to the landowner and local economy.

Fee-Simple Acquisition

Fee-simple acquisition is the process of acquiring complete ownership of the land. Fee-simple acquisition can be accomplished through the Florida Forever program or through grant programs and acquisition partnerships. The Florida Forever program is a land acquisition program with the purpose of conserving natural and cultural resources throughout the State. The DEP, as staff to

the Board of Trustees, oversees the program. The Florida Forever program replaced the Preservation 2000 program, and since these programs' inception, nearly three million acres have been conserved throughout the State.

FWC's Additions and Inholdings Acquisition Program

Per 18-2.021, F.A.C., the FWC identifies parcels located directly in or adjacent to the subject area which can be recommended for acquisition through the FWC Additions and Inholdings Acquisition program. Multiple properties, equaling approximately 10,380 acres, have been identified for recommended acquisition under the auspices of the FWC's Additions and Inholdings Acquisition program for the TMGWMA (Figure 13). Consistent with Florida Forever program criteria, parcels on the list have been ranked High, Medium, or Low priority based on a score generated by a GIS-based resource evaluation model, along with technical input from FWC staff. The order of acquisition priority may be changed as necessary based on factors including available funding necessary to complete a particular acquisition project, changing development pressures, landowner willingness, funding partnerships, unique acquisition opportunities like bargain sales (less than 80% of appraised value), and donations.

The FWC Additions and Inholdings Acquisition List is updated through time, thus staying up to date for land ownerships, County parcel records, land conservation opportunities, and evolving management challenges. The FWC frequently analyzes, evaluates, and prioritizes its recommended conservation actions in a systematic, comprehensive, and consistent manner over time. Currently, the FWC often recommends fee-simple acquisition of the lands on the FWC Additions and Inholdings Acquisition List for the TMGWMA to optimize the conservation of fish and wildlife, public access and use, and overall resource and operational management of the area. However, as mentioned previously, the FWC may also pursue less-than-fee acquisition with adjacent landowners; though it should be noted that landowner preference is often the key element in determining whether to pursue a fee-simple or less-than-fee acquisition.

Parcels on the FWC Additions and Inholdings Acquisition List will be acquired if possible, according to their priority ranking for acquisition, as funding availability allows, and based on the landowner's willingness to sell their lands. Participation in any FWC acquisition is entirely voluntary and at the sole discretion of willing landowners. The FWC also continues to assist and support the DEP/Board of Trustees in the acquisition or recommend acquisition of the remaining lands within nearby Florida Forever projects as essential to the long-term conservation of wildlife and other elements important to the ecosystem functions.

Alternative Options

Along with the several land acquisition options described previously, alternative land protection methods are also available. The state accepts donations of land, life estate, and first-right-of-refusal. Life estate is an alternative that allows a landowner to reside on their property during their lifetime, however, ensures state ownership after passing. Additionally, there is also the option that a landowner could offer the state a first-right-of-refusal. After a first offer is denied by a landowner, the first-right-of-refusal option provides the state with a chance to purchase the land in the future.

The state offers several alternative possibilities to obtaining the rights and/or ownership to land for conservation purposes, which furthers conversation-based goals and objectives for Florida's future.

4.11.4 Landscape Conservation Activities and Accomplishments

During the previous 10-year planning period, the FWC has worked to advance landscape conservation partnerships and pursue potential acquisition opportunities. Also, the FWC continues to work with non-governmental agencies such as Ducks Unlimited, United Waterfowlers-Florida, and Delta Waterfowl on conservation activities on the TMGWMA and in the vicinity. Some examples of projects completed during the previous 10 years include the annual youth hunt celebration and the refurbishment of the Persons with Disabilities Duck Blind. The FWC continued to collaborate with the USACOE and SJRWMD to maintain levees on the area. The FWC continues to collaborate with Willowbrook Farms to share water to maintain appropriate hydraulic levels and continues to coordinate with Mary A Ranch Mitigation Bank on invasive plant management.

