

A Management Plan for
Big Bend
Wildlife Management Area
2015 - 2025



Taylor and Dixie Counties, Florida

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

Volume I of II



Florida Department of Environmental Protection

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September 1, 2015

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

RE: Big Bend Wildlife Management Area - Lease #3558

Dear Mr. Cochran:

On **August 21, 2015**, the Acquisition and Restoration Council recommended approval of the **Big Bend Wildlife Management Area** management plan. Therefore, the Division of State Lands, Office of Environmental Services, acting as agent for the Board of Trustees of the Internal Improvement Trust Fund, hereby approves the Big Bend Wildlife Management Area management plan. The next management plan update is due August 21, 2025.

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

Sincerely,

A handwritten signature in cursive script, appearing to read "M. Sengenbach".

Marianne S. Gengenbach
Office of Environmental Services
Division of State Lands

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**A Management Plan
for
Big Bend Wildlife Management Area**

Taylor and Dixie Counties, Florida

Owned by the Board of Trustees of the Internal Improvement Trust Fund
Managed by the Florida Fish and Wildlife Conservation Commission



Volume I
August 2015

Approved Thomas H. Eason

Thomas Eason
Director, Division of Habitat and Species Conservation

Land Management Plan Compliance Checklist

Required for State-owned conservation lands over 160 acres

Section A: Acquisition Information Items

Item #	Requirement	Statute/Rule	Page Numbers and/or Appendix
1	The common name of the property.	18-2.018 & 18-2.021	1
2	The land acquisition program, if any, under which the property was acquired.	18-2.018 & 18-2.021	4
3	Degree of title interest held by the Board, including reservations and encumbrances such as leases.	18-2.021	5
4	The legal description and acreage of the property.	18-2.018 & 18-2.021	1, Appendix 13.1
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	6-16, 130-134
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	103
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	135, 137
8	Identification of adjacent land uses that conflict with the planned use of the property, if any.	18-2.021	21
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)	4, 101-103
10	Proximity of property to other significant State, local or federal land or water resources.	18-2.021	17-19

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	101-103
12	A description of past and existing uses, including any unauthorized uses of the property.	18-2.018 & 18-2.021	99-101
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	100-103
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	5, 138
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	128

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	135-138
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)	100-103
18	A finding regarding whether each planned use complies with the 1981 State Lands Management Plan, particularly whether such uses represent “balanced public utilization,” specific agency statutory authority and any other legislative or executive directives that constrain the use of such property.	18-2.021	183
19	Letter of compliance from the local government stating that the LMP is in compliance with the Local Government Comprehensive Plan.	BOT requirement	Appendix 13.15
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	22-103, 111-141
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	100-103
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	Appendix 13.4.2
23	A statement regarding incompatible use in reference to Ch. 253.034(10).	253.034(10)	102-103

*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	21, Appendix 13.2
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)	Appendix 13.2
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)	21, Appendix 13.2
27	Summary of comments and concerns expressed by the advisory group for parcels over 160 acres	18-2.021	Appendix 13.2
28	During plan development, at least one public hearing shall be held in each affected county. Notice of such public hearing shall be posted on the parcel or project designated for management, advertised in a paper of general circulation, and announced at a scheduled meeting of the local governing body before the actual public hearing. <i>Include a copy of each County's advertisements and announcements (meeting minutes will suffice to indicate an announcement) in the management plan.</i>	253.034(5) & 259.032(10)	Appendix 13.2
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	111, Appendix 13.8
30	Summary of comments and concerns expressed by the management review team, if required by Section 259.036, F.S.	18-2.021	Appendix 13.8
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 13.8

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	23-33, Appendix 13.3
33	Insert FNAI based natural community maps when available.	ARC consensus	60-64
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	48-64

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	81-98
36	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding beaches and dunes.	18-2.021	98
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	98
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	65-91
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	78-91
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	81, 87-91
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)	111-182
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.	↓	111-182
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.		144-174
42-C.	The associated measurable objectives to achieve the goals.		144-174
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>		111-182
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.		179-181, Appendix 13.13
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)	34-64
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).		111-182

44-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).		144-174
44-C.	Measurable objectives (see requirement for #42-C).		144-174
44-D.	Related activities (see requirement for #42-D).		111-182
44-E.	Budgets (see requirement for #42-E).		179-181, Appendix 13.13
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).	↓	111-182
45-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).		144-174
45-C.	Measurable objectives (see requirement for #42-C).		144-174
45-D.	Related activities (see requirement for #42-D).		111-182
45-E.	Budgets (see requirement for #42-E).		179-181, Appendix 13.13
46	***Quantitative data description of the land regarding an inventory of exotic and invasive plants and associated acreage. <i>See footnote.</i>		253.034(5)
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 13.14
48	Exotic and invasive species maintenance and control	259.032(10) & 253.034(5)	
48-A.	Management needs, problems and a desired outcome (see requirement for # 42-A).	↓	111-182
48-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).		144-174
48-C.	Measurable objectives (see requirement for #42-C).		144-174
48-D.	Related activities (see requirement for #42-D).		111-182
48-E.	Budgets (see requirement for #42-E).		179-181, Appendix 13.13

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	1, 4, 92-97, Appendix 13.2

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	92-97
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	92-97
52	***Quantitative description of the land regarding an inventory of hydrological features and associated acreage. <i>See footnote.</i>	253.034(5)	92-97, 127-128
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).	↓	111-182
53-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).		144-174
53-C.	Measurable objectives (see requirement for #42-C).		144-174
53-D.	Related activities (see requirement for #42-D).		111-102
53-E.	Budgets (see requirement for #42-E).		179-181, Appendix 13.13

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	98, Appendix 13.6.1
55	***Quantitative data description of the land regarding an inventory of significant land, cultural or historical features and associated acreage.	253.034(5)	98, 128-129, Appendix 13.6.1
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	128-129, Appendix 13.6.2
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).	↓	98, 128-129, 153-154
57-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).		153-154
57-C.	Measurable objectives (see requirement for #42-C).		153-154
57-D.	Related activities (see requirement for #42-D).		98, 128-129
57-E.	Budgets (see requirement for #42-E).		179-181, Appendix 13.13

**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. <i>See footnote.</i>	253.034(5)	129-134
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).	↓	129-134, 154
59-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).		154
59-C.	Measurable objectives (see requirement for #42-C).		154
59-D.	Related activities (see requirement for #42-D).		129-134, 154
59-E.	Budgets (see requirement for #42-E).		179-181, Appendix 13.13
60	*** Quantitative data description of the land regarding an inventory of recreational facilities and associated acreage.	253.034(5)	129-134
61	Public Access and Recreational Opportunities	259.032(10) & 253.034(5)	
61-A.	Management needs, problems and a desired outcome (see requirement for # 42-A).	↓	124-127, 150-151
61-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).		150-151
61-C.	Measurable objectives (see requirement for #42-C).		150-151
61-D.	Related activities (see requirement for #42-D).		124-127, 150-151
61-E.	Budgets (see requirement for #42-E).		179-181, Appendix 13.13

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-x
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	104-110
65	Key management activities necessary to achieve the desired outcomes regarding other appropriate resource management.	259.032(10)	111-182

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)	179-181, Appendix 13.13
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)	179-181, Appendix 13.13
68	A statement of gross income generated, net income and expenses.	18-2.018	179-181, Appendix 13.13

*** = 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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1 Introduction and General Information

Anchored within the heart of a nearly unbroken corridor of public conservation lands stretching over 200 miles from the St. Marks River to the Suwannee River along Florida's Nature Coast, the Big Bend Wildlife Management Area (BBWMA) conserves approximately 70,000 acres of public coastal conservation land along the rugged and remote Big Bend coast in Taylor and Dixie counties. Among its many natural superlatives, the BBWMA aids in the protection of one of the largest coastal hardwood swamp forests along the northern Gulf of Mexico, north of the Suwannee River. Public ownership within this 200-mile stretch includes the St. Marks National Wildlife Refuge (SMNWR) to the west of the Snipe Island Unit and the Lower Suwannee National Wildlife Refuge (LSNWR) to the south of the Jena Unit.

Managed by the Florida Fish and Wildlife Conservation Commission (FWC), the BBWMA protects the watershed and water quality of dozens of pristine springs, tidal and freshwater creeks, and drainages that wind through the area on their meandering flow to the coast. Conserving this important watershed also aids in the protection of the water quality of the vital fisheries and aquatic habitat of the adjacent Big Bend Seagrasses Aquatic Preserve (BBSAP), which buffers the borders of most of the area. Together with protecting its intact and functioning freshwater, tidal and spring system communities, it provides important wildlife habitat for an array of imperiled and rare wildlife and plant species.



Bordered on the south by the LSNWR and on the north by the SMNWR, the BBWMA conserves 60 miles of coastal habitats that contain a diverse assemblage of natural communities which sustain a large variety of wildlife species. Extensive hardwood swamps in association with uplands create good habitat conditions for wildlife and allow for seasonal movement

of animals in response to fluctuating water levels and food supplies. The BBWMA contributes to the conservation of an array of imperiled and other native wildlife including the Florida black bear, gopher tortoise, gopher frog, along with a large variety of imperiled wading birds including the wood stork, white ibis, limpkin, piping plover, and many others.

In addition to protecting significant gaps within a coastal conservation corridor, the five units comprising the BBWMA – Snipe Island, Hickory Mound, Spring Creek, Tide Swamp, and Jena – also provide outstanding opportunities for fish- and wildlife-based public outdoor recreational opportunities. Hunting and fishing are traditional activities and continue to constitute the major public recreation uses on all of the area’s management units. Opportunities are available for archery and general gun hunting on each of its five units, while dog hunting is allowed on the Hickory Mound and Jena units and muzzle loading gun hunting is allowed on the Snipe Island, Spring Creek and Tide Swamp units. Additionally, wildlife viewing, particularly birding, and paddling are also increasingly popular recreational pursuits along the area’s pristine coastline. The FWC’s Big Bend Saltwater Paddling Trail has become a favorite destination amongst paddle sports enthusiasts.

The FWC has lead management authority for all of the resources and lands within the established boundary of the BBWMA. The area is managed by the FWC to conserve, manage, and restore the important natural communities on site that provide habitat for a wide range of imperiled and more common wildlife species and to provide high-quality opportunities for hunting, fishing, wildlife viewing, hiking, biking, horseback riding, paddling and camping along the Big Bend Saltwater Paddling Trail, and scenic driving along more than 200 miles of roads. The Florida Forest Service (FFS) serves as a cooperative manager for the area.

1.1 Management Plan Purpose

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

This Management Plan is submitted for review to the Acquisition and Restoration Council (ARC) acting on behalf of the Board of Trustees of the Internal Improvement Trust Fund (Board of Trustees) of the State of Florida through the Florida Department of Environmental Protection’s (DEP) Division of State Lands (DSL), in compliance with paragraph seven of Lease No. 3885 (Appendix 13.1) and pursuant to 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 ARC requirements for management plans and the model plan outline provided by the staff of DSL. Terms used in this Management Plan describing management activities and associated measurable goals and objectives conform to those developed for the Land Management Uniform Accounting Council Biennial Land Management Operational Report (Appendix 13.13).

1.1.1 FWC Planning Philosophy

FWC’s planning philosophy includes emphasizing management recommendation consensus-building among stakeholders and input from user groups and the general public at the beginning of the planning process. FWC engages stakeholders by convening a Management Advisory Group (MAG) and solicits additional input from user groups and the general public at a public hearing (Appendix 13.2). FWC also engages area, district, and regional agency staff, as well as other FWC staff expertise, in developing this Management Plan, thereby facilitating area biologist and manager “ownership” of the Management Plan, and thus the development of meaningful management intent language, goals with associated measurable objectives, timelines for completion, and the identification of challenges and solution strategies for inclusion in the BBWMA Management Plan (Sections 5 – 8).

Further management planning input is received through Land Management Reviews (LMR) conducted every five years, which includes a review of the previous Management Plan, as well as a field review of BBWMA. The LMR report (Section 5.1, 13.8) provides FWC staff with important information and guidance provided by a diverse team of land management auditors, and communicates the recommendations of the LMR team to FWC so they may be adequately addressed in this Management Plan, and thus guide the implementation of the LMR team recommendations on BBWMA.

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

1.2 Location

The BBWMA is located along the coasts of Taylor and Dixie counties, 11 miles southwest of Perry, 15 miles east-southeast of St. Marks, and 15 miles west of Cross City. The communities of Keaton Beach, Steinhatchee, and Horseshoe Beach are located between or adjacent to the units of the BBWMA. There are several designated entrances to the BBWMA located near U.S. Highway 98. As stated above, the BBWMA consists of five irregular shaped units that stretch for approximately 60 miles along the Gulf of Mexico. As shown in Figure 1, much of the land along the coastline of Taylor and Dixie counties is within the boundary of the BBWMA. The specific location and boundaries of each unit are depicted in Figures 2a through 3e.

1.3 Acquisition

1.3.1 Purpose for Acquisition of the Property

The acquisition of BBWMA was a significant accomplishment for the State of Florida. Collectively, these environmentally endangered lands embodied one of the largest public coastal conservation acquisitions in Florida's and the nation's history. The acquisition of these coastal tracts filled a 60-mile void in a 200-mile stretch of coast already in public ownership.

The primary purposes of acquisition included protecting the important watershed and water quality of coastal streams and springs, as well as ensuring the maintenance and conservation of upland vegetative communities that are responsible for the vitality of the coastal marshes and seagrass beds in the adjacent waters of the BBSAP.

Acquisition also ensured the vital breeding, nursery, and overall habitat of the BBSAP was protected and preserved for the abundant marine and aquatic sea life that depend upon it for their existence and, in turn, sustain the important commercial and recreational fisheries in the region. Additionally, these lands were acquired to preserve habitat for imperiled and more common wildlife and to provide resource-based public outdoor recreation for the public to enjoy.



1.3.2 Acquisition History

The lands acquired and established as the BBWMA were purchased under the Save our Coast (SOC), Conservation and Recreation Lands Acquisition (CARL), Preservation 2000 (P-2000), and Florida Forever Acquisition Programs, and fee-simple title resides with the Board of Trustees. The FWC leases the BBWMA from the Board of Trustees through the DSL under Lease Number 3558 and subsequent amendments to it. The FWC has lead management authority on all lands and resources established within the boundary of the BBWMA.

Most of the lands that comprise the BBWMA in Taylor and Dixie counties were originally acquired by The Nature Conservancy (TNC) from the Buckeye Cellulose Corporation in 1984 as part of a larger land acquisition project, including the salt marsh (managed by the

DEP Bureau of Coastal and Aquatic Managed Areas) adjacent to the BBWMA, the McKay tract (Econfina River State Park) in southwest Taylor County, and another parcel south of Horseshoe Beach in Dixie County (managed by the DEP Division of Recreation and Parks). All of the original BBWMA was purchased through the CARL Program (using SOC funds), with the fee simple title for the land being transferred to the State of Florida in July 1987. In 1999, 4,750 acres of coastline were acquired by the FWC from the Four States Timber LLC through its P-2000 Additions and Inholdings Acquisition Program. Additional tracts were acquired later from other private owners with funds from the State's Florida Forever Acquisition Program, including the 10,960-acre Snipe Island Unit. The portions of the Big Bend CARL, P-2000, and Florida Forever acquisition projects under FWC management will be referred to as the BBWMA or by unit name: Snipe Island, Hickory Mound, Spring Creek, Tide Swamp or Jena.

1.4 Management Authority

FWC is the designated lead managing agency for BBWMA under the authority granted by Lease Number 3558 from the Board of Trustees agent, DSL. Further management authority derives from Article IV, Section 9 of the Florida Constitution as well as the guidance and directives of Chapters 253, 259, 327, 370, 373, 375, 378, 379, 403, 487, 870, and 597 and of the F.S. These constitutional provisions and laws provide FWC the authority to protect, conserve, and manage the State's fish and wildlife resources.

1.5 Management Directives

The 50-year Board of Trustees' Lease Agreement Number 3558 with FWC directs FWC to "manage the leased premises only for the conservation and protection of natural and historical resources and resource-based, public outdoor recreation which is compatible with the conservation and protection of these public lands, as set forth in subsection 253.023(11), F.S..." The lease agreement further directs FWC to "implement applicable Best Management Practices for all activities under this lease in compliance with paragraph 18-2.018(2)(h), F.A.C., which have been selected, developed, or approved by lessor, lessee, or other land managing agencies for the protection and enhancement of the leased premises."

1.6 Title Interest and Encumbrances

As State-owned lands, title to BBWMA is vested in the Board of Trustees (Governor and Cabinet). In March of 1984, DSL, as staff to the Board of Trustees, entered into Lease Agreement Number 3558, a 50 year lease agreement, granting FWC management authority for BBWMA. There are no known encumbrances to the property except for two apiaries which operate seasonally on the area. Although not technically an encumbrance, many portions of the BBWMA are only accessible by privately-owned roads on which neither the Board of Trustees or the FWC hold ingress and egress or access easements. The FWC continues to work with the private landowners who own these roads to obtain access easements in order to secure and ensure vital, long-term access.

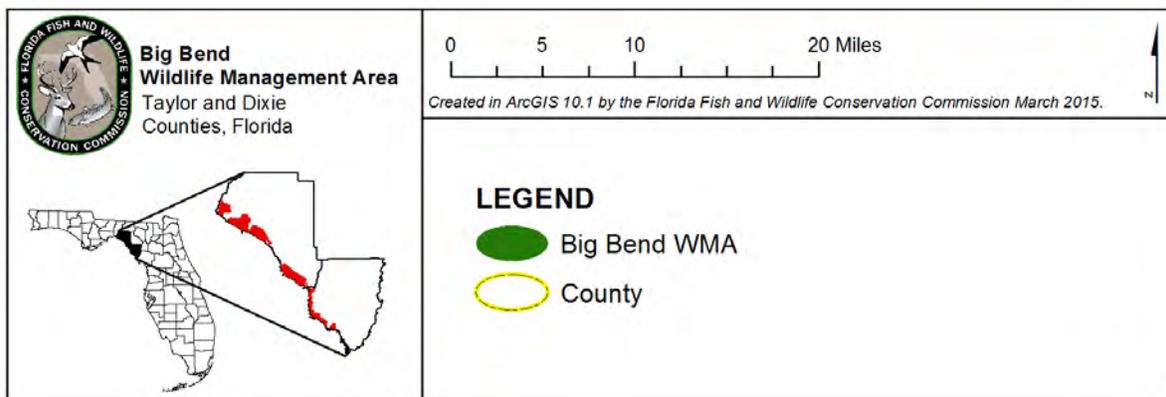


Figure 1: The Location of the BBWMA

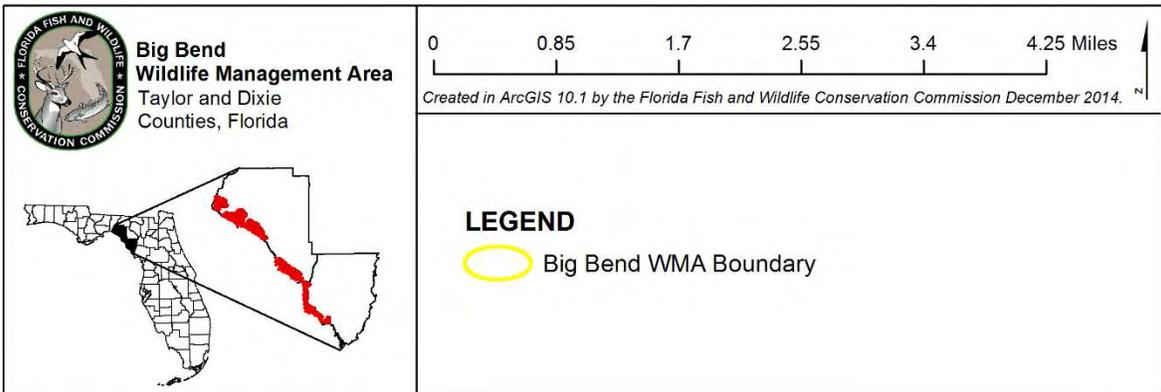
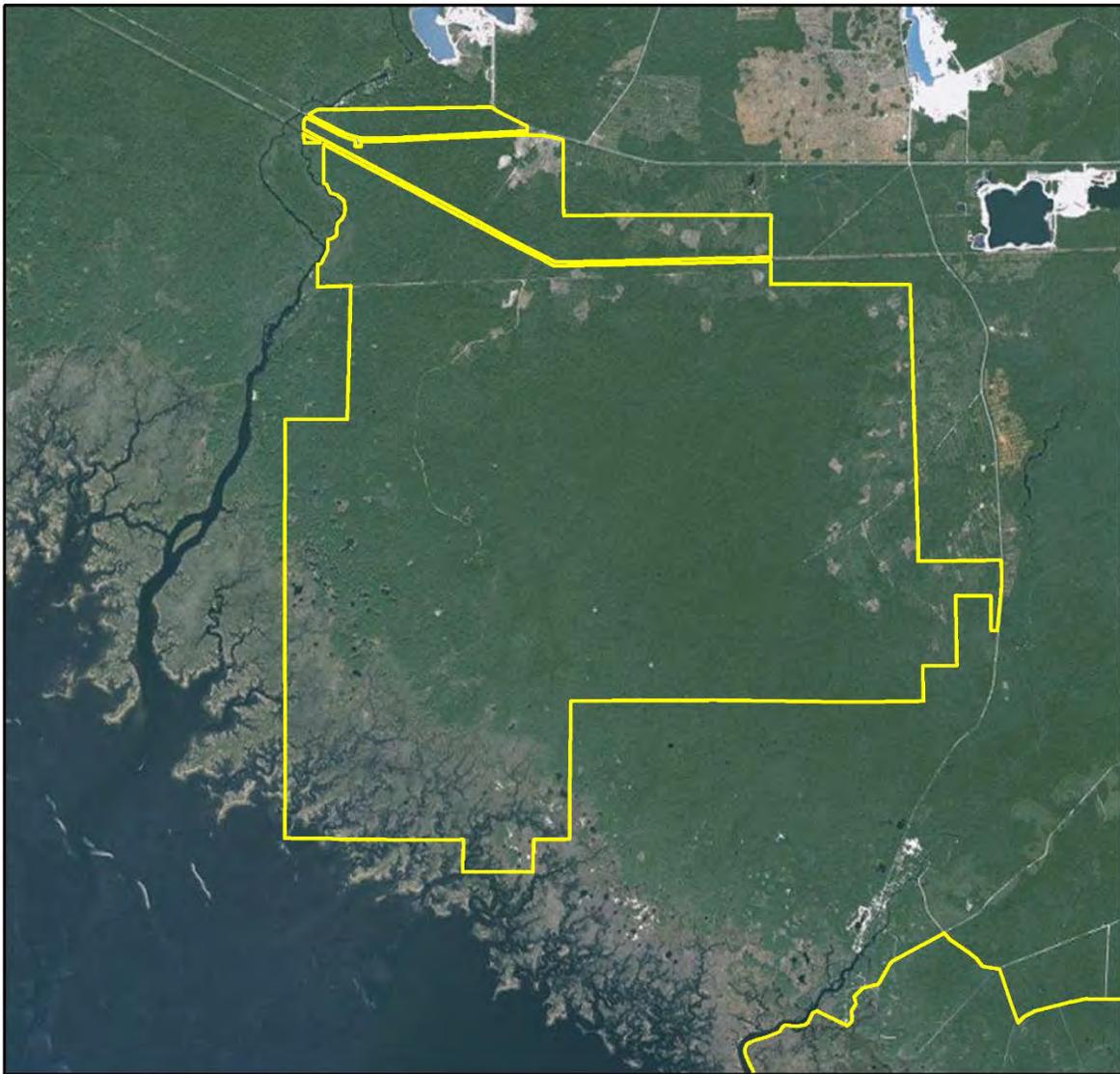