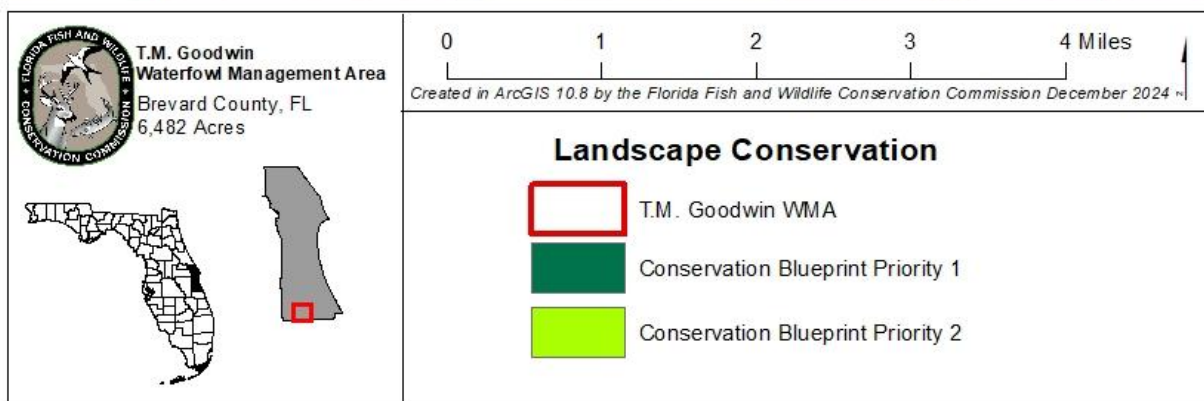
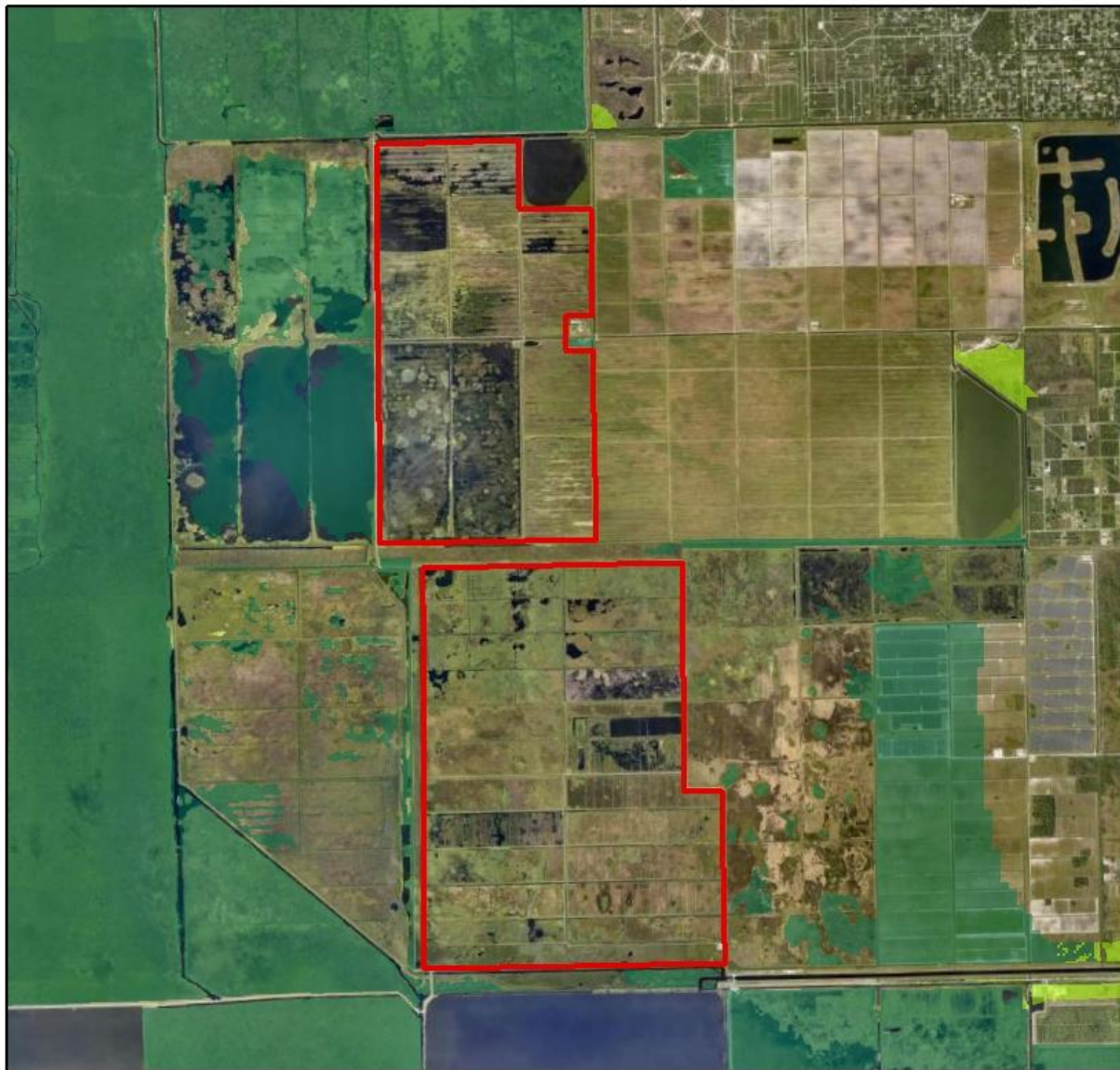


Figure 12. Landscape Conservation Blueprint

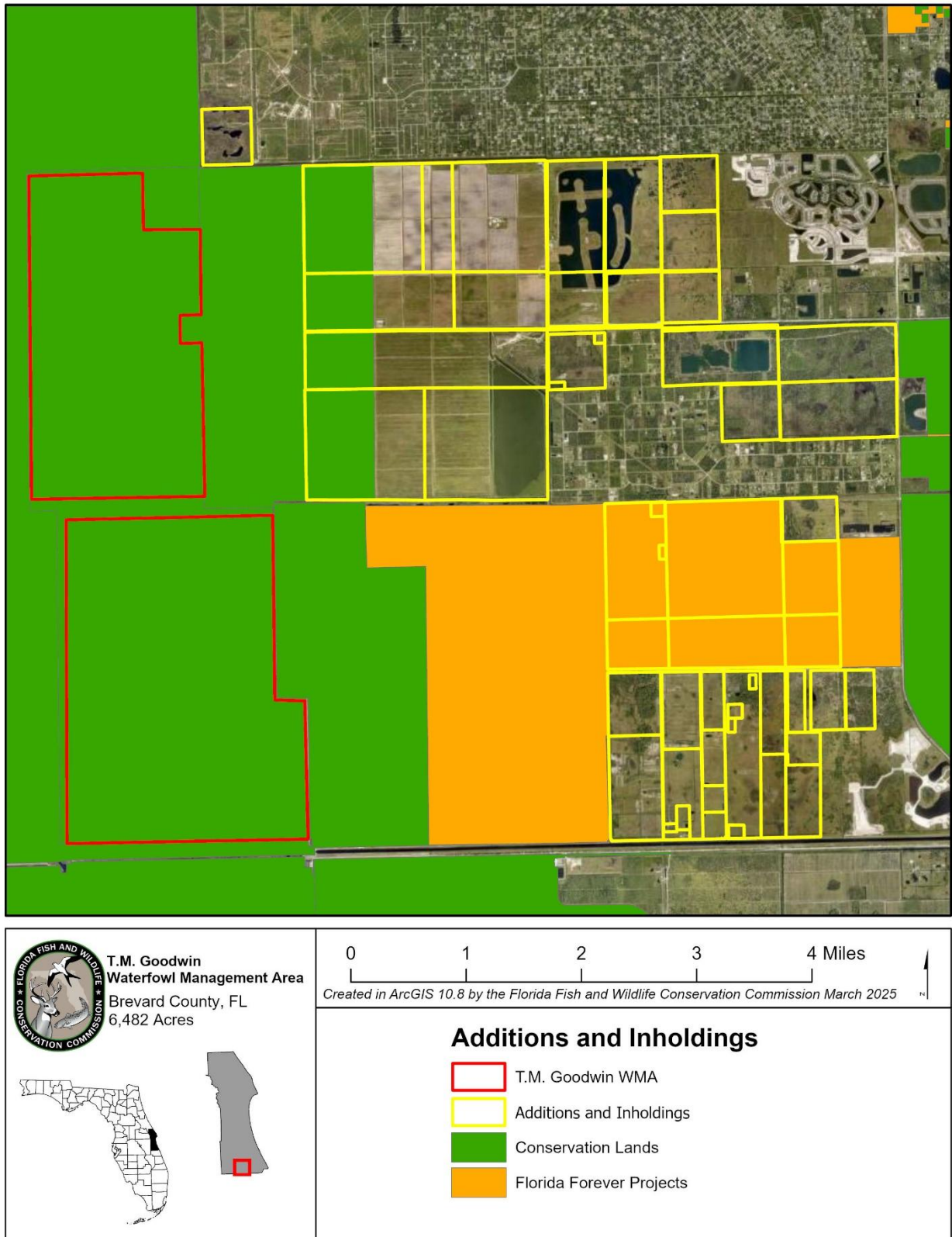


Figure 13. Additions and Inholdings

4.12 Research Opportunities

The FWC intends to cooperate with researchers, universities, and others as feasible and appropriate. For the TMGWMA, the FWC will continue to assess and identify 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 must have prior approval by the FWC.

During the previous 10-year planning period, the FWC participated in several research opportunities on the TMGWMA, including:

- Coordinated with researchers on studies looking at regional populations, hybridization, and lead accumulation in mottled duck.
- Coordinated with researchers on the use of Unmanned Aerial Systems to survey for American alligators and conduct nest searches as part of a global crocodilian conservation effort.

4.13 Cooperative Management and Special Uses

4.13.1 Cooperative Management

The FWC is responsible for the overall management and operation of the TMGWMA as set forth in the lease agreements with the SJRWMD. In keeping with the lease agreements and conducting 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 the DHR to ensure the requirements of the *Management Procedures Guidelines - Management of Archaeological and Historical Resources* document (Appendix 11.17) are followed regarding any ground-disturbing activities. Also, the 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 the TMGWMA.