Figure 2a: The Snipe Island Unit of the BBWMA

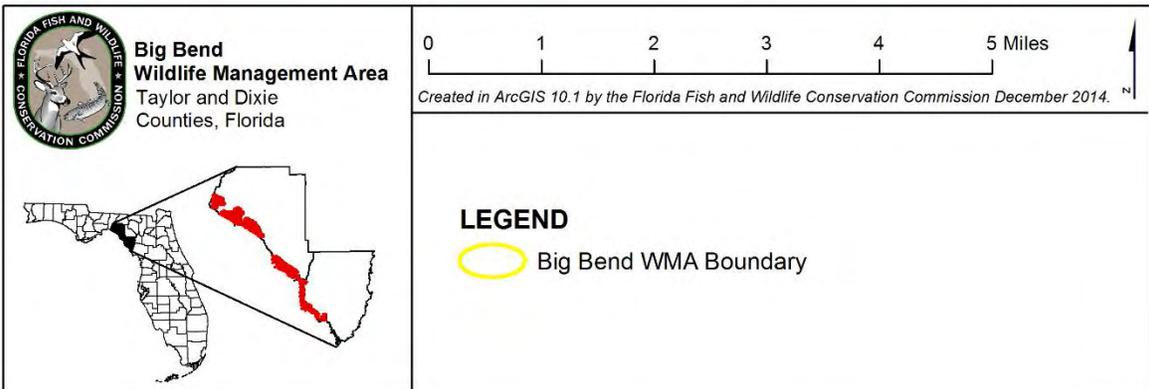
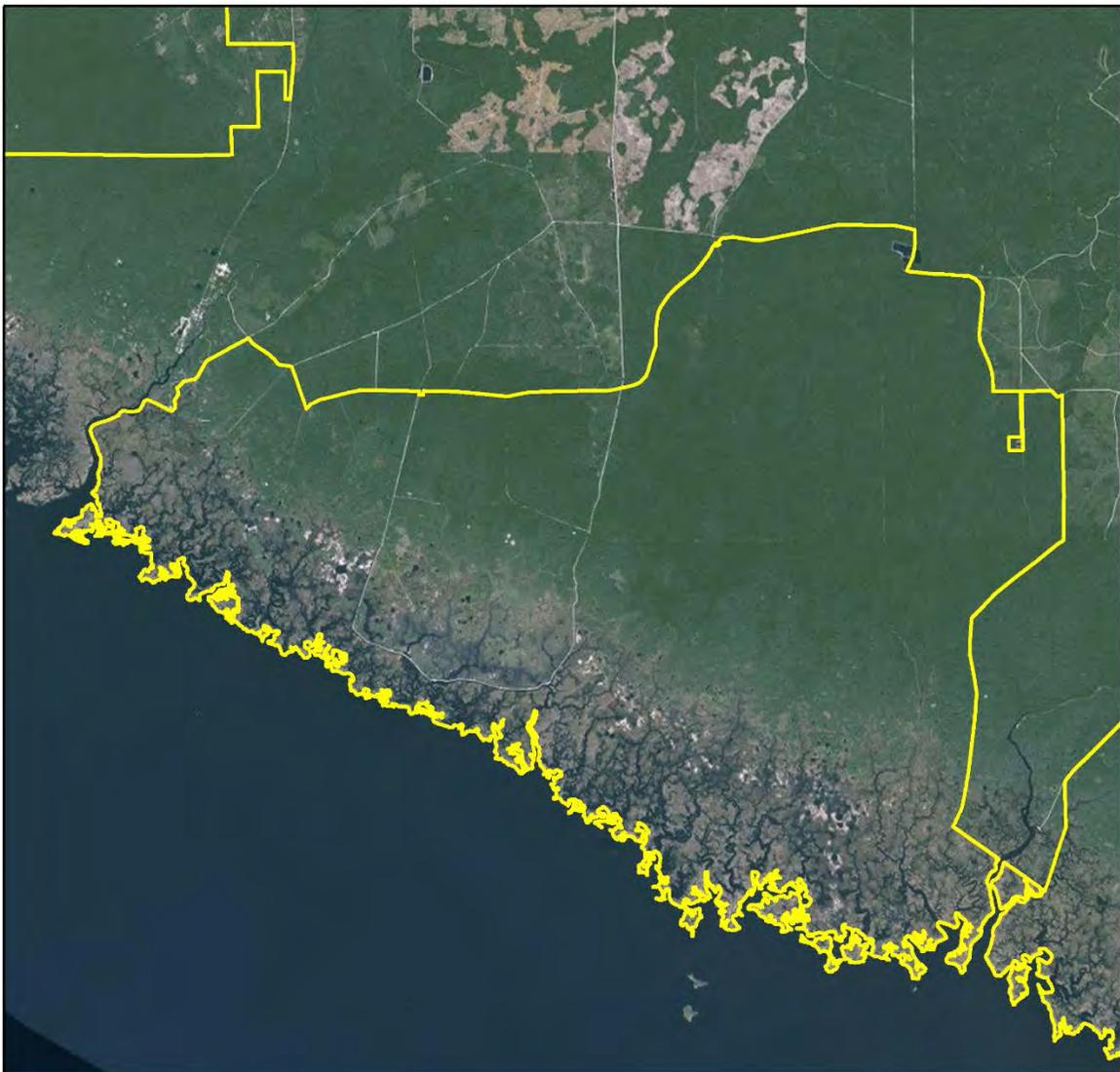


Figure 2b: The Hickory Mound Unit of the BBWMA

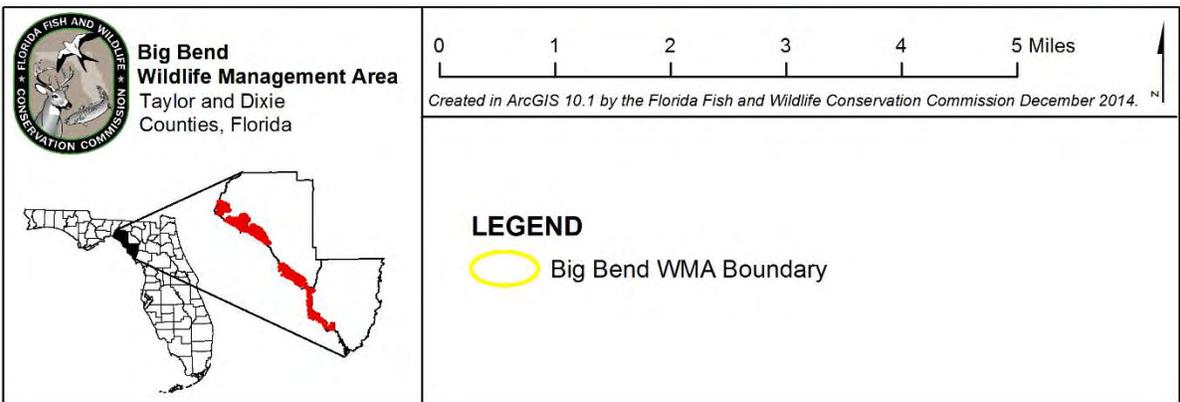


Figure 2c: The Spring Creek Unit of the BBWMA

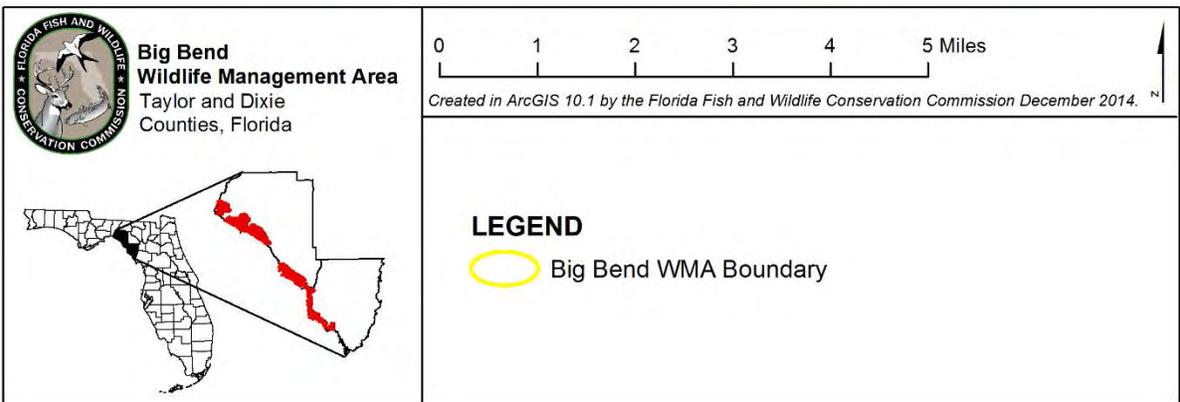
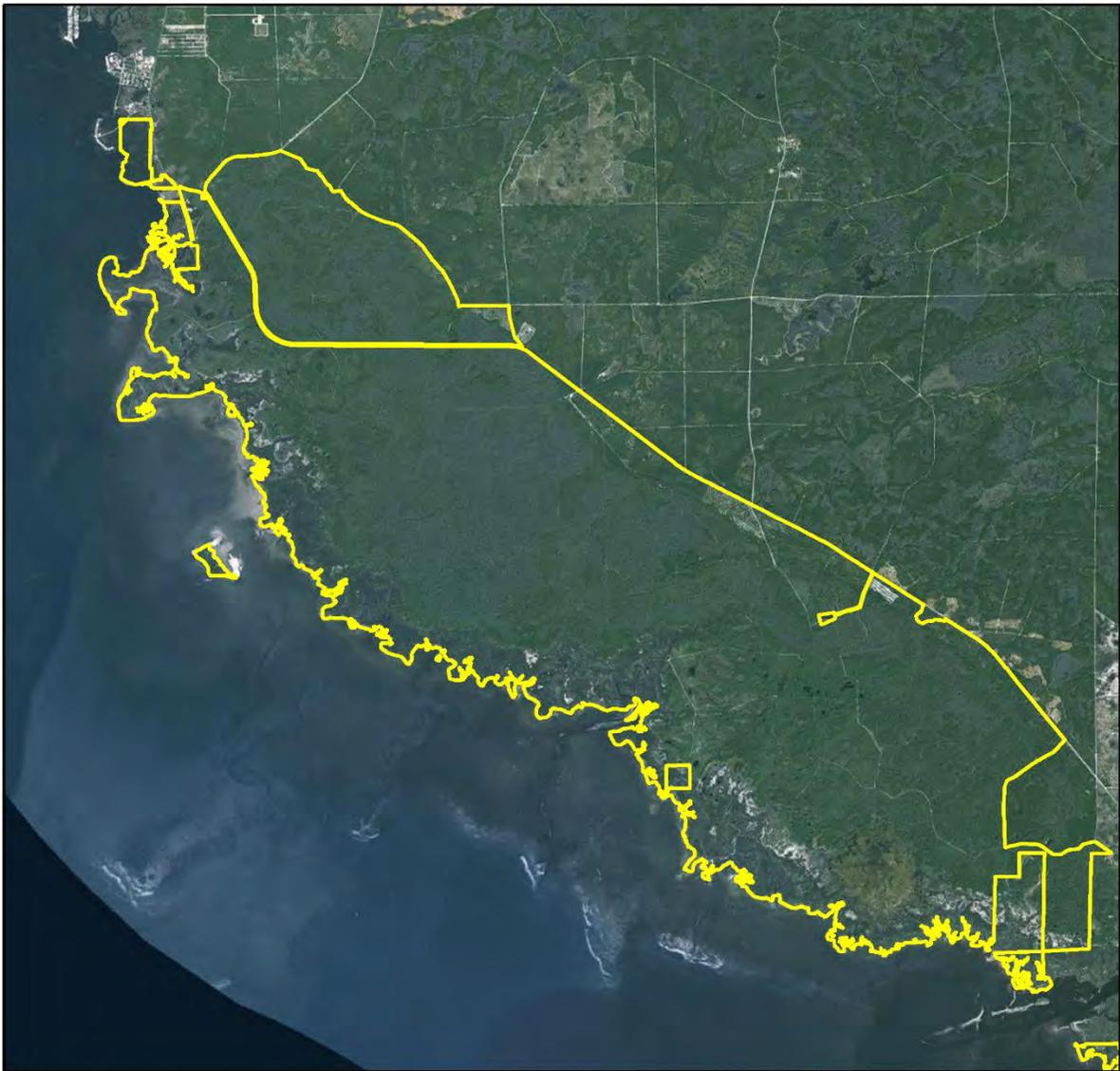


Figure 2d: The Tide Swamp unit of the BBWMA

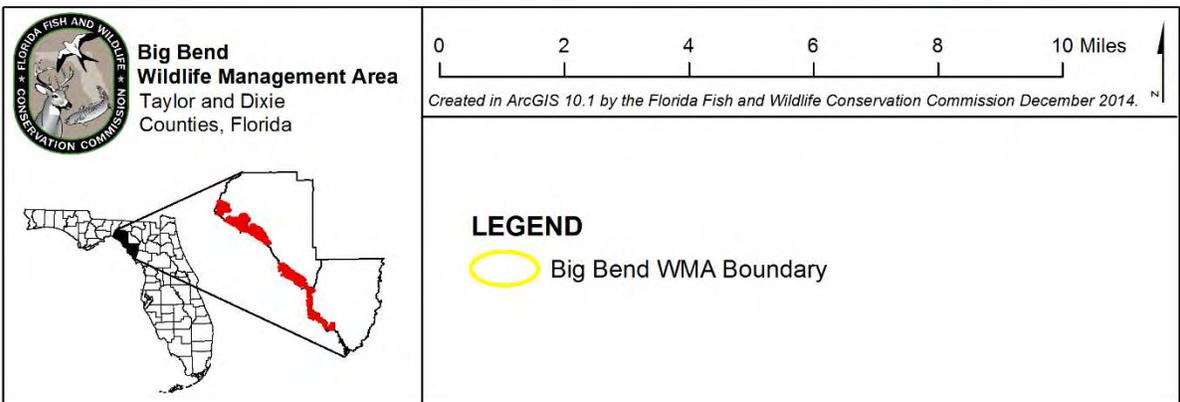
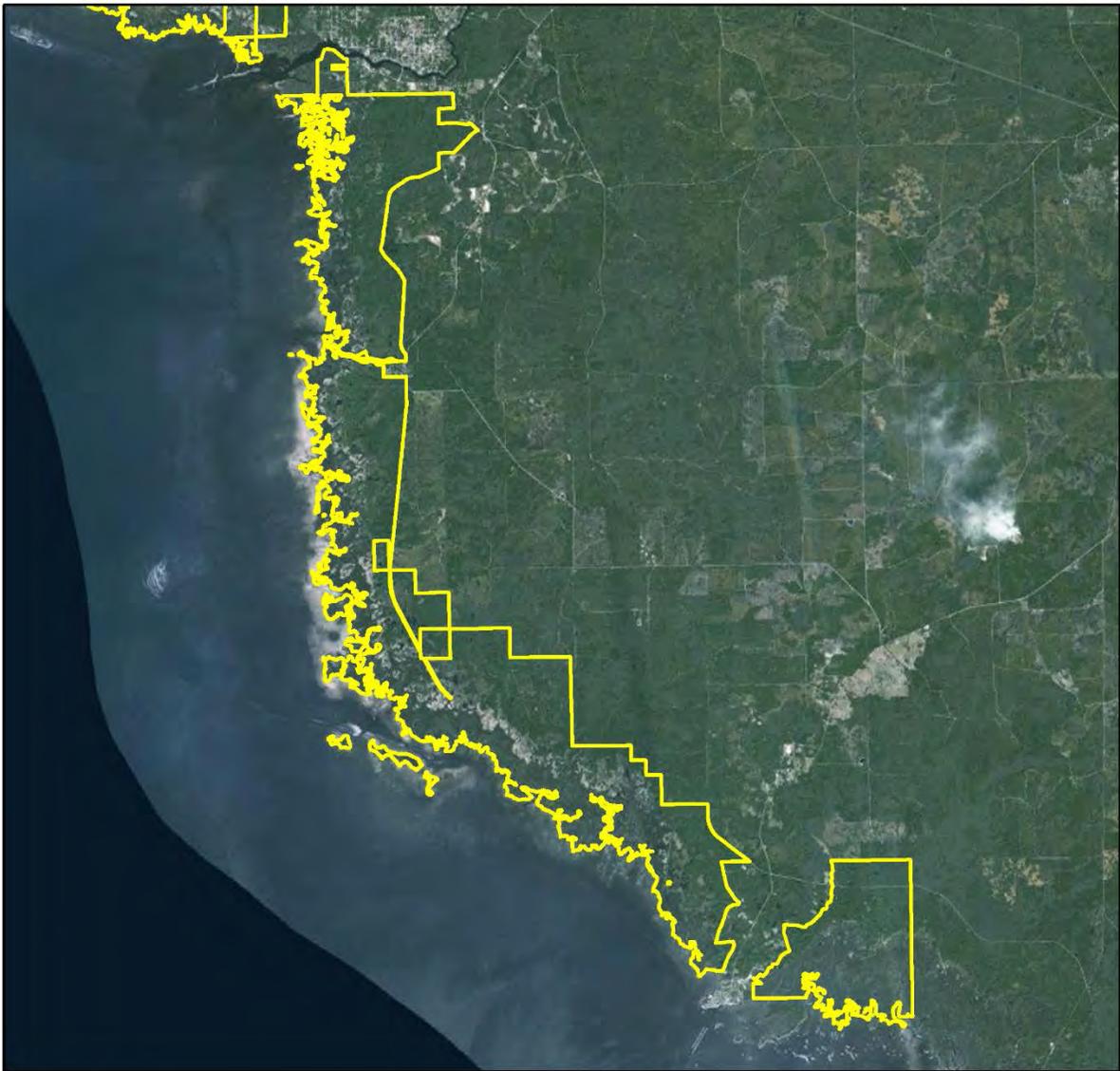


Figure 2e: The Jena Unit of the BBWMA

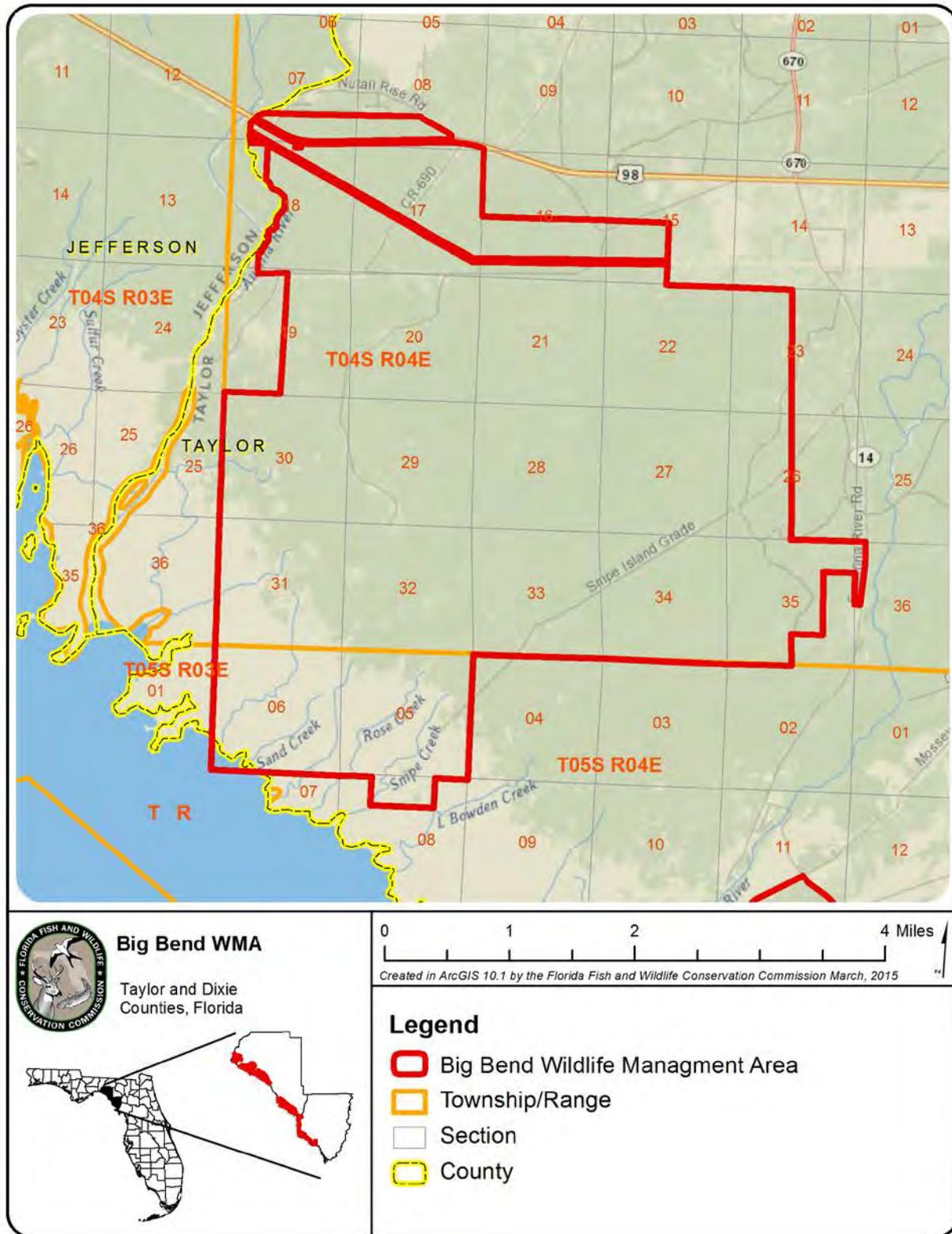


Figure 3a: Township, Range, and Section Location of the Snipe Island Unit

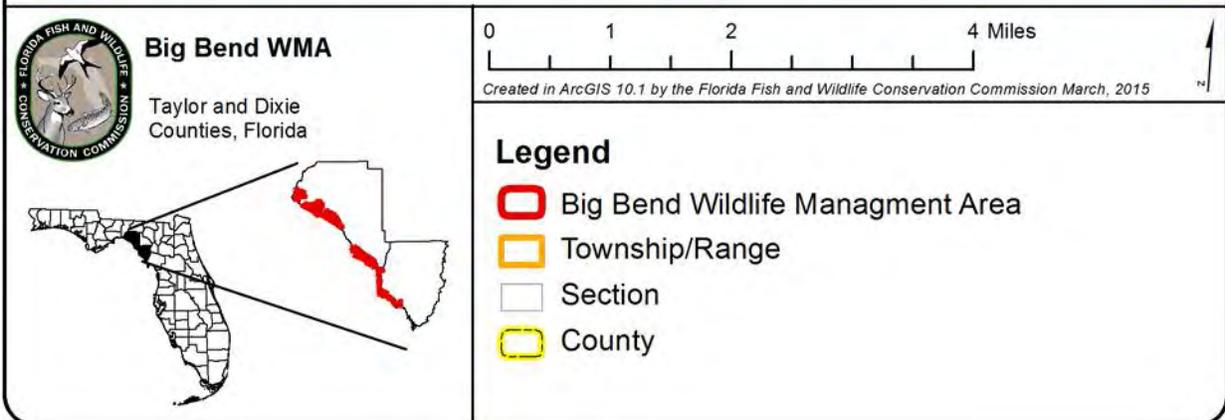
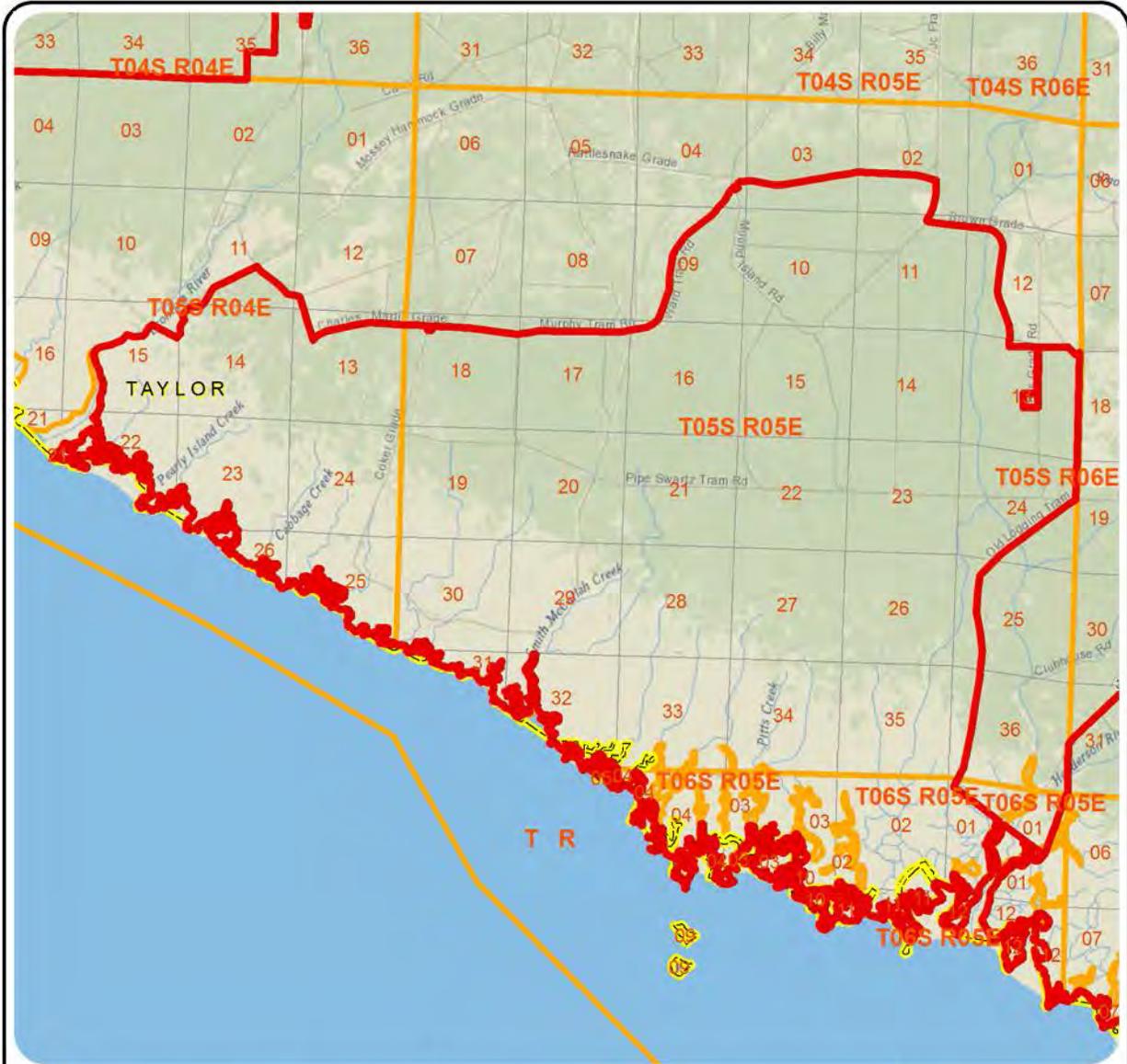