4.13.2 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 the TMGWMA. 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 the TMGWMA and cause no measurable long-term impact to the natural resources of the area. Additionally, FWC staff must be notified and approve of the training through the issuance of a permit prior to any such training taking place on the TMGWMA. Any first-responder or military training that is not low-impact, intermittent and occasional would require an amendment to the Management Plan and therefore will be submitted by the FWC to the SJRWMD for approval consideration prior to authorization.

4.13.3 Apiaries

Currently, there are no apiaries operating on the TMGWMA. However, use of apiaries is conditionally approved for the TMGWMA, is deemed to be consistent with purposes for acquisition, follows the Conceptual State Lands Management Plan, and is consistent with the FWC agency mission, goals, and objectives. Location, management, and administration of apiaries on the TMGWMA will be guided by the FWC Division of Habitat and Conservation's Apiary Policy (Appendix 11.14).

4.14 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. Water conservation is accomplished through hydrological management and monitoring as described in Section 4.7.

5 Resource Management Goals and Objectives

The management goals and objectives described in this section are broad, enduring statements designed to guide the general direction of management actions aimed at achieving an overall desired future outcome for the TMGWMA. 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. The objectives are classified as having either short-term (less than two years) or long-term (up to 10 years) timelines for completion.

5.1 Habitat Restoration and Improvement

Goal: Improve extant habitat and restore disturbed areas.

Long-term

1. Continue to implement Prescribed Burn Plan and update as needed.
2. Conduct habitat/natural community improvement through mechanical and chemical treatments to control plant succession and maintain marsh in an early successional state and provide quality forage for wintering waterfowl, wading birds, shorebirds, and other migratory species.
3. Remove vegetation that impedes water movement from area ditches and canals as needed to improve ability to maintain water levels in impoundments and reservoirs to enhance moist soil conditions for favorable vegetation.
4. Explore the feasibility of conducting a dewatering/de-mucking project on Goodwin Reservoir to improve habitat and remove floating tussocks. If determined appropriate and feasible complete designated improvement work as funding allows.
5. Develop an impoundment management and monitoring plan which optimizes habitat.

5.2 Imperiled Species Habitat Maintenance, Enhancement, Restoration, or Population Restoration

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

Long-term

1. Continue to collect and record opportunistic wildlife species occurrence data.
2. Evaluate the need for an imperiled species assessment on the area.

5.3 Other Wildlife (Game and Non-game) Habitat Maintenance, Enhancement, Restoration, and Population Restoration.

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

Long-term

1. Continue to manage impoundments for favorable moist soil vegetation through various mechanical, chemical, and hydrologic management methods to maintain and enhance habitat for waterfowl, wading birds, shorebirds, and other migratory species.
2. Continue to collect opportunistic game and more common wildlife species occurrences on the area.
3. Manage beneficial non-native species for wildlife use while considering potential public access and off-site impacts.
4. Continue to collect biological harvest data on harvested game species.
5. Continue to manage water levels within area's impoundments and reservoirs to enhance habitat for waterfowl, wading birds, and shorebirds.
6. Maintain 15 wood duck boxes throughout the area.
7. Maintain nesting habitat on area's levees during the breeding season to increase nesting success of mottled duck.
8. Monitor waterfowl, wading birds, shorebirds, and other migratory species as needed to adjust management of impoundments/reservoirs to benefit the species while providing quality recreational opportunities for area visitors including hunters, wildlife observers, etc.
9. Conduct waterfowl banding as determined appropriate.

5.4 Non-native Species Maintenance and Control

Goal: Remove non-native plants and animals and conduct needed maintenance and/or control.

Long-term

1. Monitor the TMGWMA for the level of infestation of FISC Category I and Category II invasive plant species and treat as needed and appropriate. (Table 4)

2. Mechanically and chemically treat nuisance and non-native species as needed to maintain open water, promote favorable vegetation, maintain public access, and maintain ability to manage water levels efficiently.
3. Ensure that staff are familiar with the identification, reporting procedures, and control measures of high priority non-native wildlife species.
4. Evaluate the need for and continue to implement control measures on non-native animal species as deemed appropriate.
5. Continue to evaluate permit applications for control and research opportunities for non-native fish and wildlife species.

5.5 Public Access and Recreational Opportunities

Goal: Provide public access, participation, and recreational opportunities.

Long-term

1. Develop a Public Access Assessment.
2. Continue to implement public access and recreation opportunities guided by the Public Access Assessment results and update if new acquisitions or other factors warrant.
3. Continue to maintain 8.46 miles of trails.
4. Maintain public access and recreational opportunities to allow for a recreational carrying capacity of 341 visitors per day.
5. Include the area in annual statewide public conservation programs and events.
6. Continue to provide a website, a two-panel kiosk, public access guide, and iNaturalist project for the area.
7. Continue to provide hunting opportunities during waterfowl, alligator, and snipe seasons.
8. Continue to provide paddling opportunities on appropriate water bodies.
9. Continue to provide fishing opportunities on appropriate water bodies.
10. Continue to assess and improve recreational and educational amenities for ADA compliance as needed.
11. Develop and continue to provide one new public access guide including days and use types on the area.
12. Update and improve signage for recreational users.
13. Work with SJRWMD to install approach signage on Fellsmere Grade Road and near the water control structure crossover.

5.6 Hydrological Preservation and Restoration

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

Long-term

1. Maintain and enhance hydrological functions, install, maintain, or replace bridges, pumps, riser board culverts, and standard culverts as appropriate.
2. Continue collecting water level and rainfall data.