Figure 3b: Township, Range, and Section Location of the Hickory Mound Unit

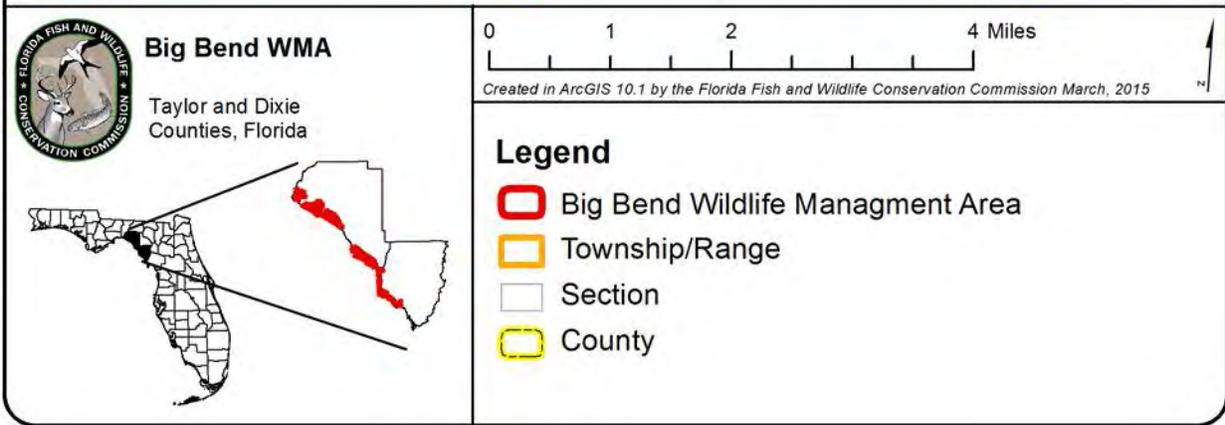
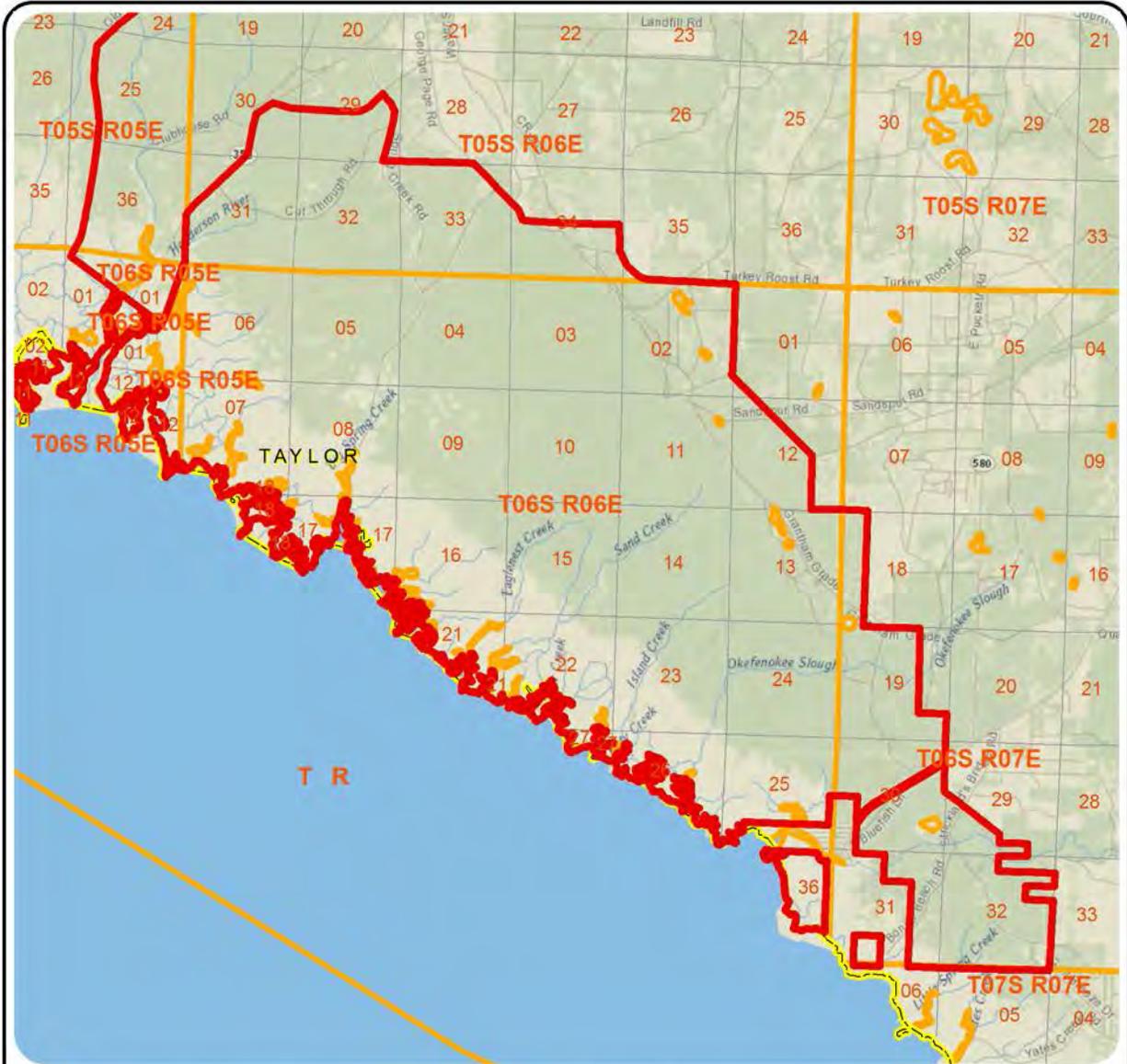


Figure 3c: Township, Range, and Section Location of the Spring Creek Unit

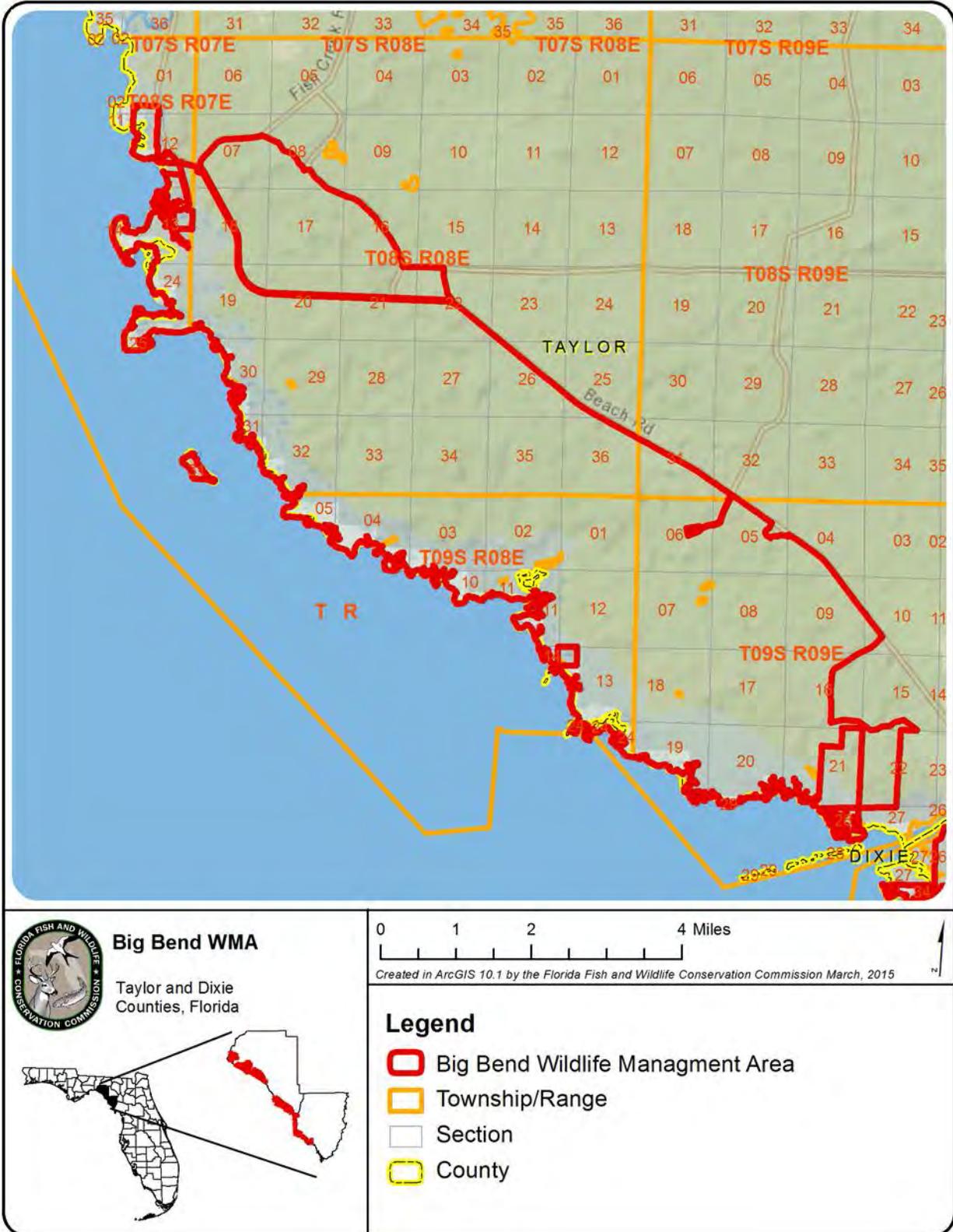


Figure 3d: Township, Range, and Section Location of the Tide Swamp Unit



Figure 3e: Township, Range, and Section Location of the Jena Unit

1.7 Proximity to Other Public Conservation Lands

The BBWMA is within close proximity to a large number of other public and private conservation lands (Figure 4). Table 1 lists the conservation lands within 15 miles of the BBWMA, and Table 2 lists the Florida Forever projects. Econfina River State Park (ERSP) and the SMNWR are both adjacent to the Snipe Island Unit of the BBWMA. The ERSP is directly across the Econfina River from the Hickory Mound Unit. The Suwannee River Water Management District (SRWMD) manages 20 conservation areas or easements in the vicinity of the BBWMA.

Most of the conservation lands listed in Table 1 are owned in full-fee by a public entity; however, five areas are held by non-governmental entities, including one wetland mitigation bank. Wetland mitigation banks provide restoration and enhancement of wetlands onsite in advance of wetland impacts on other sites and earn compensatory mitigation credits that can be used to satisfy development mitigation requirements for future wetland impacts. Additionally, there are several conservation easements in close proximity to BBWMA. Conservation easements are a less-than-fee ownership classification where the land is owned and managed by a private landowner holds a conservation easement on the land.

Table 1: Conservation Lands Within 15 Miles of BBWMA

Federal Government	Managing Agency
Lower Suwannee National Wildlife Refuge	USFWS
St. Marks National Wildlife Refuge	USFWS
State of Florida	Managing Agency
Aucilla Wildlife Management Area	FWC
Econfina River State Park	DEP
Forest Capital Museum State Park	DEP
Manatee Springs State Park	DEP
Natural Bridge Battlefield Historic State Park	DEP
Nature Coast State Trail	DEP
San Marcos de Apalachee Historic State Park	DEP
Tallahassee-St. Marks Historic Railroad State Trail	DEP
County	Managing Agency
Headwaters of the Wacissa River	Jefferson County
Water Management District	Managing Agency
Bailey Brothers Conservation Easement	SRWMD
California Creek Conservation Area	SRWMD
David and Sarah Meeks Conservation Easement	SRWMD
Econfina Conservation Area	SRWMD

Table 1: Conservation Lands Within 15 Miles of BBWMA

Fenholloway Conservation Area	SRWMD
Forest Systems Conservation Easement	SRWMD
Fowlers Bluff Conservation Area	SRWMD
Gerrell Conservation Easement	NFWFMD
Lower Steinhatchee Conservation Area	SRWMD
Middle Aucilla Conservation Area	SRWMD
NATC Oak Hammock Conservation Easement	SRWMD
NATC Suwannee Swamp Conservation Easement	SRWMD
Sheppard Conservation Easement	SRWMD
Spring Warrior Creek Conservation Area	SRWMD
Strickland Field Conservation Easement	SRWMD
Tisdale Conservation Easement	SRWMD
Upper Steinhatchee Conservation Area	SRWMD
Usher Trust Conservation Easement	SRWMD
Wacissa Conservation Area	SRWMD
Walker Spring Conservation Easement	SRWMD
Yellow Jacket Conservation Area	SRWMD

Other Conservation Lands**Managing Agency**

Avalon Plantation Conservation Easement	TNC
Fanlew Preserve	TNC
Flint Rock Tract	TNC
Oak Hill Conservation Easements	Tall Timbers Research, INC
St. Marks Mitigation Bank	Westervelt Ecological Services

Table 2: Florida Forever Projects Within 15 Miles of BBWMA

Project Name	Acres
Florida's First Magnitude Springs Florida Forever BOT Project – St. Marks Springs site	245
Lower Suwannee River and Gulf Watershed Florida Forever BOT Project	46,441
St. Joe Timberland Florida Forever BOT Project	4,527
Upper St. Marks River Corridor Florida Forever BOT Project	14,363
Wacissa/Aucilla River Sinks Florida Forever BOT Project	33,080

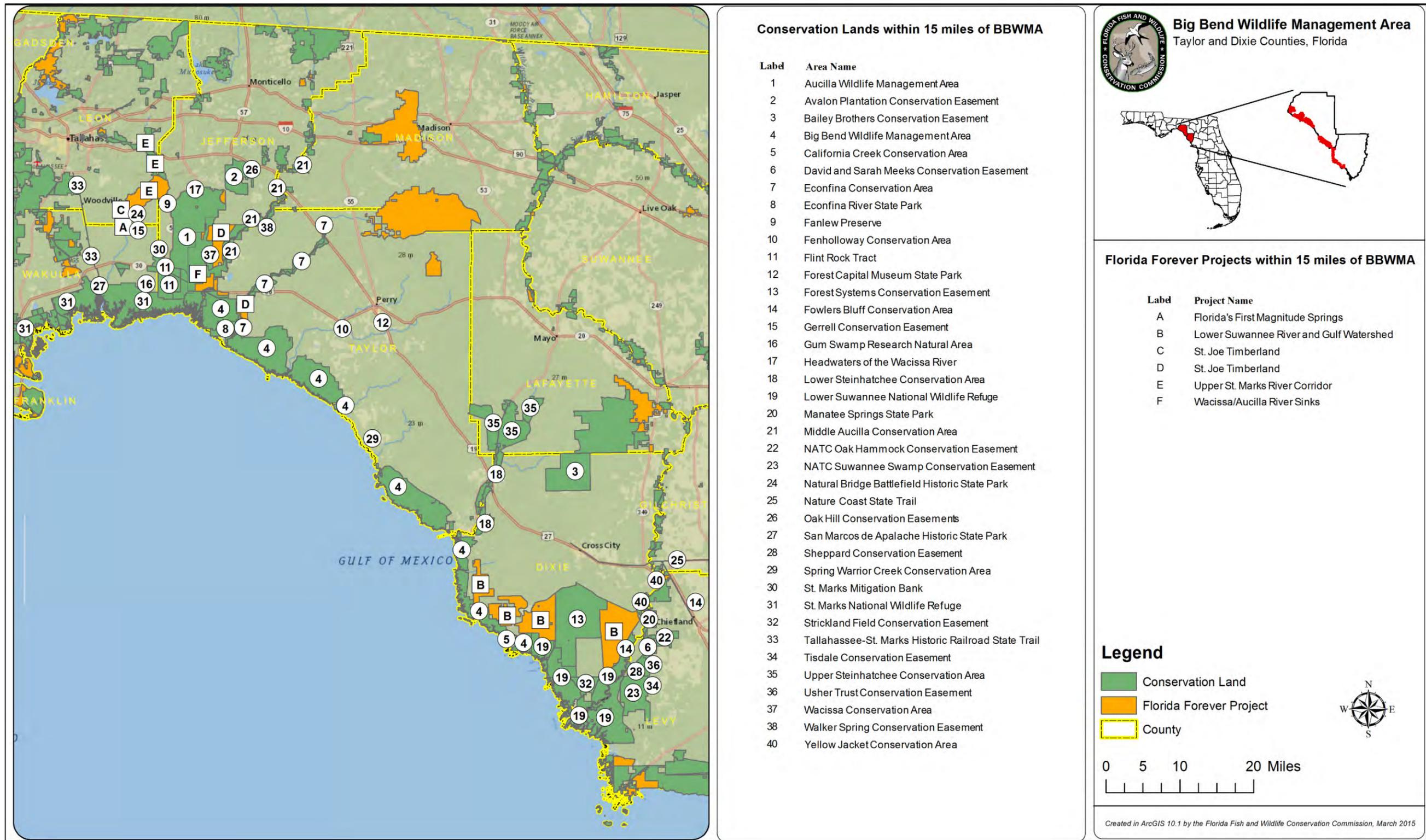


Figure 4: Conservation Lands and Florida Forever Projects within 15 miles of the BBWMA

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1.8 Adjacent Land Uses

The BBWMA is located along what is known as Florida's Nature Coast. This stretch of coastline generally lacks the sandy beaches that Florida is recognized for, and has a much more rural character than other coastal areas in the state. Most of the land surrounding the BBWMA is owned by timber companies and managed for silvicultural uses. The timber companies often lease their property for recreational uses including hunting. The current land use designations for areas in the vicinity of the BBWMA are currently zoned conservation and agriculture. The activities that are permitted on these properties include outdoor recreation, public boat ramps, current and future silviculture, low density residences, and land management practices that is consistent with conservation use.

The 2013 U.S. Census estimates that Taylor and Dixie counties have populations of 20,613 and 16,234 people, respectively. The University of Florida's Bureau of Economic and Business Research's (BEBR) medium-range population projections for the year 2025 predict that Taylor County's population will increase to 24,400 people while Dixie County's population will increase to 18,500 people.

In early 2015, the Foley Timber and Land Company (FTLC) placed over 500,000 acres of land on the market for sale. All five units of The BBWMA are adjacent to FTLC land, and the Hickory Mound, Spring Creek, and Tide Swamp units are almost completely surrounded by it. Because of the potential sale of these adjacent lands, it is possible that land use near the BBWMA could change in the future.

1.9 Public Involvement



FWC conducted a MAG meeting in Steinhatchee, Florida, on January 14, 2015, to obtain input from both public and private stakeholders regarding management of BBWMA. The results of this meeting were used by FWC to develop management goals and objectives and to identify opportunities and strategies for inclusion in this Management Plan. A summary of issues and opportunities raised by the MAG, as well as a listing of participants, is included as Appendix B. Further, a public hearing, as required by Chapter

259.032(10), F.S., was held in Perry on February 10, 2015. The report of that hearing is also contained in Appendix B. A website is also maintained for receipt of public input at <http://myfwc.com/conservation/terrestrial/management-plans/develop-mps/>. Further testimony and input is received at a public hearing held by ARC. Input received from all public involvement efforts has been considered in the development of this Management Plan.

2 Natural and Cultural Resources

2.1 Physiography

2.1.1 Climate

The climate of the Big Bend region of Florida is characterized by long, hot, humid summers and short, mild to cool winters. Daily temperatures at nearby Cross City average 78-80 degrees Fahrenheit during the summer and 53-55 degrees during the winter. Although moderated by the Gulf of Mexico, daytime temperatures often exceed 90 degrees during the summer.

Mean annual rainfall is 57 inches at Cross City. Approximately half of the total rainfall occurs during afternoon or early evening thundershowers between June and September. The rest of the rainfall is evenly distributed throughout the remainder of the year, except that October and November are the driest months, averaging less than three inches of rain.

2.1.2 Topography

Each of the five units of the BBWMA share certain topographic features, but are sufficiently varied to give each unit a unique character. Following are topography discussions for each unit of the area.

Snipe Island Unit: Topography is generally flat with elevations up to 25 feet above Mean Sea Level (MSL) about three miles inland. Small ponds, depressions and intermittent streams are scattered throughout the unit.

Hickory Mound Unit: Topography of this unit is the most uniform on the BBWMA. From an elevation of 10 feet above MSL in the northeast portion of the area, the land gradually slopes toward the coast. There are scattered depressions and small ponds on the area, though less numerous than those found on the other units. Interspersed throughout the area are small topographical “islands,” where the elevation may be two to three feet higher than the surrounding land. These areas usually do not show up on topographic maps, but provide enough difference in elevation to support plant communities that are different from the surrounding areas.

Spring Creek Unit: The sandhills of this area exhibit the greatest elevation changes and relief on the BBWMA. The sandhills attain an elevation of 25 feet above MSL and run roughly parallel to the coast, approximately three miles inland, along the northern boundary. Numerous depressions and small ponds are dispersed throughout this unit. Once the elevation drops to 10 feet above MSL, the topography becomes uniform and slopes gradually toward the coast. A small sandhill area, which supports coastal scrub vegetation, occurs on the southeastern portion of the area, approximately 1 to 1.5 miles inland, and roughly parallel to the coast. The Spring Warrior Creek traverses through this ridge, resulting in steep banks, with elevations abruptly dropping from 25 feet to less than 10 feet above MSL.

Tide Swamp Unit: A sandhill ridge, with elevations up to 25 feet above MSL, extends along a portion of the northern boundary of the unit approximately three miles inland. Numerous depressions are scattered throughout this sandhill ridge. Once the elevation drops to 10 feet, the topography becomes more uniform and gradually slopes toward the coast. Several small ponds and depressions are widely scattered throughout this area. One of the unique features of this unit is known as the Hickory Ridge area that runs from Dallis Creek Landing to the south for one mile. This area has sandhill community characteristics, but only reaches an elevation of approximately 5 feet.

Jena Unit: Most of its elevation and relief occurs on the northern end of the unit. One sandhill reaches a height of 25 feet above MSL, and numerous elevation changes from 5 to 15 feet occur. Moving southward, the topography becomes more uniform, gradually sloping toward the coast. Numerous depressions and small fresh and saltwater ponds (less than one acre in size) are scattered throughout the area.

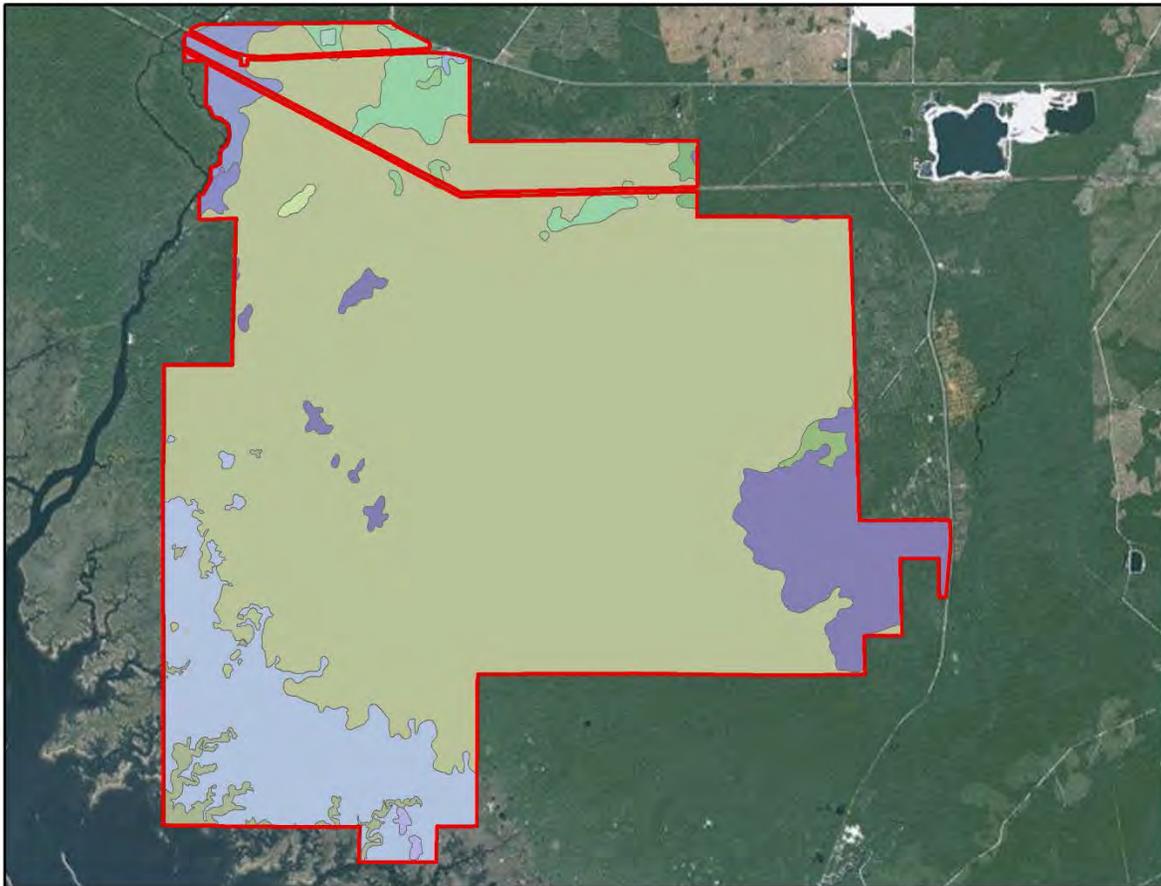
2.1.3 Soils

The Taylor and Dixie County soil survey prepared by Natural Resources Conservation Service (NRCS) shows 26 series occurring on the BBWMA. Most soils are poorly-drained fine sands, medium sands, or sandy loams. The taxonomic and physical descriptions of the series found within the BBWMA are found in Appendix 13.3. Figures 5a through 5e depict the soil profile of each of the units of the BBWMA, while Figures 6a through 6e show the soil depth to the water table of each of the units of BBWMA.

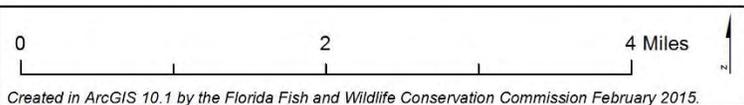
2.1.4 Geologic Conditions

The geology of the BBWMA is divided into three formations at the surface according to the geologic map of the State of Florida. The first is Beach Ridge & Dune. This formation covers 4.47% of BBWMA. These sediments are of the Pleistocene and Holocene periods. This formation covers the eastern edge of the Spring Creek Unit and the Tide Swamp Unit. The second major formation at the surface of BBWMA includes Ocala Limestone. This formation makes up 33.76% of BBWMA and is located in the southern half of the Tide Swamp Unit and all of the Jena Unit. This formation is of the Eocene period. The third formation at the surface of BBWMA is Suwannee Limestone. This formation makes up 61.76% of the management area. This formation makes up the Northern half of the Tide Swamp Unit, the remaining portion of the Spring Creek Unit, all of the Hickory Mound Unit, and all of the Snipe Island Unit. This formation is of the Oligocene period.

The submerged limestone karst formations, honey-combed with caves, underground streams, and springs, are commonly known as the Big Bend Drowned Karst Section. This section accounts for the flat continental shelf which characterizes the Big Bend. The extensive shallow marshes and swamps, numerous freshwater springs, aquatic caves, and sinkholes are a result of the karst topography.



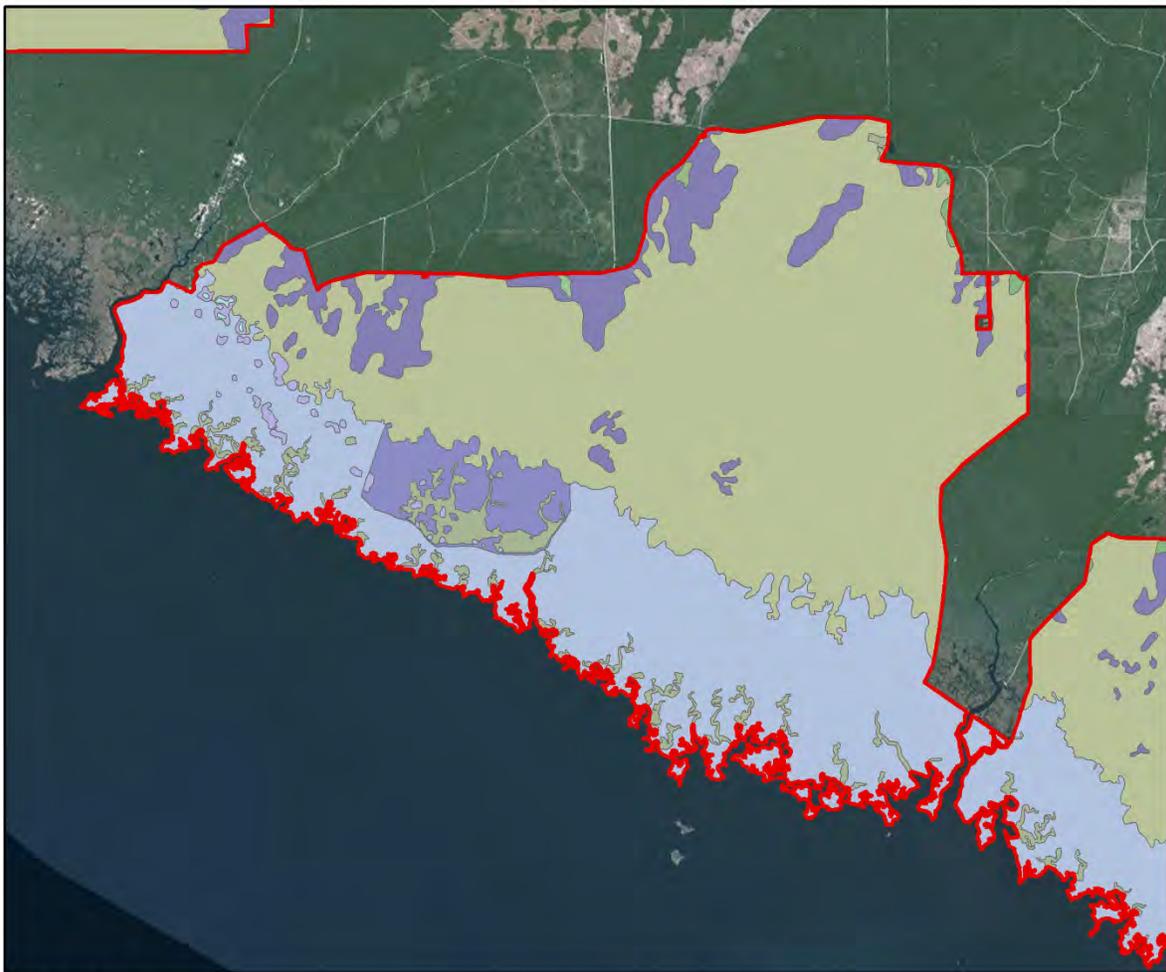
Soil Type	
Bayvi muck, frequently flooded	Tooles-Nuttall complex, frequently flooded
Clara and Bodiford soils, frequently flooded	Tooles-Tennille-Wekiva complex, depressional
Leon fine sand	Tooles-Wekiva complex
Matmon-Wekiva-Rock outcrop complex, occasionally flooded	Water
Pits	Wekiva-Tennille-Tooles complex, occasionally flooded
Seaboard-Bushnell-Matmon complex, 0 to 3 percent slopes	Wekiva-Tooles,depressional-Tennille complex, rarely flooded
Steinhatchee fine sand	Yellowjacket and Maurepas mucks



Legend

Big Bend WMA

Figure 5a: Soils of the Snipe Island Unit of BBWMA



Soil Type	
	Bayvi muck, frequently flooded
	Chaires fine sand
	Clara and Bodiford soils, frequently flooded
	Leon fine sand
	Ridgewood fine sand, 0 to 3 percent slopes
	Steinhatchee fine sand
	Tooles-Tennille-Wekiva complex, depressional
	Tooles-Wekiva complex
	Water
	Wekiva-Tennille-Tooles complex, occasionally flooded
	Wekiva-Tooles,depressional-Tennille complex, rarely flooded

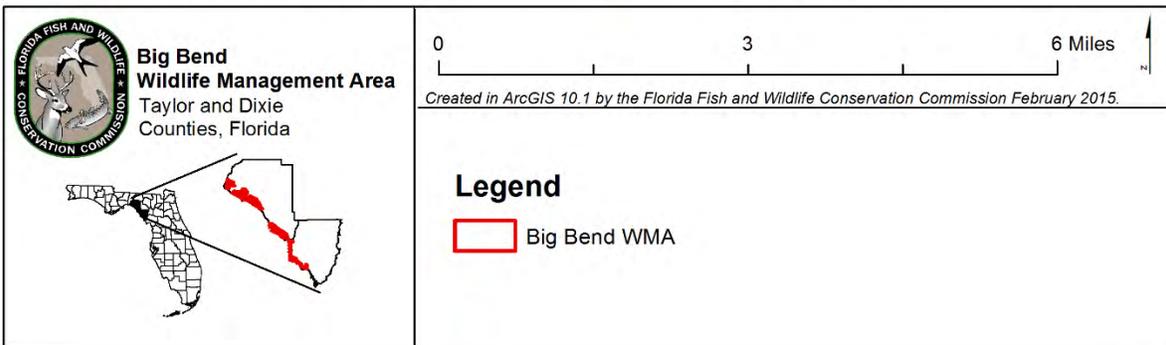
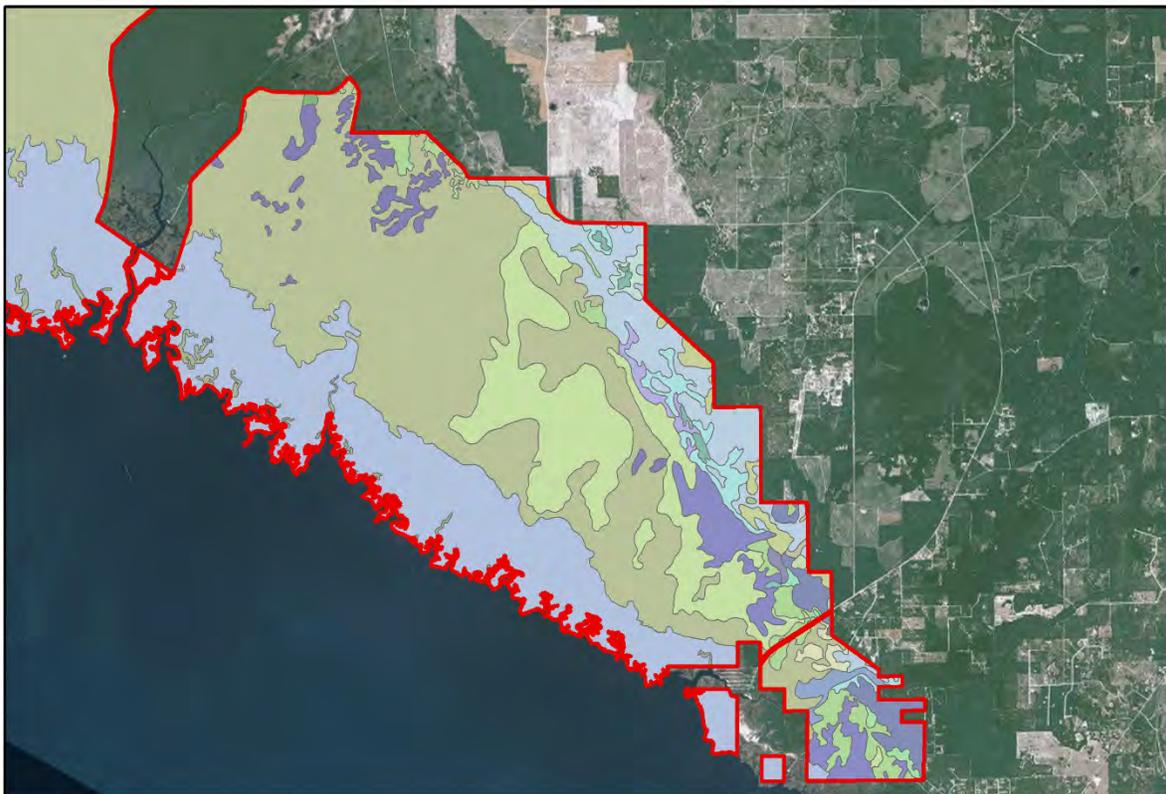


Figure 5b: Soils of the Hickory Mound Unit of the BBWMA

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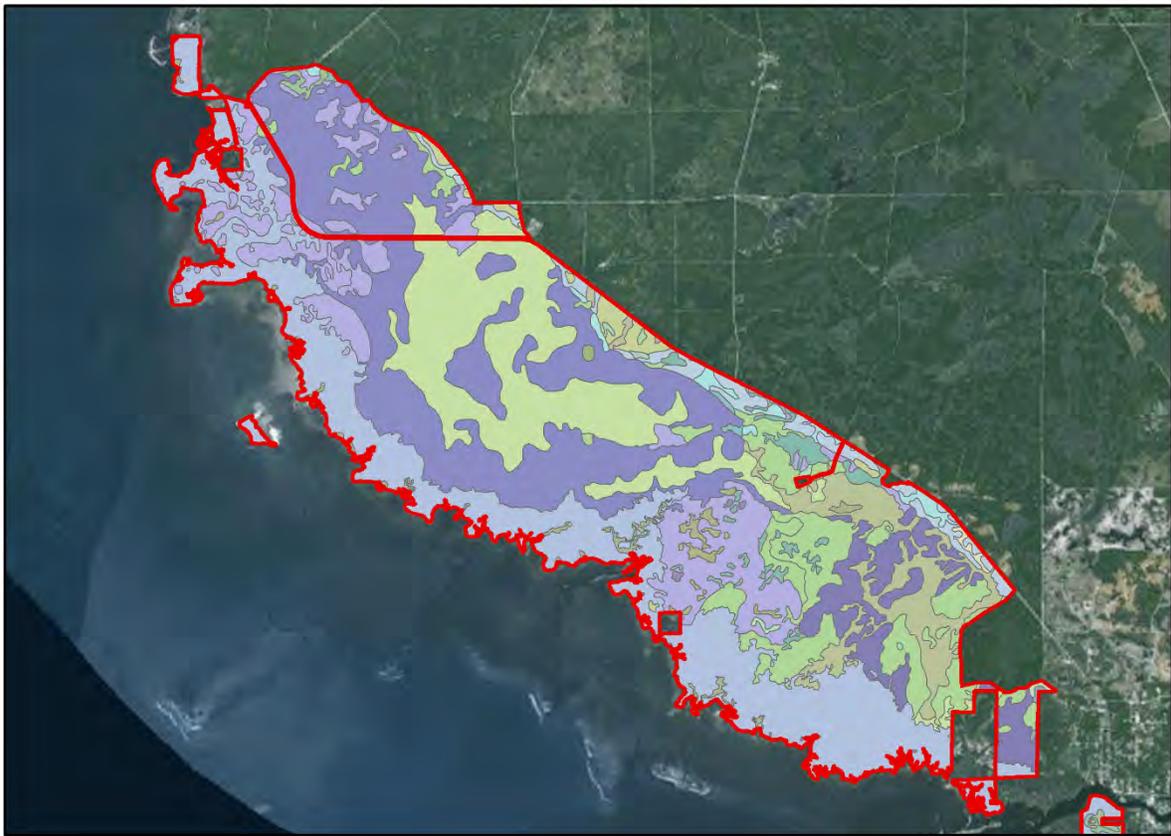


Soil Type	
	Bayvi muck, frequently flooded
	Chaires fine sand
	Clara and Bodiford soils, frequently flooded
	Clara and Meadowbrook soils
	Clara and Osier fine sands
	Hurricane fine sand, 0 to 3 percent slopes
	Kershaw fine sand, 0 to 8 percent slopes
	Leon fine sand
	Lutterloh fine sand, limestone substratum
	Lutterloh-Ridgewood complex, 0 to 3 percent slopes
	Mandarin-Hurricane complex, 0 to 3 percent slopes
	Melvina-Moriah-Lutterloh complex
	Ortega fine sand, 0 to 5 percent slopes
	Otela-Ortega-Lutterloh complex, 0 to 5 percent slopes
	Ousley-Leon-Clara complex, 0 to 3 percent slopes, occasionally flooded
	Pits
	Resota-Hurricane complex, 0 to 5 percent slopes
	Ridgewood fine sand, 0 to 3 percent slopes
	Steinhatchee fine sand
	Tooles and Meadowbrook soils, depressional
	Tooles-Meadowbrook complex
	Tooles-Tennille-Wekiva complex, depressional
	Water
	Wekiva-Tennille-Tooles complex, occasionally flooded
	Wekiva-Tooles, depressional-Tennille complex, rarely flooded
	Yellowjacket and Maurepas mucks



Legend
 Big Bend WMA

Figure 5c: Soils of the Spring Creek Unit of the BBWMA



Soil Type	
	Bayvi muck, frequently flooded
	Chaires fine sand
	Clara and Bodiford soils, frequently flooded
	Clara and Meadowbrook soils
	Clara and Osier fine sands
	Clara, depressional-Clara-Meadowbrook complex, occasionally flooded
	Dorovan and Pamlico soils, depressional
	Hurricane fine sand, 0 to 3 percent slopes
	Kershaw fine sand, 0 to 8 percent slopes
	Leon fine sand
	Leon-Leon, depressional complex
	Lutterloh fine sand, limestone substratum
	Lutterloh-Ridgewood complex, 0 to 3 percent slopes
	Mandarin-Hurricane complex, 0 to 3 percent slopes
	Mandarin-Lutterloh, limestone substratum complex
	Meadowbrook-Tooles-Clara, depressional, complex
	Ortega fine sand, 0 to 5 percent slopes
	Pits
	Psammaquents-Rock outcrop complex, frequently flooded
	Ridgewood fine sand, 0 to 3 percent slopes
	Tooles and Meadowbrook soils, depressional
	Tooles-Meadowbrook complex
	Tooles-Wekiva complex
	Water
	Wekiva-Tennille-Tooles complex, occasionally flooded
	Wekiva-Tooles,depressional-Tennille complex, rarely flooded
	Yellowjacket and Maurepas mucks