3. Monitor and maintain the area's levee and ditch system.
4. Continue to operate and maintain three pump stations.
5. Evaluate the need for replacement of the southern water control structure and pump station on the Goodwin Unit to improve function and efficiency of the structure. If determined appropriate replace as funding allows.
6. If necessary, continue to cooperate with the SJRWMD and the DEP for the monitoring of surface and ground water quality and quantity.
7. If necessary, conduct a hydraulic study to determine the need for additional pumps, control structures, and ditches and design and construct if determined necessary.

5.7 Cultural Resources

Goal: Protect, preserve, and maintain cultural resources of the TMGWMA.

Short-term

1. Conduct a historical resource survey.

Long-term

1. Cooperate with the DHR in designing site plans for development of infrastructure.
2. Continue to follow the DHR's *Management Procedures for Archaeological and Historical Sites and Properties on State-Owned or Controlled Properties* for the management of cultural and historic resources.
3. Continue to annually monitor, protect, preserve, and report any changes on two recorded sites) on the TMGWMA.
4. Ensure any newly identified sites are reported to the DHR for inclusion in the FMSF.
5. Coordinate with the DHR to ensure that staff have received updated Archaeological Resource Management training.

5.8 Capital Facilities and Infrastructure

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

Short-term

1. Construct a pole barn at the office/shop to increase equipment storage capacity.

Long-term

1. Monitor trails and infrastructure monthly for visitor impacts.
2. Continue to maintain eight facilities.
3. Continue to maintain 42 miles of roads.
4. Improve, repair, or replace facilities and roads as needed.
5. Add a concrete slab to the shelter at the day use/observation area.

6. Construct an accessible parking space and sidewalk at the day use/observation area.
7. Construct a kiosk near the entrance or move the kiosk at the office/shop to a more convenient location for the public to access.
8. Design, permit, and construct a replacement shop/storage building.
9. Coordinate with NRCS and others as appropriate to explore the feasibility of adding a pole barn to the Broadmoor Marsh Unit. If appropriate, design, permit, and construct pole barn.
10. Install a new automated gate at the main entrance to provide increased recreational hours.
11. Maintain and improve existing trailer pads as needed.
12. Maintain and improve the Goodwin Lake boat ramp as needed.
13. Determine feasibility and funding to repair the viewing structure and proceed as appropriate.

5.9 Land Conservation and Stewardship Partnerships

Goal: Enhance fish and wildlife conservation, resource, and operational management through internal and external partnerships and programs.

Long-term

1. Continue to identify and evaluate potential important wildlife habitat, landscape-scale linkages, wildlife corridors, and operational management needs for TMGWMA as appropriate and necessary.
2. Continue to contact and inform adjoining private landowners about the FWC Landowners Assistance Program, and coordinate with public entities to pursue conservation stewardship partnerships.
3. Staff will continue to maintain relationships with adjoining private landowners for nomination for the LAP Wildlife Habitat Recognition Program.
4. Continue to evaluate and identify FWC inholdings and additions priority parcels for potential conservation acquisition and pursue acquisitions as funding allows.
5. Continue to maintain a GIS shapefile and other necessary data to facilitate nominations for the FWC landowner assistance and conservation acquisition programs.
6. Continue to identify potential non-governmental land stewardship organization partnerships and grant program opportunities.
7. Determine the efficacy of conducting a landowner assistance/conservation stewardship partnership workshop(s) and pursue as necessary and appropriate.
8. Continue to evaluate and determine if any portions of TMGWMA are no longer needed for conservation purposes and therefore may be designated as surplus lands.