Big Bend Wildlife Management Area
Taylor and Dixie Counties, Florida

0 3.75 7.5 Miles

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

Legend

Big Bend WMA

Figure 5d: Soils of the Tide Swamp Unit of the BBWMA

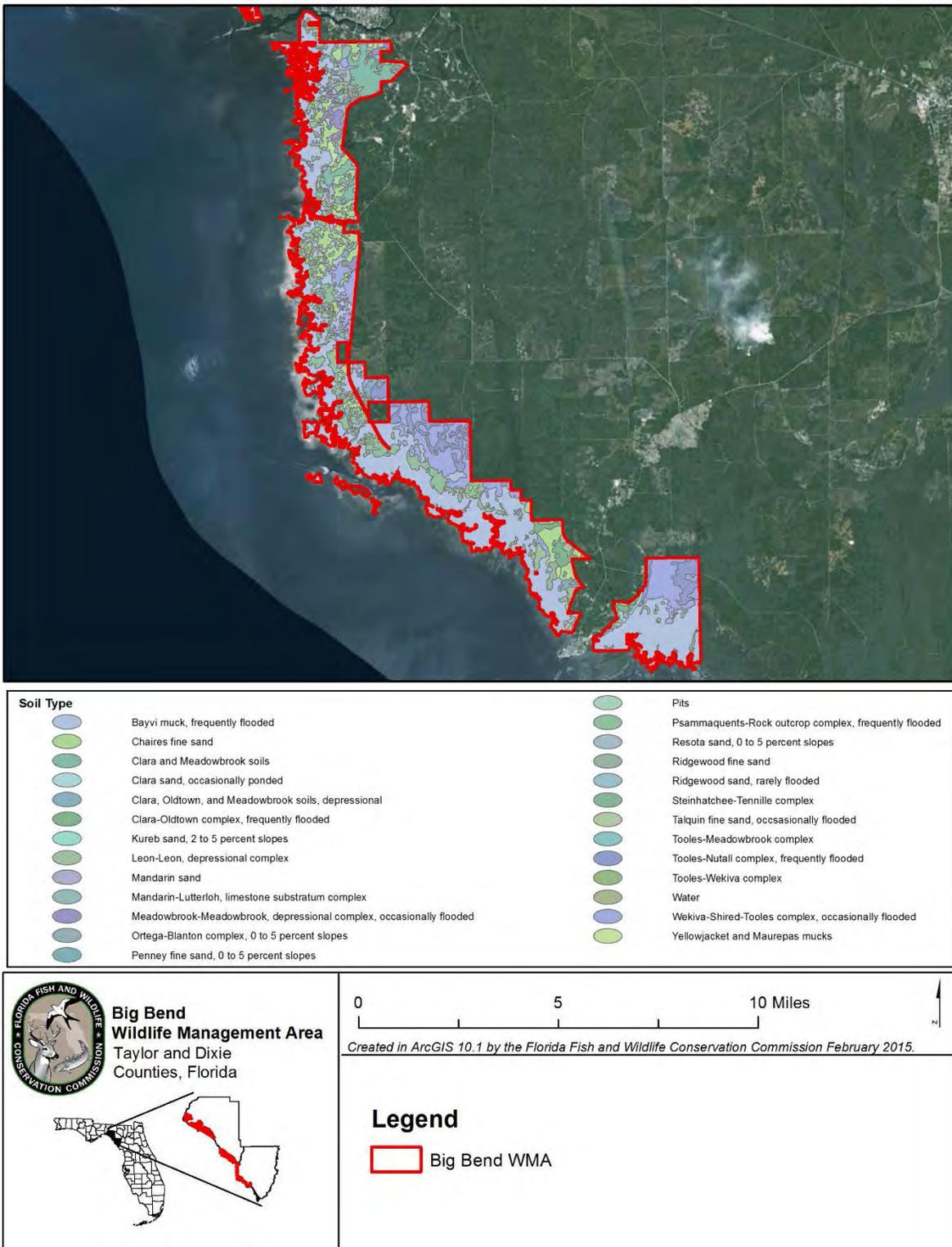


Figure 5e: Soils of the Jena Unit of the BBWMA

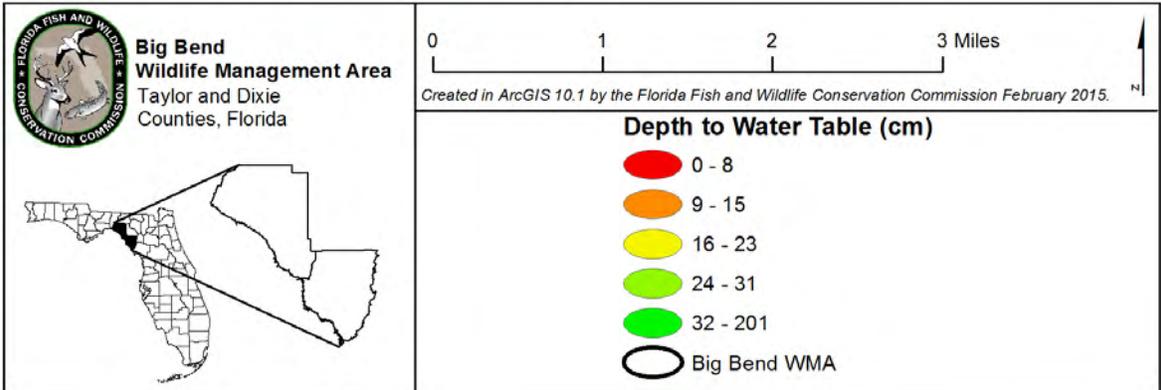
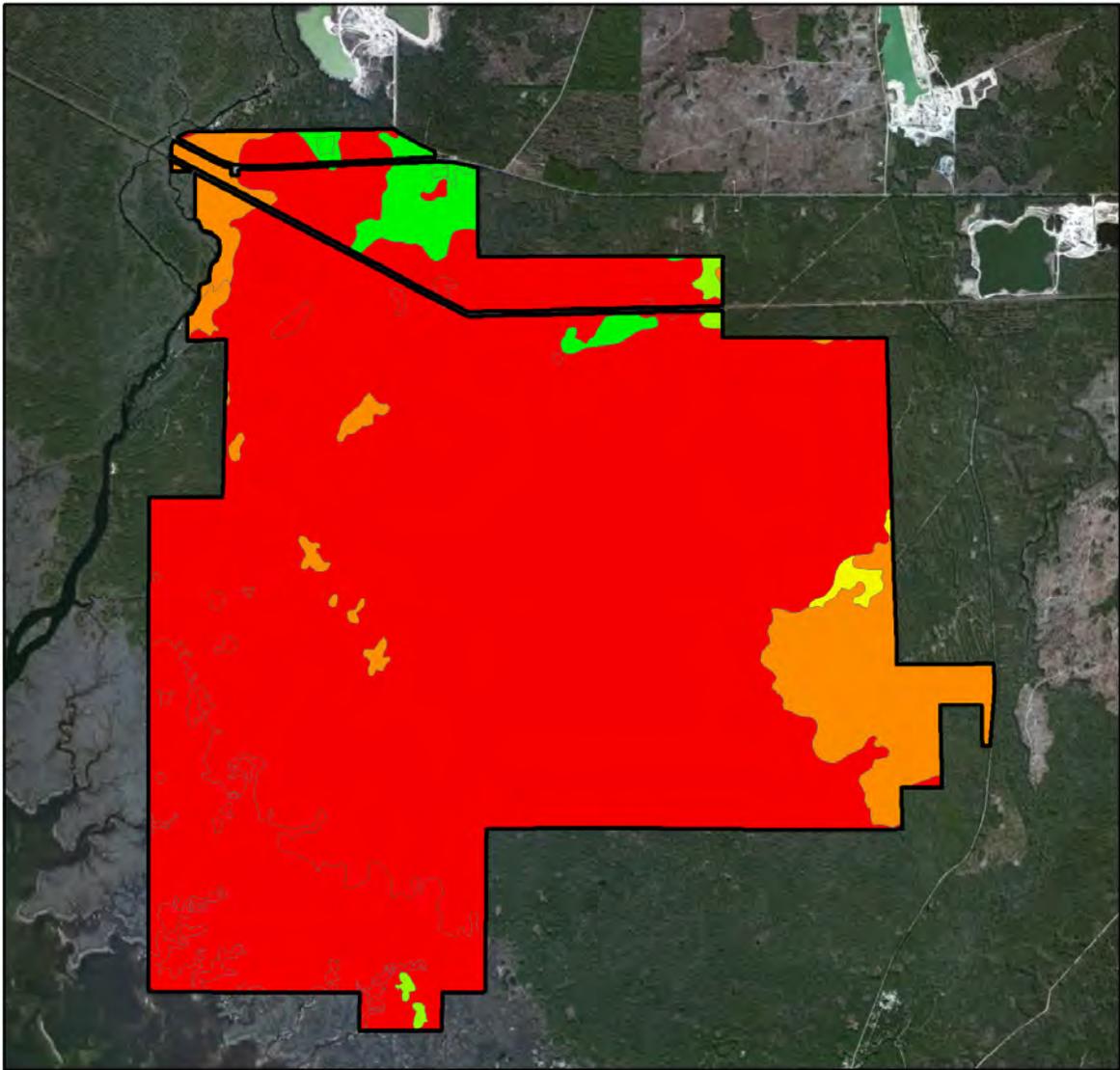


Figure 6a: Soil Depth to the Water Table at the Snipe Island Unit of BBWMA

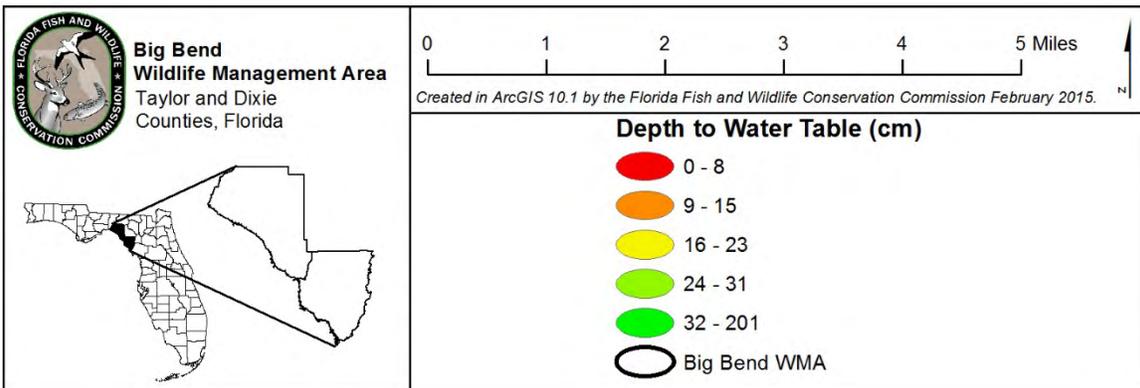
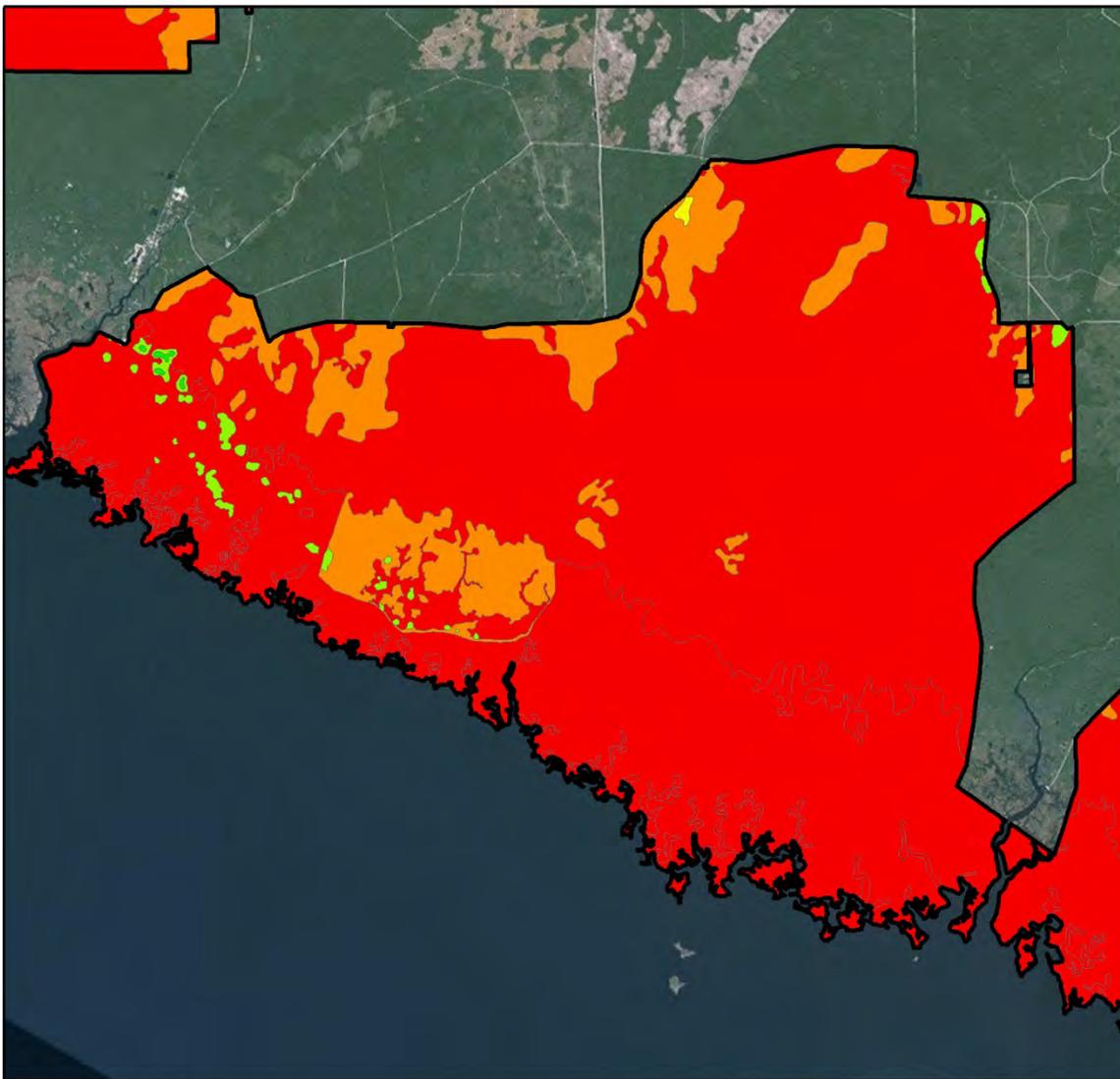


Figure 6b: Soil Depth to the Water Table at the Hickory Mound Unit of BBWMA

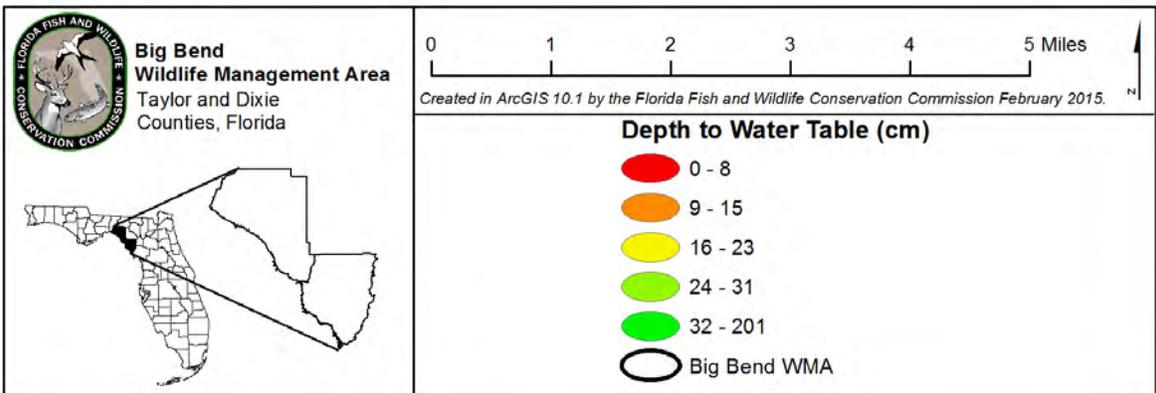
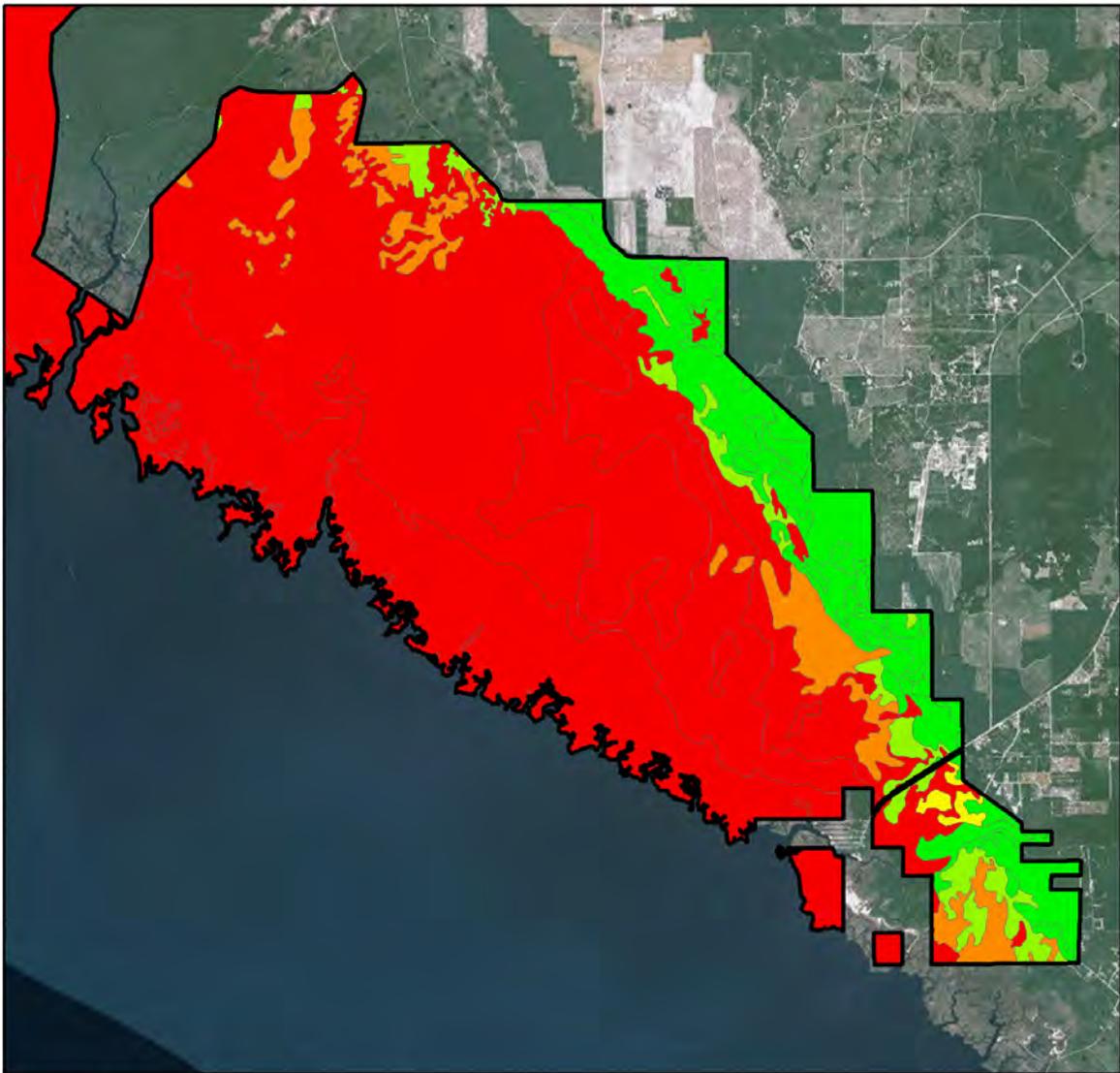


Figure 6c: Soil Depth to the Water Table at the Spring Creek Unit of the BBWMA

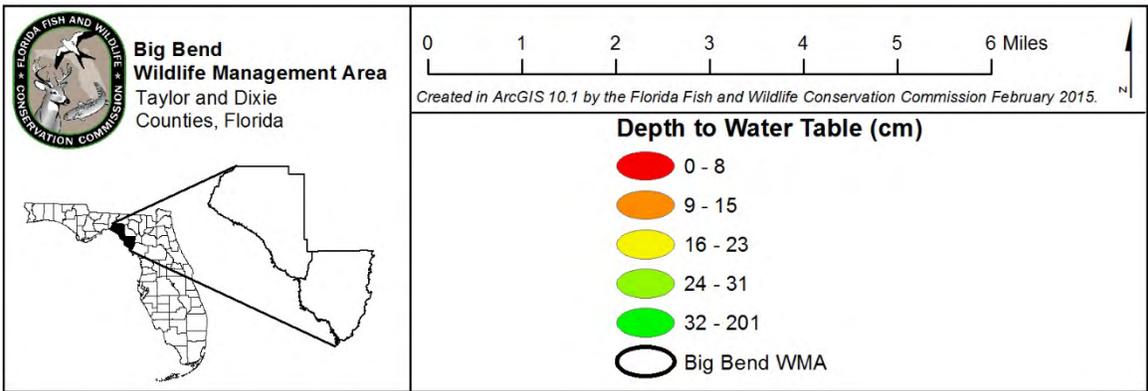
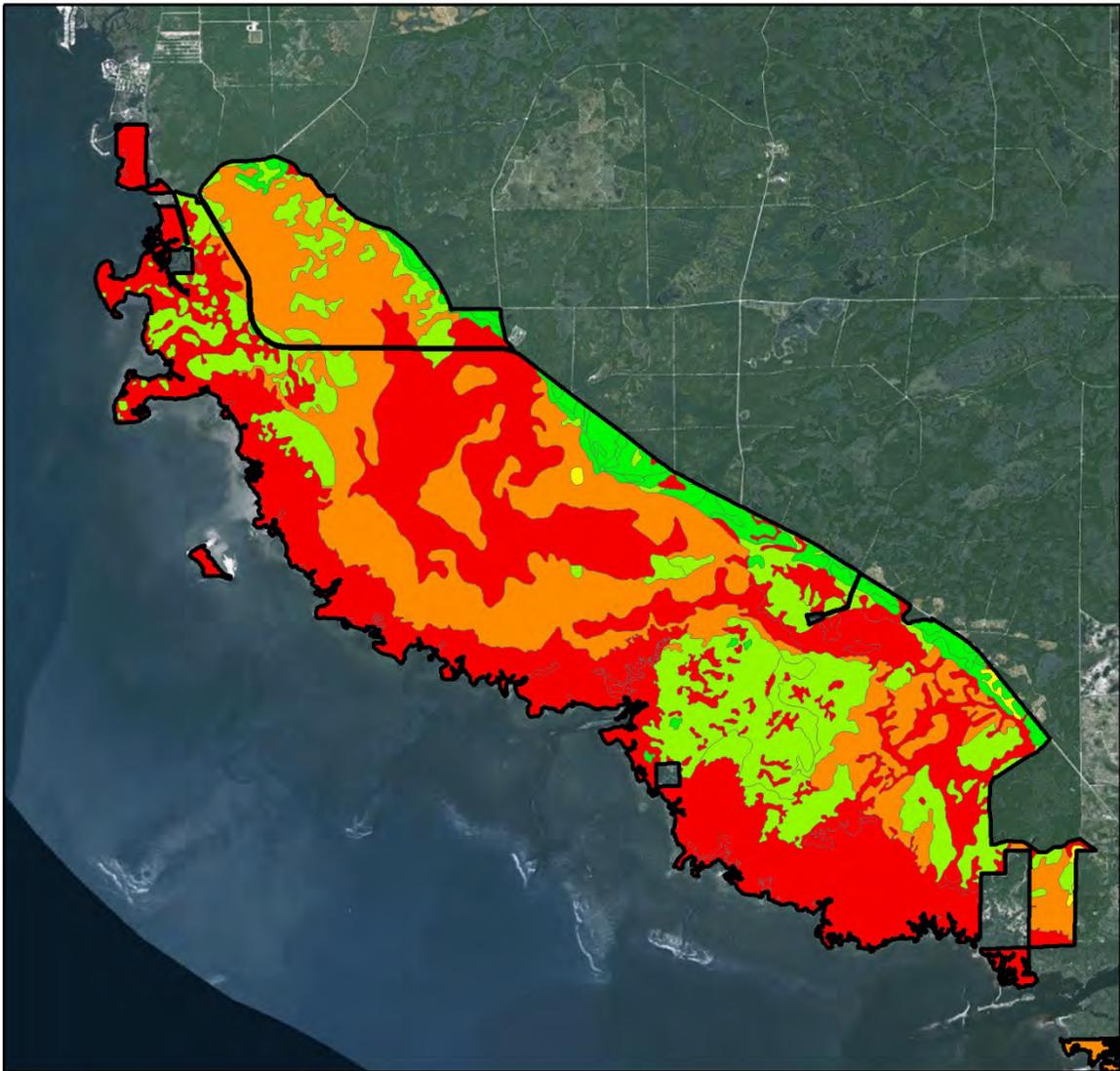


Figure 6d: Soil Depth to the Water Table at the Tide Swamp Unit of the BBWMA

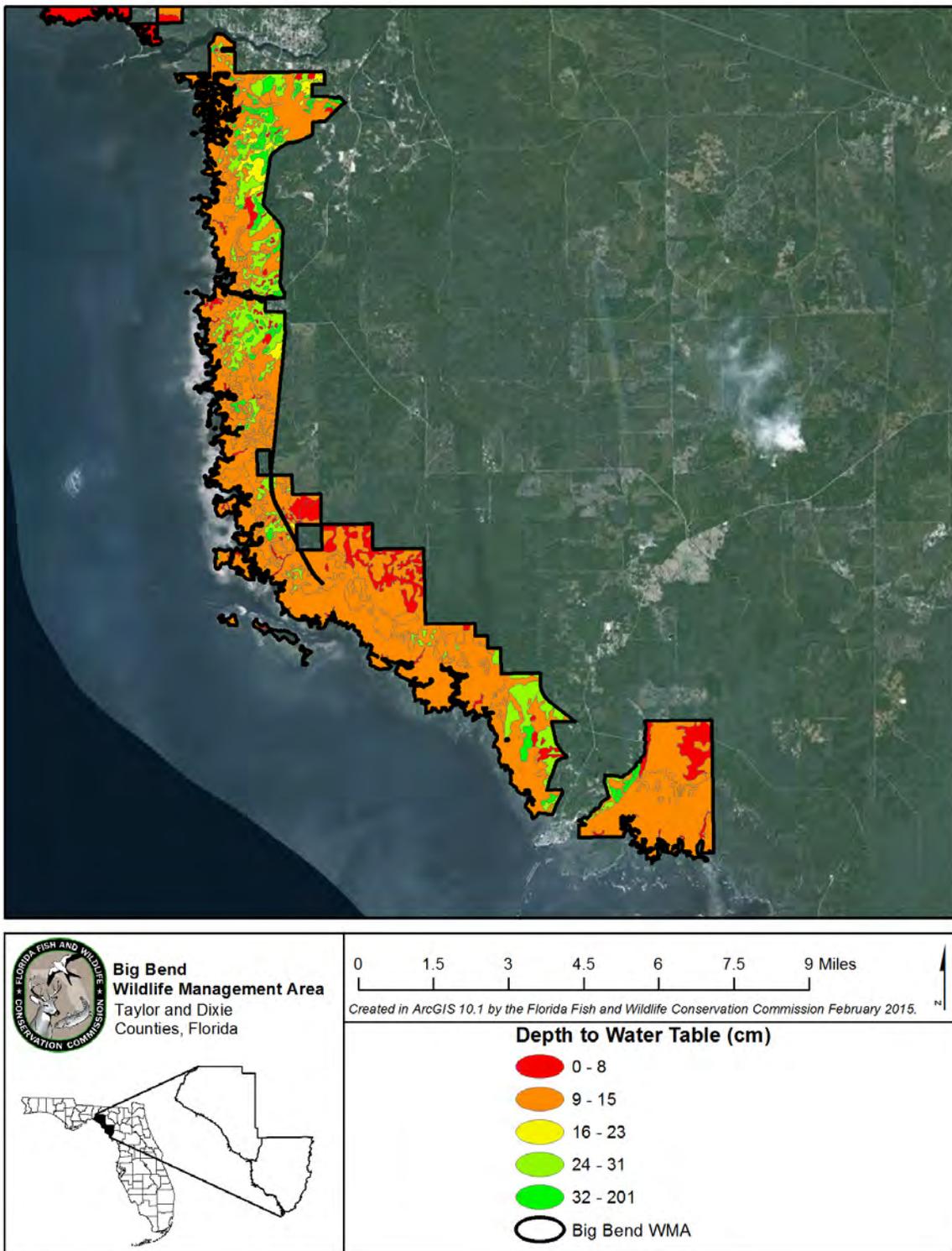


Figure 6e: Soil Depth to the Water Table at the Jena Unit of the BBWMA

2.2 Vegetation

The BBWMA is situated along Florida’s Nature Coast, an expansive stretch of mostly rural coastline with little development. The region is characterized by tidal marsh, hydric hammock, and mesic flatwoods. There are also large pine plantations in the region; the nearby town of Perry is known as the Forest Capital of Florida. There are numerous streams and rivers that flow through or adjacent to the area, including the Aucilla River, Econfina River, Fenholloway River, Spring Warrior Creek, Dallus Creek, Steinhatchee River, and Rocky Creek.

The FWC has completed historic and natural community mapping of BBWMA through the work of the Florida Natural Areas Inventory (FNAI). FNAI identified and mapped a total of 17 historic and current plant communities, eight rare plants and 12 exotic invasive plants within the BBWMA. Following are tables listing natural, rare and exotic invasive plant species known to occur on BBWMA. Descriptions of the plant communities located on BBWMA, listed in Table 6 and shown in Figures 7a through 7e, are provided immediately following the lists of plant species observed on the area presented in Tables 3, 4 and 5.

Table 3: Plant Species Observed at BBWMA

Common Name	Scientific Name
American basswood	<i>Tilia americana</i>
American beautyberry	<i>Callicarpa americana</i>
American elm	<i>Ulmus americana</i>
American holly	<i>Ilex opaca</i>
American hornbeam	<i>Carpinus caroliniana</i>
American plum	<i>Prunus americana</i>
American snowbell	<i>Styrax americanus</i>
American strawberrybush	<i>Euonymus americanus</i>
Angle pod	<i>Matelea gonocarpos</i>
Anise-scented goldenrod	<i>Solidago odora</i>
Apalachicola toadflax	<i>Linaria floridana</i>
Arrowfeather threeawn	<i>Aristida purpurascens</i>
Aster	<i>Aster sp.</i>
Atlantic pigeonwings	<i>Clitoria mariana</i>
Atlantic St. John's wort	<i>Hypericum reductum</i>
Axilflower	<i>Mecardonia acuminata</i>
Bahiagrass	<i>Paspalum notatum</i>
Bald cypress	<i>Taxodium distichum</i>
Baldwin's flatsedge	<i>Cyperus croceus</i>
Baldwin's spikerush	<i>Eleocharis baldwinii</i>
Bandana-of-the-Everglades	<i>Canna flaccida</i>
Beaked panicum	<i>Panicum anceps</i>

Table 3: Plant Species Observed at BBWMA

Common Name	Scientific Name
Beaksedge	<i>Rhynchospora sp.</i>
Bearded skeletongrass	<i>Gymnopogon ambiguus</i>
Beargrass	<i>Yucca filamentosa</i>
Bedstraw	<i>Galium aparine</i>
Bedstraw St. John's wort	<i>Hypericum galioides</i>
Big carpetgrass	<i>Axonopus furcatus</i>
Piedmont threeawn	<i>Aristida condensata</i>
Bigleaf sumpweed	<i>Iva frutescens</i>
Black berry	<i>Rubus sp.</i>
Blackgum	<i>Nyssa sylvatica</i>
Blackroot	<i>Pterocaulon pycnostachyum</i>
Blackseed needlegrass	<i>Piptochaetium avenaceum</i>
Blacksenna	<i>Seymeria cassioides</i>
Bladderwort	<i>Utricularia sp.</i>
Blazing star; gayfeather	<i>Liatris sp.</i>
Blue huckleberry	<i>Gaylussacia frondosa var. tomentosa</i>
Blue maidencane	<i>Amphicarpum muhlenbergianum</i>
Bluejack oak	<i>Quercus incana</i>
Bluestem	<i>Schizachyrium sp.</i>
Bluestem palm	<i>Sabal minor</i>
Bog white violet	<i>Viola lanceolata</i>
Bottlebrush threeawn	<i>Aristida spiciformis</i>
Boxelder	<i>Acer negundo</i>
Bracken fern	<i>Pteridium aquilinum</i>
Bristly greenbrier	<i>Smilax tamnoides</i>
Broadleaf cattail	<i>Typha latifolia</i>
Broomsedge bluestem	<i>Andropogon virginicus</i>
Broomsedge	<i>Andropogon sp.</i>
Bulltongue arrowhead	<i>Sagittaria lancifolia</i>
Bully	<i>Sideroxylon sp.</i>
Bulrush	<i>Scirpus sp.</i>
Bushy bluestem	<i>Andropogon glomeratus</i>
Bushy seaside oxeye	<i>Borrchia frutescens</i>
Butterweed	<i>Senecio glabellus</i>
Buttonbush	<i>Cephalanthus occidentalis</i>
Cabbage palm	<i>Sabal palmetto</i>
Camphorweed	<i>Heterotheca subaxillaris</i>
Canadian horseweed	<i>Conyza canadensis</i>
Canadian toadflax	<i>Linaria canadensis</i>
Cancerroot	<i>Conopholis americana</i>

Table 3: Plant Species Observed at BBWMA

Common Name	Scientific Name
Candyroot	<i>Polygala nana</i>
Capillary hairsedge	<i>Bulbostylis ciliatifolia</i>
Cardinal flower	<i>Lobelia cardinalis</i>
Caribbean purple everlasting	<i>Gamochaeta antillana</i>
Carolina ash	<i>Fraxinus caroliniana</i>
Carolina fimbry	<i>Fimbristylis caroliniana</i>
Carolina horsenettle	<i>Solanum carolinense</i>
Carolina indigo	<i>Indigofera caroliniana</i>
Carolina scalystem	<i>Elytraria caroliniensis</i>
Carolina sealavender	<i>Limonium carolinianum</i>
Carolina wild petunia	<i>Ruellia caroliniensis</i>
Carolina yelloweyed grass	<i>Xyris caroliniana</i>
Carpetsgrass	<i>Axonopus sp.</i>
Cat greenbrier	<i>Smilax glauca</i>
Catbriers	<i>Smilax sp.</i>
Centipedegrass	<i>Eremochloa ophiuroides</i>
Chaffhead	<i>Carphephorus sp.</i>
Chalky bluestem	<i>Andropogon virginicus var. glaucus</i>
Chapman's oak	<i>Quercus chapmannii</i>
Chapman's gayfeather	<i>Liatris chapmanii</i>
Chapman's goldenrod	<i>Solidago odora var. chapmanii</i>
Chickasaw plum	<i>Prunus angustifolia</i>
Christmasberry	<i>Lycium carolinianum</i>
Cinnamon fern	<i>Osmunda cinnamomea</i>
Climbing hemp vine	<i>Mikania scandens</i>
Climbing hydrangea	<i>Decumaria barbara</i>
Clustered bushmint	<i>Hyptis alata</i>
Clustered mille grains	<i>Oldenlandia uniflora</i>
Clustered sedge	<i>Carex glaucescens</i>
Clusterspike false indigo	<i>Amorpha herbacea</i>
Coastal sandbur	<i>Cenchrus spinifex</i>
Coastal sweetpepperbush	<i>Clethra alnifolia</i>
Coastalplain chaffhead	<i>Carphephorus corymbosus</i>
Coastalplain dawnflower	<i>Stylisma patens</i>
Coastalplain goldenaster	<i>Chrysopsis scabrella</i>
Coastalplain honeycomb head	<i>Balduina angustifolia</i>
Coastalplain milkwort	<i>Polygala setacea</i>
Coastalplain nailwort	<i>Paronychia herniarioides</i>
Coastalplain palafox	<i>Palafoxia integrifolia</i>
Coastalplain staggerbush	<i>Lyonia fruticosa</i>

Table 3: Plant Species Observed at BBWMA

Common Name	Scientific Name
Coastalplain willow	<i>Salix caroliniana</i>
Colicroot	<i>Aletris lutea</i>
Combleaf mermaidweed	<i>Proserpinaca pectinata</i>
Comfortroot	<i>Hibiscus aculeatus</i>
Common blue violet	<i>Viola sororia</i>
Common moonseed	<i>Menispermum canadense</i>
Common oat	<i>Avena fatua var. sativa</i>
Common ragweed	<i>Ambrosia artemisiifolia</i>
Common yellow stargrass	<i>Hypoxis curtissii</i>
Common yellow woodsorrel	<i>Oxalis corniculata</i>
Coontie	<i>Zamia pumila</i>
Copperleaf/threeseed mercury	<i>Acalypha sp.</i>
Coral greenbrier	<i>Smilax walteri</i>
Coralbean	<i>Erythrina herbacea</i>
Cottonweed	<i>Froelichia floridana</i>
Cottony goldenaster	<i>Chrysopsis gossypina</i>
Crabgrass	<i>Digitaria sp.</i>
Creeping primrosewillow	<i>Ludwigia repens</i>
Crimson clover	<i>Trifolium incarnatum</i>
Crossvine	<i>Bignonia capreolata</i>
Crowngrass	<i>Paspalum sp.</i>
Cutleaf eveningprimrose	<i>Oenothera laciniata</i>
Cypress witchgrass	<i>Dichanthelium ensifolium</i>
Dahoon	<i>Ilex cassine</i>
Darrow's blueberry	<i>Vaccinium darrowii</i>
Dawnflower	<i>Stylisma sp.</i>
Deerberry	<i>Vaccinium stamineum</i>
Devil's walking stick	<i>Aralia spinosa</i>
Dodder	<i>Cuscuta sp.</i>
Dog fennel	<i>Eupatorium capillifolium</i>
Dollar weed	<i>Hydrocotyle bonariensis</i>
Dollarleaf	<i>Rhynchosia reniformis</i>
Downy milkpea	<i>Galactia regularis</i>
Duckweed	<i>Lemna sp.</i>
Dwarf huckleberry	<i>Gaylussacia dumosa</i>
Dwarf live oak	<i>Quercus minima</i>
Dwarf pawpaw	<i>Asimina pygmaea</i>
Earleaf greenbrier	<i>Smilax auriculata</i>
Early blue violet	<i>Viola palmata</i>
Early whitetop fleabane	<i>Erigeron vernus</i>

Table 3: Plant Species Observed at BBWMA

Common Name	Scientific Name
Eastern bluestar	<i>Amsonia tabernaemontana</i>
Eastern gamagrass	<i>Tripsacum dactyloides</i>
Eastern milkpea	<i>Galactia volubilis</i>
Eastern poison ivy	<i>Toxicodendron radicans</i>
Eastern redbud	<i>Cercis canadensis</i>
Elliot's milk pea	<i>Galactia elliotii</i>
Elliot's blueberry	<i>Vaccinium elliotii</i>
Elliot's lovegrass	<i>Eragrostis elliotii</i>
Elliot's yelloweyed grass	<i>Xyris elliotii</i>
Erect pricklypear	<i>Opuntia stricta</i>
Eustis Lake beardtongue	<i>Penstemon australis</i>
Everlasting	<i>Gamochaeta sp.</i>
False foxglove	<i>Agalinis sp.</i>
False hop sedge	<i>Carex lupuliformis</i>
False indigobush	<i>Amorpha fruticosa</i>
Fascicled beaksedge	<i>Rhynchospora fascicularis</i>
Feay's palafox	<i>Palafoxia feayi</i>
Fern	<i>Thelypteris sp.</i>
Fewflower milkweed	<i>Asclepias lanceolata</i>
Flatsedge	<i>Cyperus retrorsus</i>
Flatsedge	<i>Cyperus sp.</i>
Flattop goldenrod	<i>Euthamia graminifolia</i>
Flatwoods plum	<i>Prunus umbellata</i>
Flatwoods St. John's wort	<i>Hypericum microsepalum</i>
Flax	<i>Linum sp.</i>
Florida butterfly orchid	<i>Encyclia tampensis</i>
Florida dropseed	<i>Sporobolus floridanus</i>
Florida hoarypea	<i>Tephrosia florida</i>
Florida panhandle spiderlily	<i>Hymenocallis choctawensis</i>
Florida rosemary	<i>Ceratiola ericoides</i>
Florida scrub frostweed	<i>Helianthemum nashii</i>
Florida tickseed	<i>Coreopsis floridana</i>
Florida ticktrefoil	<i>Desmodium floridanum</i>
Florida yam	<i>Dioscorea floridana</i>
Forked bluecurls	<i>Trichostema dichotomum</i>
Four petal St. John's wort	<i>Hypericum tetrapetalum</i>
Fourleaf vetch	<i>Vicia acutifolia</i>
Fox sedge	<i>Carex vulpinoidea</i>
Fragrant eryngo	<i>Eryngium aromaticum</i>
Fragrant water lily	<i>Nuphar lutea</i>

Table 3: Plant Species Observed at BBWMA

Common Name	Scientific Name
Fringed bluestar	<i>Amsonia ciliata</i>
Fringed nutrush	<i>Scleria ciliata</i>
Gallberry	<i>Ilex glabra</i>
Giant cutgrass	<i>Zizaniopsis miliacea</i>
Giant ironweed	<i>Vernonia gigantea</i>
Giant sedge	<i>Carex gigantea</i>
Glasswort	<i>Salicornia bigelovii</i>
Goldenaster	<i>Chrysopsis sp.</i>
Goldenrod	<i>Solidago sp.</i>
Gopher apple	<i>Licania michauxii</i>
Grape	<i>Vitis sp.</i>
Grassleaf lettuce	<i>Lactuca graminifolia</i>
Grassleaf roseling	<i>Callisia graminea</i>
Grassleaf rush	<i>Juncus marginatus</i>
Grasslike fimbry	<i>Fimbristylis miliacea</i>
Green ash	<i>Fraxinus pennsylvanica</i>
Green hawthorn	<i>Crataegus viridis</i>
Groundsel tree	<i>Baccharis halimifolia</i>
Gulf cordgrass	<i>Spartina spartinae</i>
Gulf Sebastian bush	<i>Sebastiania fruticosa</i>
Gum bully	<i>Sideroxylon lanuginosum</i>
Hairawn muhly	<i>Muhlenbergia capillaris</i>
Hairsedge	<i>Bulbostylis sp.</i>
Hairy bedstraw	<i>Galium pilosum</i>
Hairy dawnflower	<i>Stylisma villosa</i>
Hairy laurel	<i>Kalmia hirsuta</i>
Hairy lespedeza	<i>Lespedeza hirta</i>
Hairy pinweed	<i>Lechea mucronata</i>
Hawthorn	<i>Crataegus sp.</i>
Hedge false bindweed	<i>Calystegia sepium ssp. limnophila</i>
Hemlock witchgrass	<i>Dichanthelium portoricense</i>
Herb-of-grace	<i>Bacopa monnieri</i>
Highbush blueberry	<i>Vaccinium corymbosum</i>
Hoarypea	<i>Tephrosia sp.</i>
Horsenettle	<i>Solanum sp.</i>
Indian woodoats	<i>Chasmanthium latifolium</i>
Indianhemp	<i>Apocynum cannabinum</i>
Joint tail grass	<i>Coelorachis sp.</i>
Kidneyleaf rosinweed	<i>Silphium compositum</i>
Ladiestresses	<i>Spiranthes sp.</i>

Table 3: Plant Species Observed at BBWMA

Common Name	Scientific Name
Lance-leaf greenbriar	<i>Smilax smallii</i>
Largefruit beaksedge	<i>Rhynchospora megalocarpa</i>
Laurel cat-brier	<i>Smilax laurifolia</i>
Laurel oak	<i>Quercus hemisphaerica</i>
Leathery rush	<i>Juncus coriaceus</i>
Leggett's pinweed	<i>Lechea pulchella</i> var. <i>ramosissima</i>
Lespedeza	<i>Lespedeza</i> sp.
Licoriceweed	<i>Scoparia dulcis</i>
Little bluestem	<i>Schizachyrium scoparium</i>
Little floatingheart	<i>Nymphoides cordata</i>
Live oak	<i>Quercus virginiana</i>
Lizard's tail	<i>Saururus cernuus</i>
Loblolly pine	<i>Pinus taeda</i>
Longleaf pine	<i>Pinus palustris</i>
Longleaf threeawn	<i>Aristida palustris</i>
Longleaf woodoats	<i>Chasmanthium laxum</i> var.
Love grass	<i>Eragrostis</i> sp.
Lupine	<i>Lupinus</i> sp.
Lyreleaf sage	<i>Salvia lyrata</i>
Maidencane	<i>Panicum hemitomon</i>
Manyflower beardtongue	<i>Penstemon multiflorus</i>
Manyflower marshpennywort	<i>Hydrocotyle umbellata</i>
Manyspike flatsedge	<i>Cyperus polystachyos</i>
Marsh fern	<i>Thelypteris palustris</i> var. <i>pubescens</i>
Marsh fimbry	<i>Fimbristylis spadicea</i>
Marsh mermaidweed	<i>Proserpinaca palustris</i>
Marsh pennywort	<i>Hydrocotyle</i> sp.
May haw	<i>Crataegus aestivalis</i>
Meadowbeauty	<i>Rhexia</i> sp.
Mexican tea	<i>Chenopodium ambrosioides</i>
Michaux's hawthorne	<i>Crataegus michauxii</i>
Milkpea	<i>Galactia</i> sp.
Milkweed	<i>Asclepias</i> sp.
Mille grains	<i>Oldenlandia</i> sp.
Millet's beaksedge	<i>Rhynchospora miliacea</i>
Mohr's thoroughwort	<i>Eupatorium mohrii</i>
Morning glory	<i>Ipomoea</i> sp.
Muscadine	<i>Vitis rotundifolia</i>
Myrtle dahoon	<i>Ilex cassine</i> var. <i>myrtifolia</i>
Myrtle oak	<i>Quercus myrtifolia</i>

Table 3: Plant Species Observed at BBWMA

Common Name	Scientific Name
Myrtleleaf St. John's wort	<i>Hypericum myrtifolium</i>
Nailwort	<i>Paronychia sp.</i>
Narrow plumegrass	<i>Saccharum baldwinii</i>
Narrowleaf blue-eyed grass	<i>Sisyrinchium angustifolium</i>
Narrowleaf purple everlasting	<i>Gamochaeta falcata</i>
Narrowleaf silkgrass	<i>Pityopsis graminifolia</i>
Narrowleaf sunflower	<i>Helianthus angustifolius</i>
Needle rush	<i>Juncus roemerianus</i>
Needleleaf witchgrass	<i>Dichantheium aciculare</i>
Netted nutrush	<i>Scleria reticularis</i>
Nettleleaf noseburn	<i>Tragia urticifolia</i>
Nutrush	<i>Scleria sp.</i>
Oak	<i>Quercus sp.</i>
Oak mistletoe	<i>Phoradendron leucarpum</i>
Oblongleaf twinflower	<i>Dyschoriste oblongifolia</i>
Old-man's beard	<i>Chionanthus virginicus</i>
Orange milkwort	<i>Polygala lutea</i>
Pale meadowbeauty	<i>Rhexia mariana</i>
Palegreen orchid	<i>Platanthera flava</i>
Panicgrass	<i>Panicum sp.</i>
Paper nailwort	<i>Paronychia chartacea</i>
Parsley hawthorn	<i>Crataegus marshallii</i>
Partridge pea	<i>Chamaecrista fasciculata</i>
Partridgeberry	<i>Mitchella repens</i>
Pawpaw	<i>Asimina sp.</i>
Peppervine	<i>Ampelopsis arborea</i>
Perennial glasswort	<i>Sarcocorina perennis</i>
Perfumed spiderlily	<i>Hymenocallis latifolia</i>
Persimmon	<i>Diospyros virginiana</i>
Pickerelweed	<i>Pontederia cordata</i>
Piedmont blacksenna	<i>Seymeria pectinata</i>
Piedmont pinweed	<i>Lechea torreyi</i>
Piedmont roseling	<i>Callisia rosea</i>
Piedmont staggerbush	<i>Lyonia mariana</i>
Pignut hickory	<i>Carya glabra</i>
Pinebarren flatsedge	<i>Cyperus ovatus</i>
Pinebarren frostweed	<i>Helianthemum corymbosum</i>
Pinebarren goldenrod	<i>Solidago fistulosa</i>
Pineland daisy	<i>Chaptalia tomentosa</i>
Pineland pimpernel	<i>Samolus valerandi parviflorus</i>

Table 3: Plant Species Observed at BBWMA

Common Name	Scientific Name
Pineland pinweed	<i>Lechea sessiliflora</i>
Pineland rayless goldenrod	<i>Bigelovia nudata</i>
Pineland scalypink	<i>Stipulicida setacea</i>
Pineland water-willow	<i>Justicia angusta</i>
Pineland wild indigo	<i>Baptisia lecontei</i>
Pinewoods dainties	<i>Phyllanthus liebmannianus</i> ssp.
Pinewoods fingergrass	<i>Eustachys petraea</i>
Pineywoods dropseed	<i>Sporobolus junceus</i>
Pinkscale gayfeather	<i>Liatris elegans</i>
Plantain	<i>Plantago</i> sp.
Plumed beaksedge	<i>Rhynchospora plumosa</i>
Plumegrass	<i>Saccharum</i> spp.
Pond cypress	<i>Taxodium ascendens</i>
Poor joe	<i>Diodia teres</i>
Possumhaw	<i>Ilex decidua</i>
Post oak	<i>Quercus stellata</i>
Prairie iris	<i>Iris hexagona</i>
Pricklypear	<i>Opuntia humifusa</i>
Primrosewillow	<i>Ludwigia</i> sp.
Procession flower	<i>Polygala incarnata</i>
Purple bluestem	<i>Andropogon glomeratus</i> var. <i>glaucopsis</i>
Purple passion-flower	<i>Passiflora incarnata</i>
Purple sandgrass	<i>Triplasis purpurea</i>
Queen's delight	<i>Stillingia sylvatica</i>
Queen-devil	<i>Hieracium gronovii</i>
Rabbitbells	<i>Crotalaria rotundifolia</i>
Rainlily	<i>Zephyranthes atamasca</i>
Rattan vine	<i>Berchemia scandens</i>
Rattlesnake master	<i>Eryngium aquaticum</i>
Red bay	<i>Persea borbonia</i>
Red buckeye	<i>Aesculus pavia</i>
Red cedar	<i>Juniperus virginiana</i>
Red chokeberry	<i>Photinia pyrifolia</i>
Red maple	<i>Acer rubrum</i>
Red mulberry	<i>Morus rubra</i>
Redroot	<i>Lachnanthes caroliniana</i>
Redtop panicum	<i>Panicum rigidulum</i>
Resurrection fern	<i>Pleopeltis polypodioides</i>
Rice button aster	<i>Symphotrichum dumosum</i>
Rose-rush	<i>Lygodesmia aphylla</i>