5.10 Cooperative Management, Special Uses, and Research Opportunities

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

Long-term

1. Continue to assess the need for and cooperate with researchers, universities, and others on research and environmental education partnership opportunities as appropriate.
2. Coordinate and cooperate with Department of Defense military branches to allow for training opportunities for military personnel and other initiatives as appropriate and compatible with the conservation of the TMGWMA.
3. Collaborate with non-governmental organizations, community groups, stakeholders, and other private entities to forward common goals.
4. Continue to work with other FWC Divisions, Offices, and Institutes on projects beneficial to the management of the area.
5. Continue to work with the Ducks Unlimited, Delta Waterfowl, United Waterfowlers - Florida and other partners to manage the area and provide recreational opportunities.
6. Continue to follow existing cooperative agreements with the SJRWMD and Willowbrook Farms.
7. Continue to cooperate with the SJRWMD and the USACOE on management of the area's levee use, access, and maintenance.

6 Resource Management Challenges and Strategies

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

Challenge 1: Meeting FWC law enforcement and management staff standards and needs can be challenging.

Strategy: Agency staff levels will continue to be evaluated to determine if increased staffing or other alternatives can improve management needs.

Strategy: Pursue funding for increased law enforcement, management staffing, and additional private sector contract services, as appropriate.

Strategy: Explore potential volunteer resources for assisting with management.

Challenge 2: Potential future development on adjacent lands can result in incompatible land uses increasing management challenges for the area.

Strategy: Cooperate and work with Brevard County to ensure land use and zoning designations adjacent to TMGWMA will continue to be compatible with the management of the area.

Challenge 3: The TMGWMA's proximity to major roadways and residential areas presents potential smoke management challenges during prescribed burning.

Strategy: Use available tools and resources to minimize smoke impact and increase outreach for areas of potential impact.

Strategy: Coordinate with the Division of Law Enforcement, Florida Highway Patrol, Florida Department of Transportation, FFS, and the Brevard County Sheriffs' Offices and Fire Department.

Challenge 4: Currently, non-native plant infestations exist at a level beyond the ability of area staff to fully maintain.

Strategy: Establish a treatment rotation and continue funding projects for contract spraying.

Strategy: Explore the feasibility of utilizing contractual services for appropriate activities.

Strategy: Cooperate with other nearby FWC staff to assist when needed.

Challenge 5: The population of visitors and TMGWMA users is increasing, resulting in increased needs for coordination with fellow agencies.

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

Challenge 6: Currently, vehicular public access to the area is limited due to the unimproved network of levees and agreements with cooperators.

Strategy: Assess the viability of increasing the number of vehicular access days.

Strategy: Work with cooperators to determine if expanding the number of vehicular access days is compatible with the maintenance and operation of the area's levee system.

7 Cost Estimates and Funding Sources

The following represents the actual and unmet budgetary needs for managing the lands and resources of the TMGWMA. This cost estimate was developed using data developed by the FWC and other cooperating entities and is based on actual costs for land management activities, equipment purchase and maintenance, and development of fixed capital facilities.

The following cost estimate, although exceeding what the 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 the TMGWMA. Cost estimate categories are those currently recognized by the FWC and the Land Management Uniform Accounting Council. More information on these categories, as well as the Fiscal Year 2023-2024 operational plan showing detailed cost estimates by activity and categories of expenditures, may be found in Appendix 11.12.

TMGWMA Management Plan Cost Estimate*Maximum expected one-year
expenditure*

<u>Resource Management</u>	<u>Expenditure</u>
Invasive Species Control	\$187,237.18
Prescribed Burning	\$10,715.36
Cultural Resource Management	\$5,940.90
Timber Management	\$0.0
Hydrological Management	\$526,175.19
Vegetation Monitoring/Management	\$131,738.13
Wildlife Monitoring/Management	\$3,638.82
Subtotal	\$865,442.57
 <u>Administration</u>	
General Administration	\$36,892.91
 <u>Support</u>	
Land Management Planning	\$5,598.30
Management Reviews	\$0.0
Training/Staff Development	\$8,257.84
Vehicle Purchase	\$212,218.70
Vehicle Operation and Maintenance	\$45,150.75
Other (Technical Reports, Data Management, etc.)	\$17,097.84
Internal Program Review	\$1,083.22
Technology and Data Management	\$7,064.01
Subtotal	\$296,470.65
 <u>Capital Improvements</u>	
New Facility Construction	\$37,146.44
Facility Maintenance	\$174,609.63
Subtotal	\$211,756.07
 <u>Visitor Services/Recreation</u>	
Info./Education/Operations	\$10,235.75
 <u>Law Enforcement</u>	
Resource protection	\$5,238.10
 Total	\$1,426,036.05

* Based on the characteristics and requirements of this area, 2 FTE positions would be optimal to fully manage this area. All land management funding is dependent upon annual legislative appropriations.