Table 3: Plant Species Observed at BBWMA

Common Name	Scientific Name
Rosy camphorweed	<i>Pluchea rosea</i>
Rough hedgehyssop	<i>Gratiola hispida</i>
Roughhair witchgrass	<i>Dichanthelium strigosum</i>
Roundhead lespedeza	<i>Lespedeza capitata</i>
Roundleaf bluet	<i>Houstonia procumbens</i>
Roundleaf thoroughwort	<i>Eupatorium rotundifolium</i>
Roundpod St. John's wort	<i>Hypericum cistifolium</i>
Royal fern	<i>Osmunda regalis</i>
Royal snoutbean	<i>Rhynchosia cytisoides</i>
Running oak	<i>Quercus pumila</i>
Rush	<i>Juncus sp.</i>
Rushfoil	<i>Croton michauxii</i>
Rustweed	<i>Polypremum procumbens</i>
Rusty staggerbush	<i>Lyonia ferruginea</i>
Saltgrass	<i>Distichlis spicata</i>
Saltmarsh cordgrass	<i>Spartina alterniflora</i>
Saltmarsh fingergrass	<i>Eustachys glauca</i>
Saltmeadow cordgrass	<i>Spartina patens</i>
Saltwater falsewillow	<i>Baccharis angustifolia</i>
Saltwort	<i>Batis maritima</i>
Sand blackberry	<i>Rubus cuneifolius</i>
Sand cordgrass	<i>Spartina bakeri</i>
Sand holly	<i>Ilex ambigua</i>
Sand live oak	<i>Quercus geminata</i>
Sand pine	<i>Pinus clausa</i>
Sand post oak	<i>Quercus margaretta</i>
Sandbur	<i>Cenchrus sp.</i>
Sandyfield hairsedge	<i>Bulbostylis stenophylla</i>
Sarsaparilla vine	<i>Smilax pumila</i>
Sassafras	<i>Sassafras albidum</i>
Saw greenbrier	<i>Smilax bona-nox</i>
Saw palmetto	<i>Serenoa repens</i>
Sawgrass	<i>Cladium jamaicense</i>
Sawtooth blackberry	<i>Rubus pensilvanicus</i>
Scarlet rosemallow	<i>Hibiscus coccineus</i>
Scratch daisy	<i>Croptilon divaricatum</i>
Scrub balm	<i>Dicerandra frutescens</i>
Scurf hoarypea	<i>Tephrosia chrysophylla</i>
Seaside primrosewillow	<i>Ludwigia maritima</i>
Sedge	<i>Carex sp.</i>

Table 3: Plant Species Observed at BBWMA

Common Name	Scientific Name
Sensitive briar	<i>Mimosa quadrivalvis</i>
Sensitive pea	<i>Chamaecrista nictitans</i>
Sensitive pea	<i>Chamaecrista sp.</i>
Shiny blueberry	<i>Vaccinium myrsinites</i>
Shiny fetterbush	<i>Lyonia lucida</i>
Shiny woodoats	<i>Chasmanthium nitidum</i>
Shoreline seapurslane	<i>Sesuvium portulacastrum</i>
Shortbristle horned beaksedge	<i>Rhynchospora corniculata</i>
Shortleaf gayfeather	<i>Liatris tenuifolia</i>
Shortleafed yelloweyed grass	<i>Xyris brevifolia</i>
Shortspike bluestem	<i>Andropogon brachystachyus</i>
Shumard's oak	<i>Quercus shumardii</i>
Sidebeak pencilflower	<i>Stylosanthes biflora</i>
Silver croton	<i>Croton argyranthemus</i>
Slash pine	<i>Pinus elliotii</i>
Slender crabgrass	<i>Digitaria filiformis</i>
Slender fimbry	<i>Fimbristylis autumnalis</i>
Slender gayfeather	<i>Liatris gracilis</i>
Slender goldenrod	<i>Euthamia caroliniana</i>
Slender threeseed mercury	<i>Acalypha gracilens</i>
Slender woodoats	<i>Chasmanthium laxum</i>
Slimleaf pawpaw	<i>Asimina angustifolia</i>
Slippery elm	<i>Ulmus rubra</i>
Small butterwort	<i>Pinguicula pumila</i>
Smallfruit beggarticks	<i>Bidens mitis</i>
Small-leaf viburnum	<i>Viburnum obovatum</i>
Smartweed	<i>Polygonum sp.</i>
Snow squarestem	<i>Melanthera nivea</i>
Soft rush	<i>Juncus effusus</i>
Southeastern sneezeweed	<i>Helenium pinnatifidum</i>
Southern arrowwood	<i>Viburnum dentatum</i>
Southern beeblossom	<i>Gaura angustifolia</i>
Southern catalpa	<i>Catalpa bignonioides</i>
Southern colic-root	<i>Aletris obovata</i>
Southern crabapple	<i>Malus angustifolia</i>
Southern crabgrass	<i>Digitaria ciliaris</i>
Southern dewberry	<i>Rubus trivialis</i>
Southern magnolia	<i>Magnolia grandiflora</i>
Southern needleleaf	<i>Tillandsia setacea</i>
Southern shield fern	<i>Thelypteris kunthii</i>

Table 3: Plant Species Observed at BBWMA

Common Name	Scientific Name
Southern umbrellasedge	<i>Fuirena scirpoidea</i>
Spadeleaf	<i>Centella asiatica</i>
Spanish bayonet	<i>Yucca aloifolia</i>
Spanish moss	<i>Tillandsia usneoides</i>
Sparkleberry	<i>Vaccinium arboreum</i>
Spiked hoarypea	<i>Tephrosia spicata</i>
Spikerush	<i>Eleocharis sp.</i>
Spiny sowthistle	<i>Sonchus asper</i>
Splitbeard bluestem	<i>Andropogon ternarius</i>
Spurred butterfly pea	<i>Centrosema virginianum</i>
St. Andrew's cross	<i>Hypericum hypericoides</i>
St. Augustine grass	<i>Stenotaphrum secundatum</i>
St. John's wort	<i>Hypericum sp.</i>
Starrush whitetop	<i>Rhynchospora colorata</i>
Sticky jointvetch	<i>Aeschynomene viscidula</i>
String lily	<i>Crinum americanum</i>
Sugarberry	<i>Celtis laevigata</i>
Sugarcane plumegrass	<i>Saccharum giganteum</i>
Summer farewell	<i>Dalea pinnata</i>
Summer grape	<i>Vitis aestivalis</i>
Swamp bay	<i>Persea palustris</i>
Swamp chestnut oak	<i>Quercus michauxii</i>
Swamp dock	<i>Rumex verticillatus</i>
Swamp dogwood	<i>Cornus foemina</i>
Swamp laurel oak	<i>Quercus laurifolia</i>
Swamp milkweed	<i>Asclepias perennis</i>
Swamp rose	<i>Rosa palustris</i>
Swamp rosemallow	<i>Hibiscus grandiflorus</i>
Swamp smartweed	<i>Polygonum hydropiperoides</i>
Swamp tupelo	<i>Nyssa sylvatica var. biflora</i>
Swamp twinflower	<i>Dyschoriste humistrata</i>
Sweet bay	<i>Magnolia virginiana</i>
Sweet gum	<i>Liquidambar styraciflua</i>
Switchcane	<i>Arundinaria gigantea</i>
Switchgrass	<i>Panicum virgatum</i>
Sword fern	<i>Nephrolepis exaltata</i>
Tall elephant's foot	<i>Elephantopus elatus</i>
Tall gallberry	<i>Ilex coriacea</i>
Tall ironweed	<i>Vernonia angustifolia</i>
Tall jointweed	<i>Polygonella gracilis</i>

Table 3: Plant Species Observed at BBWMA

Common Name	Scientific Name
Tall yelloweyed grass	<i>Xyris platylepis</i>
Tarflower	<i>Bejaria racemosa</i>
Thin paspalum	<i>Paspalum setaceum</i>
Thoroughwort	<i>Eupatorium sp.</i>
Threeawn grass	<i>Aristida sp.</i>
Threesquare bulrush	<i>Schoenoplectus pungens</i>
Thymeleaf pinweed	<i>Lechea minor</i>
Ticktrefoil	<i>Desmodium sp.</i>
Titi; swamp cyrilla	<i>Cyrilla racemiflora</i>
Toothpetal false reinorchid	<i>Habenaria floribunda</i>
Tread-softly	<i>Cnidocolus stimulosus</i>
Trumpet creeper	<i>Campsis radicans</i>
Turkey oak	<i>Quercus laevis</i>
Turkey tangle fogfruit	<i>Phyla nodiflora</i>
Twinning snoutbean	<i>Rhynchosia tomentosa</i>
Twoflower melicgrass	<i>Melica mutica</i>
Twoleaf watermilfoil	<i>Myriophyllum heterophyllum</i>
Vanilla leaf	<i>Carphephorus odoratissimus</i>
Vente conmigo	<i>Croton glandulosus</i>
Virginia buttonweed	<i>Diodia virginiana</i>
Virginia chain fern	<i>Woodwardia virginica</i>
Virginia creeper	<i>Parthenocissus quinquefolia</i>
Virginia dwarfdandelion	<i>Krigia virginica</i>
Virginia saltmarsh mallow	<i>Kosteletzkya virginica</i>
Virginia snakeroot	<i>Aristolochia serpentaria</i>
Virginia willow	<i>Itea virginica</i>
Walter's groundcherry	<i>Physalis walteri</i>
Wand goldenrod	<i>Solidago stricta</i>
Ware's hairsedge	<i>Bulbostylis warei</i>
Water cowbane	<i>Oxypolis filiformis</i>
Water hickory	<i>Carya aquatica</i>
Water lily	<i>Nymphaea odorata</i>
Water locust	<i>Gleditsia aquatica</i>
Water oak	<i>Quercus nigra</i>
Watermeal	<i>Wolffia sp.</i>
Waterwillow	<i>Justicia sp.</i>
Wavyleaf noseburn	<i>Tragia urens</i>
Wax myrtle	<i>Myrica cerifera</i>
Whip nutrush	<i>Scleria triglomerata</i>
White thoroughwort	<i>Eupatorium album</i>

Table 3: Plant Species Observed at BBWMA

Common Name	Scientific Name
Whitehead bogbutton	<i>Lachnocaulon anceps</i>
Whitemouth dayflower	<i>Commelina erecta</i>
Whitetop aster	<i>Sericocarpus tortifolius</i>
Wild olive	<i>Osmanthus americanus</i>
Winged elm	<i>Ulmus alata</i>
Winged sumac	<i>Rhus copallinum</i>
Wiregrass	<i>Aristida stricta</i> var. <i>beyrichiana</i>
Wiry flatsedge	<i>Cyperus filiculmis</i>
Witch grass	<i>Dichantheium</i> sp.
Wood sage	<i>Teucrium canadense</i>
Woodoats	<i>Chasmanthium</i> spp.
Woodsgrass	<i>Oplismenus hirtellus</i>
Yankeeweed	<i>Eupatorium compositifolium</i>
Yaupon	<i>Ilex vomitoria</i>
Yellow bristlegrass	<i>Setaria parviflora</i>
Yellow jessamine	<i>Gelsemium sempervirens</i>
Yelloweyed grass	<i>Xyris</i> sp.
Yellowseed false pimpernel	<i>Lindernia dubia</i>

Table 4: Rare Plant Species Observed at BBWMA

Common Name	Scientific Name
Beaked spikerush	<i>Eleocharis rostellata</i>
Chapman's sedge	<i>Carex chapmannii</i>
Corkwood	<i>Leitneria floridana</i>
Palegreen orchid	<i>Platanthera flava</i>
Pinewood dainties	<i>Phyllanthus liebmannianus</i> spp
Pondspice	<i>Litsea aestivalis</i>
Sandhill spiny pod	<i>Matelea pubiflora</i>
Southern crabapple	<i>Malus angustifolia</i>

Table 5: Exotic Invasive Plant Species Observed at BBWMA

Common Name	Scientific Name
Chinese brake fern	<i>Pteris vittata</i>
Chinese privet	<i>Ligustrum sinense</i>
Chinese tallowtree	<i>Triadica sebifera</i>

Table 5: Exotic Invasive Plant Species Observed at BBWMA

Common Name	Scientific Name
Cogongrass	<i>Imperata cylindrica</i>
Common wheat	<i>Triticum aestivum</i>
Japanese climbing fern	<i>Lygodium japonicum</i>
Japanese honeysuckle	<i>Lonicera japonica</i>
Mimosa	<i>Albizia julibrissin</i>
Old World climbing fern	<i>Lygodium microphyllum</i>
Purple sesban	<i>Sesbania punicea</i>
Torpedograss	<i>Panicum repens</i>

Table 6: FNAI Mapped Natural Communities on the BBWMA

Community Type	Acres	Percentage
Basin marsh	519	0.8%
Basin swamp	1,085	1.7%
Baygall	26	0.1%
Depression marsh	777	1.2%
Dome swamp	129	0.2%
Floodplain swamp	186	0.3%
Hydric hammock	44,554	67.3%
Maritime hammock	103	0.2%
Mesic flatwoods	6,245	9.4%
Mesic hammock	756	1.1%
Pine plantation	5,258	8.0%
Ruderal	951	1.5%
Sandhill	118	0.2%
Scrub	180	0.3%
Scrubby flatwoods	934	1.4%
Tidal creek	173	0.3%
Tidal marsh	2,495	3.8%
Unconsolidated substrate	13	0.1%
Wet flatwoods	972	1.5%
Xeric hammock	132	0.2%

2.2.1 FNAI Natural Community Descriptions

2.2.1.1 Basin Marsh

Basin marsh is a wetland herbaceous community occupying large, irregularly shaped depressions within mesic flatwoods, wet flatwoods or hydric hammocks. Basin marshes are regularly inundated freshwater herbaceous wetlands that may occur in a variety of

situations, but in contrast to depression marshes, are not small or shallow inclusions within a fire-maintained natural community. Plant species composition is heterogeneous, both within and between marshes, but can generally be divided into submersed, floating-leaved, emergent, and grassy zones from deepest to shallowest portions; shrub patches may be present within any of these zones.

On BBWMA, saw grass and needle rush are the dominant species in this community. Often these marshes are fringed with sand cordgrass and, closer to the coast, saltmeadow cordgrass. The outer edges may have a sparse to dense cover of shrubs such as coastal plain willow, buttonbush, and wax myrtle. Most basin marshes have open water in the deepest portions. The FNAI-tracked plant species Florida corkwood is occasionally found in the marsh edges.

2.2.1.2 Basin Swamps

Basin swamp is a forested wetland community that occurs in large, irregularly-shaped depressions within hydric hammocks, mesic flatwoods, and wet flatwoods, vegetated with hydrophytic trees and shrubs that can withstand an extended hydroperiod. Basin swamps are highly variable in size, shape, and species composition. Mixed-species tree canopies are common, often including both evergreen and deciduous tree species. This natural community typically occurs in any type of large landscape depression such as old lake beds, river basins, and ancient coastal swales and lagoons that existed during higher sea levels.

On BBWMA, these are distinguished by a deciduous canopy of pond cypress, bald cypress, black gum, and red maple. Evergreen trees are less abundant, and include slash pine, swamp laurel oak, sweet bay and dahoon. Cypress knees and hummocks are common, with open water or mucky soils over much of the ground. Shrubs include Virginia willow, wax myrtle, and shiny fetterbush. Herbs are sparse, and typically include saw grass, lizard's tail, and horned beaksedge.

2.2.1.3 Baygall

Baygalls are characterized as dense stands of evergreen trees and shrubs in depressions or seepage areas where groundwater is at or near the surface for long periods of time. Although most baygalls are small in acreage, some form large, mature forests. Soils are generally composed of peat, with seepage from uplands, rainfall, and capillary action from adjacent wetlands maintaining a saturated substrate. Baygall typically develops at the bases of slopes, edges of floodplains, in depressions, and in stagnant drainages. Generally influenced by flowing water, baygall is often drained by small blackwater streams.

On BBWMA, baygalls are noted in only a few transitional areas between hydric hammocks and uplands, where some seepage is likely. Dominant canopy trees are sweet bay and red bay. Slash pine may be emergent in the canopy, and in one location, live oaks occur on hummocks in the baygall. Both tall and short shrubs are dense and include tall gallberry,

shiny fetterbush, wax myrtle and cabbage palm. Baygall vegetation is sometimes noted as an inclusion vegetation type in the hydric hammock.

2.2.1.4 Depression Marsh

Depression marsh is a wetland herbaceous community similar to basin marsh, but occupying smaller, typically circular or elliptic depressions in mesic flatwoods, wet flatwoods, and hydric hammocks found in low flatlands, forming the characteristic pockmarked landscape seen on aerial photographs of the flat landscapes of the Florida peninsula. Depression marsh is usually characterized as a shallow, rounded depression in sand substrate with herbaceous vegetation and shrubs, often in concentric bands. These marshes also frequently form an outer rim around swamp communities such as dome swamps. They form when the overlying sands slump into depressions dissolved in underlying limestone. Depression marshes often burn with the surrounding landscape, and are seasonally inundated. Depression marshes typically occur in landscapes occupied by fire-maintained natural communities such as mesic flatwoods, dry prairie, or sandhill.

On BBWMA, they are dominated by saw grass and needle rush, often with a fringe of sand cordgrass or saltmeadow cordgrass. Maidencane, pickerel weed, and fragrant water lily may occur in deeper portions of some depression marshes. Coastal plain willow, wax myrtle or buttonbush often form a dense band on the edges of the depressions, and can invade the depression centers if fire is excluded. In some areas, particularly in the Jena Unit, some depression marshes appear quite deep and are mostly open water with an herbaceous marshy fringe. The FNAI-tracked plant species Florida corkwood is occasionally found in the marsh edges.

2.2.1.5 Dome Swamp

Dome swamps are isolated, forested wetlands dominated by pond cypress and swamp tupelo, found in depressions within a mesic flatwoods, wet flatwoods or sandhill community. These swamps are generally small, but may also be large and shallow. The characteristic dome shape is created by smaller trees that grow in the shallower waters of the outer edge, while taller trees grow in the deeper water in the interior of the swamp. Dome swamps are most often found on flat terraces, where they develop when the overlying sand has slumped into a depression in the underlying limestone, creating a rounded depression connected to a shallow water table. In uplands with clay soils, dome swamps may occupy depressions over a perched water table. Soils in dome swamps are variable, but are most often composed of a layer of peat, which may be thin or absent at the periphery, becoming thicker toward the center of the dome. Red maple, sweetbay, swamp laurel oak and sweet gum are often present. Shrubs may be sparse or dense, and often occur on hummocks with mucky soil or open water between them. Shiny fetterbush, wax myrtle, buttonbush, Virginia willow, costal plain willow and dahoon are common in the tall and short shrub layers. Herbs are typically sparse and are typically saw grass, lizard-tail, Virginia chain fern and beaksedges.

2.2.1.6 Floodplain Swamp

Floodplain swamps are primarily deciduous wetland forests occurring along streams and rivers. Floodplain swamps occur on frequently flooded terraces of river floodplains. These multi-layered forests harbor many hardwood trees and shrub species, and are variable in respect to canopy and shrub dominants. Very subtle changes in micro-topography affect flooding duration, and subsequent seedling germination and survival. Floodplain swamp is located within floodplains of any permanently moving stream or river. It ranges from narrow strips of cypress along primary and secondary streams to expansive stands along large rivers to tidally influenced freshwater swamps near river mouths. Often, floodplain swamps immediately border the stream or river channel. In many cases, however, floodplain swamps are isolated from the main channel by riverbank levees and restricted to oxbows, overflow channels, old stream beds, and expansive flats commonly called backswamps. Soils are variable mixtures of alluvial and organic materials, sometimes with layers of sand in the subsoil. Inundation is seasonal and usually prolonged, restricting the growth of most shrubs and herbs and leaving most of the ground surface open or thinly mantled with leaf litter.

On BBWMA, this natural community is similar to low hydric hammock, but was identified as floodplain swamp where larger, obvious creek channels and floodplains were discernible in the field and on infrared aerial photography. Typical canopy and subcanopy trees include bald cypress, black gum, and red maple. Less common trees include cabbage palm, and American elm. The sparse shrub layer is characterized by Virginia willow, dahoon, and wax myrtle. Herbs are generally sparse.

2.2.1.7 Hydric Hammock

Densely forested wetlands known as hydric hammocks have a well-developed canopy and subcanopy of a mix of evergreen and deciduous trees, most often dominated by oaks and cabbage palms. Hydric hammock is an evergreen hardwood and/or palm forest with a variable understory typically dominated by palms and ferns occurring on moist soils, often with limestone very near the surface. While species composition varies, the community generally has a closed canopy of oaks and palms, an open understory, and a sparse to a moderate groundcover of grasses and ferns. Hydric hammock occurs on low, flat, wet sites where limestone may be near the surface, and soil moisture is kept high mainly by rainfall accumulation on poorly drained soils. Periodic flooding from rivers, seepage, and spring discharge may also contribute to hydric conditions.

BBWMA contains expansive areas of hydric hammocks that are part of a larger area known as the Gulf Coastal Hammocks. These hammocks occur in coastal lowlands where thin deposits of sand, peat, or muck overlie Tertiary limestone at or near the surface. An uneven karst terrain develops as limestone is dissolved by the water table, which is near the surface. There are three variants of hydric hammock at BBWMA, depending on distance from the coast and upon variation in hydroperiod in the uneven karst terrain: the

typical hydric hammock of seasonally inundated sites, a low variant that occurs in the wettest areas within the typical hammock, and a coastal variant influenced by maritime conditions near the Gulf of Mexico. Although these variants are noted separately here, in the field the shift from one variant to the other is often gradual, and they are all mapped under the hydric hammock classification.



The typical and low variants occur in a complex mosaic over large, low areas of the BBWMA; toward the coast, the vegetation grades gradually into the coastal variant. The typical hammock canopy includes swamp laurel oak, sweet gum, loblolly pine, red maple, black gum, American elm, sweetbay, and, occasionally, cypress. In some locations, the canopy is dominated by

loblolly pines, indicating past disturbances such as timber harvesting, and subsequent seeding, either by nearby adult trees or by silvicultural broadcasting or planting. Common subcanopy trees are younger canopy species, as well as cabbage palm, red bay, basswood, and water locust. The most common shrubs are wax myrtle and yaupon. Less common but characteristic shrubs are Virginia willow, blue palmetto, swamp dogwood and persimmon. Herb cover is variable, typically sparse, and includes saw grass, woodoats, millet beaksedge, lizard's tail, and string lily. Southern shield fern or Virginia chain fern can be abundant. Common vines are saw greenbrier, bristly greenbrier, muscadine, and poison ivy.

The low hydric hammock variant is found in depressions in the uneven karst terrain and on low terrain along intermittent creeks and drains that braid through the hydric hammock complex. The soils have a deeper organic layer and longer hydroperiod than the surrounding matrix. Species structure and composition are similar to the typical hydric hammock, except pond cypress, bald cypress, swamp tupelo, and green ash dominate. Because water stands for longer periods, shrubs and herbs are often on hummocks around the tree bases with open water or mucky soils between.

The coastal variant of hydric hammock is found near the Gulf shore and can continue inland for up to a kilometer. This vegetation is heavily influenced by maritime conditions such as saltwater inundation and salt spray caused by storms, and is distinguished by a dominance of live oak, cabbage palm, and red cedar in the canopy and subcanopy. Slash pines and loblolly pines are common. Typical shrubs include yaupon, wax myrtle, and groundsel tree. Spanish bayonet is occasionally seen in coastal hydric hammocks.

In some areas slash pines may dominate coastal hydric hammocks, especially nearest the salt marsh, and on small islands. The pines may surpass the cabbage palm, red cedar and live oak in height, and form an emergent canopy.

2.2.1.8 Maritime Hammock

Maritime hammocks are characterized by dense live oak-dominated forests on old dune ridges near the Gulf coast. Maritime hammock is a predominantly evergreen hardwood forest growing on stabilized coastal dunes lying at varying distances from the shore. Species composition changes from north to south with temperate species dominating from the Georgia border to Cape Canaveral and tropical species increasingly prevalent south of Cape Canaveral. The overstory of maritime hammocks typically has a low, streamlined profile that deflects winds and generally prevents hurricanes from uprooting the trees. Maritime hammock occurs on deep well-drained acid quartz sands, or well-drained, moderately alkaline quartz sands mixed with shell fragments. Due to their coastal location, with water bodies on at least one side, fire was probably naturally rare and very spotty in maritime hammock.