TMGWMA Management Plan Cost Estimate

Ten-year projection

<u>Resource Management</u>	<u>Expenditure</u>	<u>Priority</u>	<u>Priority schedule:</u>
<i>Invasive Species Control</i>	\$2,088,089.28	(1)	(1) Immediate (annual)
<i>Prescribed Burning</i>	\$119,498.89	(1)	(2) Other (5+ years)
<i>Cultural Resource Management</i>	\$66,253.51	(1)	
<i>Timber Management</i>	\$0.0	(1)	
<i>Hydrological Management</i>	\$5,867,962.74	(1)	
<i>Vegetation Monitoring/Management</i>	\$1,469,157.86	(1)	
<i>Wildlife Monitoring/Management</i>	\$40,547.07	(1)	
<u>Subtotal</u>	\$9,651,509.35		
 <u>Administration</u>			
<i>General Administration</i>	\$411,433.75	(1)	
 <u>Support</u>			
<i>Land Management Planning</i>	\$62,432.81	(1)	
<i>Management Reviews</i>	\$0.0	(2)	
<i>Training/Staff Development</i>	\$92,092.28	(1)	
<i>Vehicle Purchase</i>	\$2,366,685.92	(2)	
<i>Vehicle Operation and Maintenance</i>	\$503,526.03	(1)	
<i>Other (Technical Reports, Data Management, etc.)</i>	\$190,676.96	(1)	
<i>Internal Program Review</i>	\$12,080.20	(1)	
<i>Technology and Data Management</i>	\$78,778.60	(1)	
<u>Subtotal</u>	\$3,306,272.81		
 <u>Capital Improvements</u>			
<i>New Facility Construction</i>	\$414,261.12	(2)	
<i>Facility Maintenance</i>	\$1,947,265.47	(1)	
<u>Subtotal</u>	\$2,361,526.59		
 <u>Visitor Services/Recreation</u>			
<i>Info./Education/Operations</i>	\$114,150.21	(1)	
 <u>Law Enforcement</u>			
<i>Resource protection</i>	\$59,255.88	(1)	
 <u>Total</u>	\$15,904,148.58	*	

* Based on the characteristics and requirements of this area, 2 FTE positions would be optimal to fully manage this area. All land management funding is dependent upon annual legislative appropriations.

8 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” are those that the 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 the 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		✓	
Invasive species control		✓	
Mechanical vegetation treatment		✓	
Public contact and educational facilities development		✓	
Prescribed burning		✓	
Timber harvest activities	✓		
Vegetation inventories		✓	

9 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 the FWC, every effort is made to comply with Public Law 101 - 336, the ADA 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 access accommodation is structurally impractical or where providing such access would change the fundamental character of the facility being provided).

Uses planned for the TMGWMA follow the Conceptual State Lands Management Plan and its requirement for “balanced public utilization,” and are in compliance with the mission of the FWC as described in its Agency Strategic Plan. 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, 373, 375, 378, 379, 403, 487, 597, and 870, F.S.

The FWC has developed and utilizes an Arthropod Control Plan for the TMGWMA in compliance with Chapter 388.4111, F.S. (Appendix 11.15). This plan was developed in cooperation with the local TMGWMA county arthropod control agency. This plan is also in conformance with the Local Government Comprehensive Plan as approved and adopted for Brevard County, Florida, (Appendix 11.16).

10 Endnotes

1. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Official Soil Series Descriptions. Available online. Accessed [2019].
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5. Walters, C. J. and R. Hilborn. 1978. Ecological optimization and adaptive management. *Annual Review of Ecology and Systematics* 9:157–188.
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