On BBWMA, maritime hammocks often grade into the coastal variant of hydric hammock or into mesic hammock, but are on drier, sandier soils. Red cedar, cabbage palm and hickory are common in the canopy levels along with live oak. Southern magnolia is often present. Shrubs include, sparkleberry, wild olive, and saw palmetto. Herbs are sparse, but may include blackseed needlegrass, witch grasses, and narrowleaf silkgrass.

2.2.1.9 Mesic Flatwoods

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

Within BBWMA, the mesic flatwoods have all experienced some form of disturbance due to past silvicultural activities; many are older pine plantations that have been thinned and treated with prescribed fire. Although these areas have experienced chopping and sometimes bedding, much of the native groundcover persists and is recovering, primarily due to FWC's prescribed fire application and timber management activities. Both longleaf pine and slash pine were likely canopy dominants prior to timbering in the area, but slash pine now dominates the canopy and subcanopy layers, but efforts are currently underway to create mixed stands by planting of longleaf seedlings within these stands where slash pines have been sufficiently thinned. The most common shrubs are saw palmetto and gallberry. Other characteristic shrubs are shiny fetterbush, coastalplain staggerbush lyonia, Darrow's blueberry, shiny blueberry, and yaupon. The most commonly documented grasses are wiregrass and Florida dropseed. Other graminoids include little bluestem, switchgrass, and witchgrasses. Herbs include vanilla leaf, yellow eyed grasses, blazing star, and occasionally bracken fern. Weedy species are often found in the mesic flatwoods at BBWMA due to past soil disturbance. These include bushy bluestem, broomsedge bluestem, dog fennel, flattop goldenrod, and blackberry.

Several islands in the tidal marshes along the Gulf of Mexico coastline were classified as mesic flatwoods. These communities have cabbage palm, yaupon, red cedar and saw palmetto in the understory. These are similar in general composition to islands of hydric hammock vegetation, but have drier, sandier soils, abundant saw palmetto, and sometimes sand live oak, in the understory.

2.2.1.10 Mesic Hammock

Mesic hammock is a well-developed evergreen hardwood and/or palm forest, typically with a closed canopy of live oak. Dominated by evergreen oak forests, mesic hammocks occur in naturally fire-protected areas. Mesic hammocks may occur as "islands" on high ground within basin or floodplain wetlands, as patches of oak/palm forest in dry prairie or flatwoods communities, on river levees, or in ecotones between wetlands and upland communities. Historically, mesic hammocks were likely restricted to fire shadows, or other naturally fire-protected areas such as islands and peninsulas of lakes. Other landscape positions that can provide protection from the spread of fire are likely places for mesic hammock development, including edges of lakes, sinkholes, other depressional or basin wetlands, and river floodplains. Although mesic hammock is not generally considered a fire-adapted community, some small patches of hammock occurring as islands within marshes or prairies may experience occasional low-intensity ground fires. Mesic hammocks occur on well-drained sands mixed with organic matter and are rarely inundated. High moisture is maintained by heavy shading of the ground layer and accumulation of litter. Where limestone is near the surface, rocky outcrops are common in mesic hammocks.

On BBWMA, mesic hammocks occur on rises within the large hydric hammock matrix where thicker sand deposits occur over the limestone substrate, in transitional areas

between wetlands and uplands, and in fire shadows of creeks and depressional wetlands. Live oak is usually the dominant canopy tree, often occurring with water oak, swamp laurel oak, sweet gum, southern magnolia, persimmon, and pignut hickory. Yaupon, saw palmetto, American holly and American beautyberry are characteristic shrubs. Herbs and grasses are variable in abundance; woodoats, panic grasses and witchgrasses are typical.

2.2.1.11 Pine Plantation

Pine plantations are tracts of planted loblolly pine, slash pine, and sand pine in a variety of silvicultural stages. Typically, pine plantations are planted in dense narrow rows, often bedded in low-lying areas, to produce pulpwood and other timber products for maximum revenue potential. Depending on the density of tree plantings, they are generally characterized by a sparse to non-existent understory of shrubs and plants, creating a monoculture community.

Pine plantations on BBWMA occur in areas that were historically scrub, sandhill, scrubby flatwoods, mesic flatwoods, wet flatwoods, and, to a lesser extent, mesic hammock, hydric hammock, and possibly high tidal marsh. Prior to acquisition by the State, many of these areas had been subjected to site preparation techniques such as bedding and roller-chopping. Damage to the soil surface due to deep bedding or large equipment tire ruts is usually evident. In areas that once supported flatwoods, where recent restoration activities such as thinning and burning have taken place, many of these plantations are beginning to resemble the historic landscape, at least in structure. Where native groundcover such as saw palmetto, wiregrass, and wiry beaksedges comprise the groundcover and where the vegetation structure appeared as relatively open pineland, FNAI classified the plantation as a wet or mesic flatwoods. Where the groundcover was dominated by weeds such as broomsedge bluestem, dog fennel, and blackberry, or the pines were so densely planted that little groundcover vegetation persisted, the area was classified as pine plantation.

2.2.1.12 Sandhill

Sandhills are characterized by upland pinelands on deep sandy soils; sandhill occurs on rolling hills with deep, often yellowish, well-drained sands. These are open, xeric communities dominated by widely-spaced longleaf pines with a sparse midstory of deciduous oaks and a moderate to dense groundcover of grasses, herbs, and low shrubs. The midstory trees and low shrubs can be sparse to dense, depending on fire history, and typically include turkey oak, bluejack oak, sand live oak, sand post oak, sparkleberry, dwarf huckleberry, pricklypear, and gopher apple. The diverse herbaceous groundcover is often dominated by grasses and herbs, including pineywoods dropseed, lopsided indiagrass, and a variety of forbs with many species of legumes and asters.

On BBWMA, sandhills are found in the eastern edges of the area, primarily in the Tide Swamp, Spring Creek, and Jena units. Although historically the canopy was certainly longleaf pine, BBWMA's sandhills have been mostly logged and converted to slash pine or

sand pine plantations. Some areas have recently been planted back to longleaf pine. Approximately 800 acres of the historic sandhill areas remain in sand pine or slash pine plantations. Where sandhills are delineated in the present map, there were some longleaf present, even if recently planted, with an understory and groundcover representative of typical sandhill vegetation. There is typically a moderate midstory shrub layer that is currently being reduced by more frequent prescribed fire, which includes sand pine, sand live oak, turkey oak, bluejack oak, and, to a lesser extent, sparkleberry and sand post oak. Short shrubs include gopher apple, saw palmetto, Darrow's blueberry, and blue huckleberry. Herbs are sparse, and include wiregrass, largefruit beaksedge, summer farewell, bottlebrush threeawn, bluestem grasses and witch grasses. Active restoration is occurring on over 750 acres of the historic sandhill, and currently an upland restoration plan is being drafted such that the remaining acreage can be restored in the most efficient manner possible.

2.2.1.13 Scrub

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

On BBWMA, the scrub community type is xeric oak-dominated shrubland on deep sands inland in the Tide Swamp, Spring Creek, and Jena units. The scrubs on the BBWMA have been disturbed through past silvicultural activities and fire exclusion. Almost all historic scrub habitat on BBWMA had been planted in sand pine plantations by the previous landowners, however, the off-site sand pine has since been clearcut. The scrub habitat is currently characterized by regenerating sand pine, and dense, often patchy shrub thickets dominated by myrtle oak, sand live oak, and Chapman's oak. Other typical shrubs and small trees include saw palmetto, rusty staggerbush, sparkleberry, wild olive, shiny blueberry, live oak, gopher apple, and Florida rosemary. Herbs are few and include largefruit beaksedge, and prickly pear. BBWMA scrubs have been disturbed by past logging, windrowing, and other soil disturbances, and contain abundant weedy forbs and grasses, including dog fennel, blackberry, witch grasses, coastalplain honeycombhead, and broomsedge bluestem.

2.2.1.14 Scrubby Flatwoods

Scrubby flatwoods are similar to mesic flatwoods in structure and species composition, but with scrub species in the shrub and herb layer, and occurring on drier, sandy soils, often as a transition zone between wetlands and scrub or sandhill vegetation. Scrubby flatwoods have an open canopy of widely spaced pines and a low, shrubby understory dominated by

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

On BBWMA, although longleaf pine likely historically occurred in the canopy, the scrubby flatwoods canopy is dominated by slash pine. Efforts are currently underway to plant longleaf seedlings in the understory. Understory shrubs are dense and patchy, and include saw palmetto, myrtle oak, sand live oak, Chapman's oak, gallberry, rusty staggerbush, and coastalplain staggerbush. Other typical species include wiregrass, shiny blueberry, dwarf live oak, bluestem grass and witchgrasses.

2.2.1.15 Salt Marsh or Tidal Marsh

Salt or tidal marshes are herbaceous lowlands along the Gulf of Mexico coastline subject to tidal flooding. Salt marsh is a largely herbaceous community that occurs in the portion of the coastal zone affected by tides and seawater and protected from large waves, either by the broad, gently sloping topography of the



shore, by a barrier island, or by location along a bay or estuary. The width of the intertidal zone depends on the slope of the shore and the tidal range. Salt marsh may have distinct zones of vegetation, each dominated by a single species of grass or rush. Salt marsh soils range from deep mucks with high clay and organic content in the deeper portions to silts and fine sands in higher areas.

On BBWMA, these are dominated by needle rush, saltmeadow cordgrass, switchgrass, gulf cordgrass, sand cordgrass, saw grass, and salt grass. Shrubs are sparse and include marsh elder, groundsel tree, Christmasberry, and wax myrtle.

2.2.1.16 Wet Flatwoods

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

On BBWMA, wet flatwoods have all experienced some form of disturbance due to past silvicultural activities, and some may represent converted hydric hammock; many are older pine plantations that have been thinned and treated with prescribed fires. Slash pine forms an open canopy over a variable midstory of slash pine, cabbage palm, red bay, and sweet bay. Typical shrubs include yaupon, wax myrtle, tall gallberry, shiny fetterbush, gallberry, and shiny blueberry. In some areas, particularly where wet and mesic flatwoods interface, saw palmetto can be present, but typically is not as abundant as in better-drained mesic flatwoods. Closer to the Gulf of Mexico, saw grass is dominant in the groundcover, indicating a coastal variant of wet flatwoods that resembles marsh. Inland, graminoids include hairawn muhly, nutrushes, woodoats, witch grasses, and beaksedges. Other herbs include yellow-eyed grasses, camphorweed, cinnamon fern, and Virginia chain fern. Laurel cat-brier is common. Weedy species in the wet flatwoods include bushy bluestem, broomsedge bluestem, dog fennel, flattop goldenrod, and blackberry.

Patches of distinct vegetation resembling wet prairies were occasionally observed within wet flatwoods on BBWMA, where lush graminoid vegetation, primarily beakrushes, was found with hatpins, yellow-eyed grasses, and southern colic-root. These patches of wetland vegetation, which are similar to wet prairies, typically occur in narrow ecotones between wet flatwoods and other wetland types such as depression marshes and hydric hammock and were not large enough to map separately.

2.2.1.17 Xeric Hammock

Xeric hammock is an evergreen forest found on well-drained sandy soil. Xeric hammocks are oak-dominated forests on dry sandy soils, typically in former sandhill or scrub that has not burned for many years. It also occurs in transition areas from uplands to wetland communities where fire has not burned sufficiently hot to retard oak growth. The low canopy is typically closed and usually dominated by sand live oak. An emergent canopy of pine may be present. Xeric hammock typically develops where fire exclusion allows for the

establishment of the oak canopy. This may occur naturally when the area has significant barriers to fire, or more commonly, as the result of human intervention. In these areas, xeric hammock can form extensive stands or can occur as small patches within or near sandhill or scrub. Xeric hammock can also occur on high islands within flatwoods, or on a high, well-drained ridge within a floodplain. Xeric hammock also can occur on barrier islands and in other coastal environs as an advanced successional stage of scrub.

Typically, there is a nearly closed canopy of sand live oak and/or live oak. Sand pine, swamp laurel oak, and pignut hickory may also be present in the canopy. In historic scrub areas, Chapman's oak and myrtle oak are present in the tall shrub layer. Other shrubs include saw palmetto, yaupon, coontie, coastalplain staggerbush, sparkleberry, and beautyberry. Herb cover is suppressed by abundant leaf litter, but includes nutrushes, beaksedges, and witchgrass.

2.2.2 Forest Resources

As described in detail above, the BBWMA has a variety of forest community types, including a large expanse of hydric hammock; mesic and xeric hammocks; sandhill; scrub; scrubby, wet, and mesic flatwoods; and pine plantations. Most of the forested areas on the BBWMA have seen some degree of timber harvesting in the past. Currently, the FWC is working to restore areas of pine plantation to appropriate historic natural community types with thinning, planting and other forest restoration management actions.

The FFS completed a FWC Timber Assessment of the BBWMA in 2015. As noted above, the FFS is a cooperative manager of the BBWMA, and a Memorandum of Understanding exists between the FFS and FWC to manage timber resources on the area (Appendix 13.4.1). Additionally, in 2014 the FWC contracted with The Forestry Company to complete timber inventories for the Jena and Tide Swamp units (13.4.2). The FWC will continue to cooperate with the FFS on all actions that involve the timber resources of the BBWMA and to contract with forest consultants for development of a Forest Management Plan, inventory, and stand information if deemed necessary for overall management of the BBWMA forest communities.

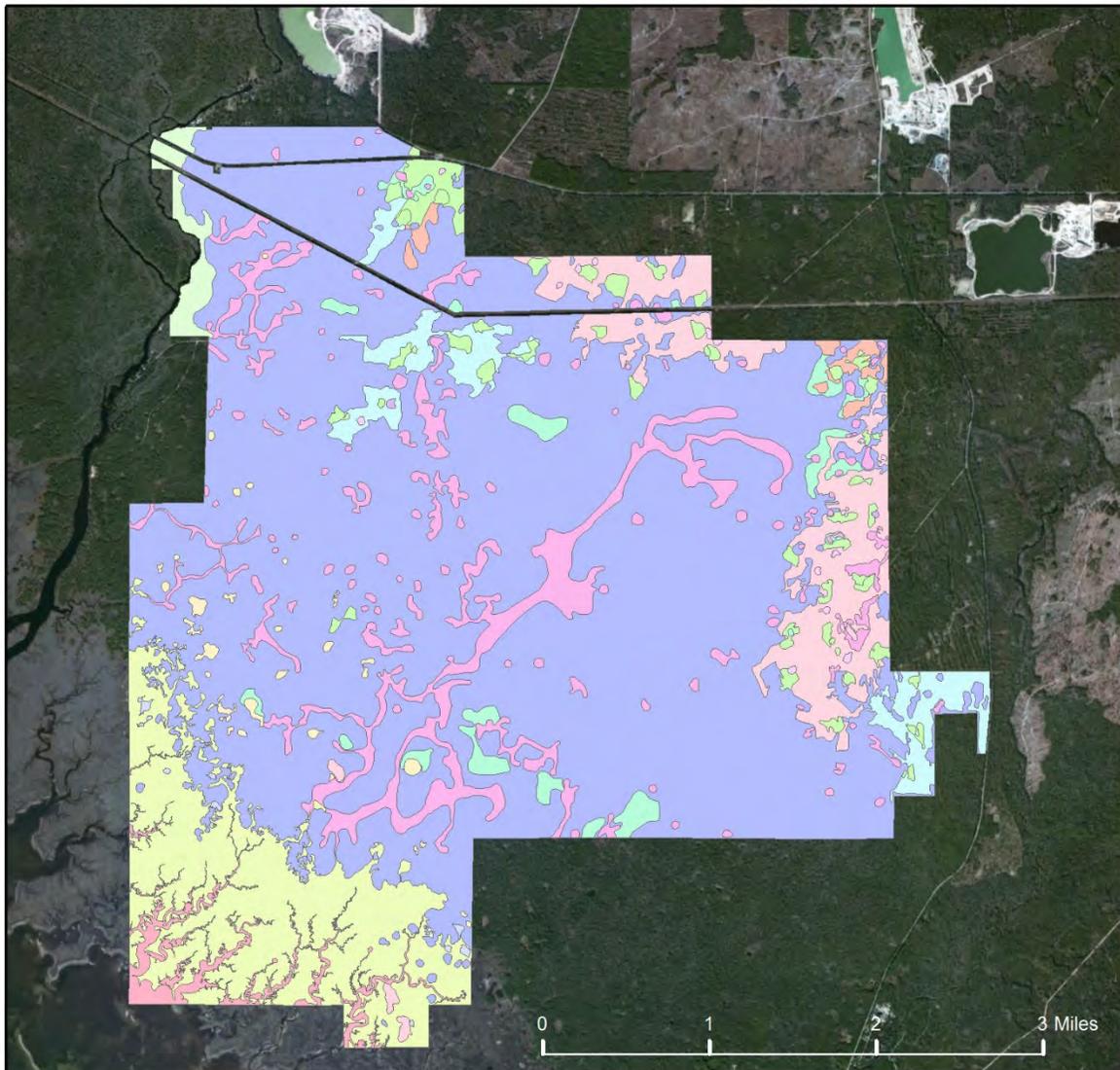


Figure 7a: FNAI Natural Communities of the Snipe Island Unit of the BBWMA

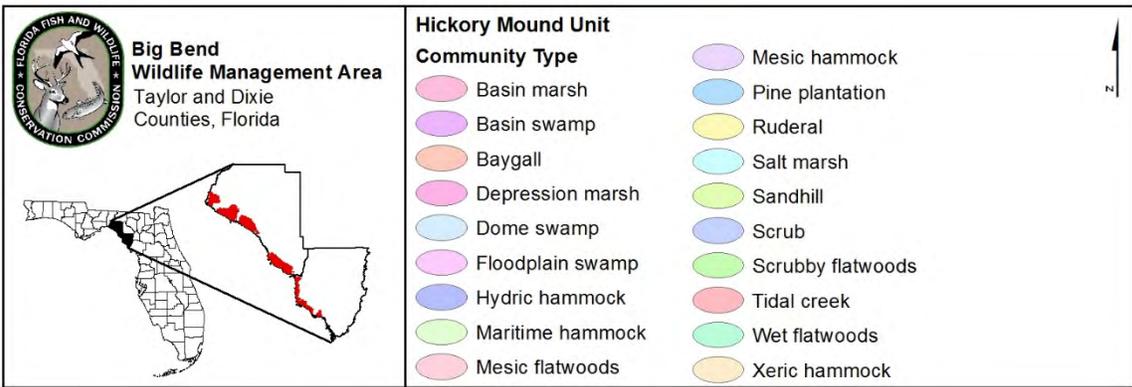
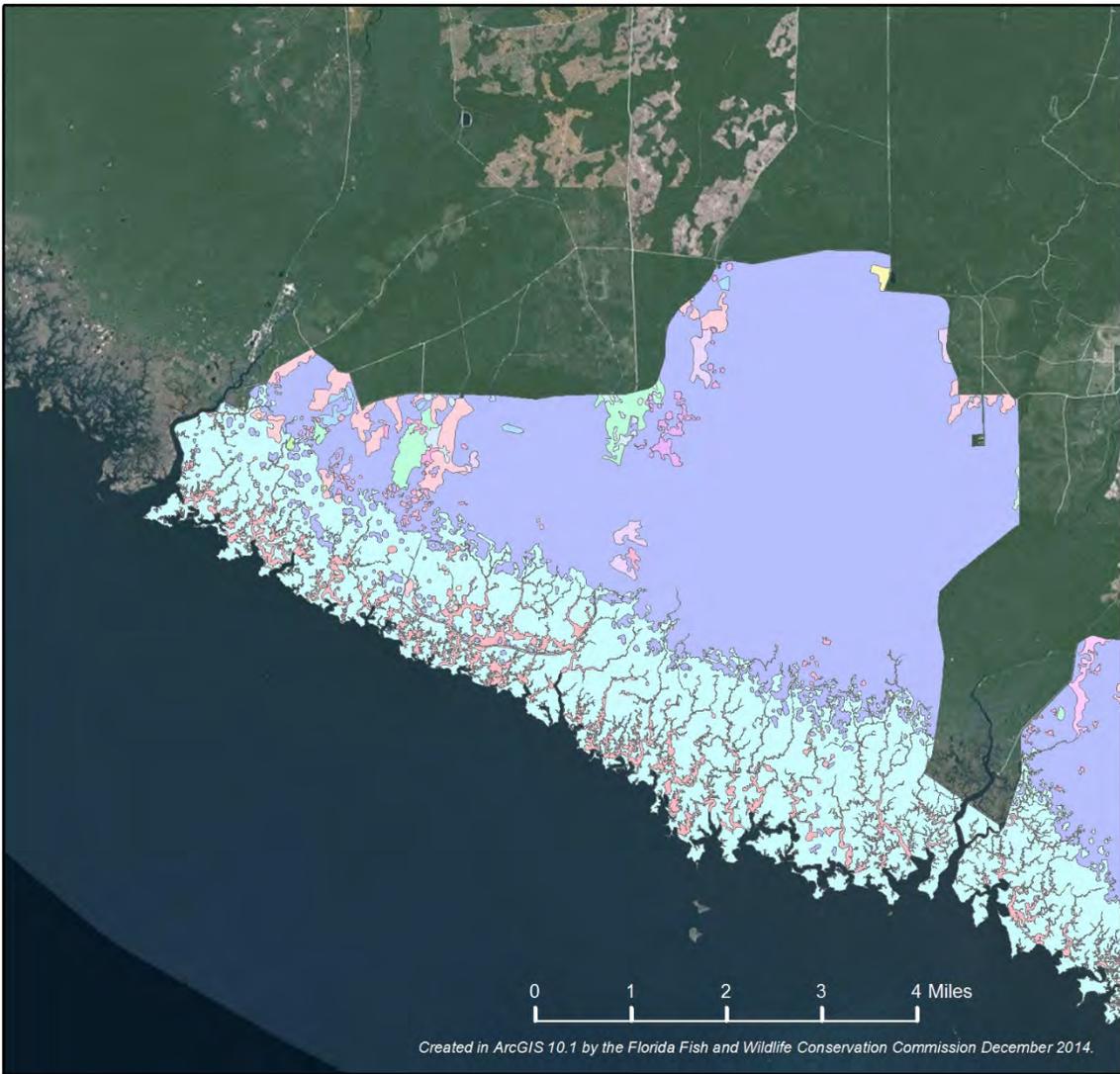


Figure 7b: FNAI Natural Communities of the Hickory Mound Unit of the BBWMA

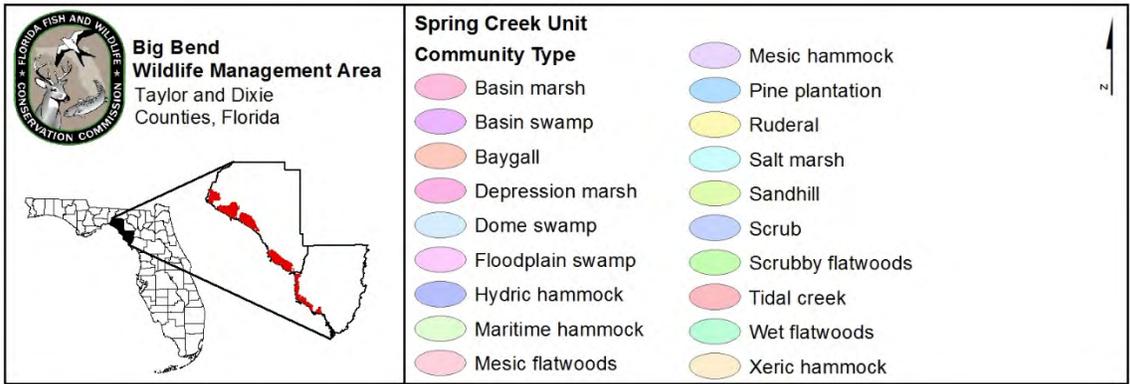
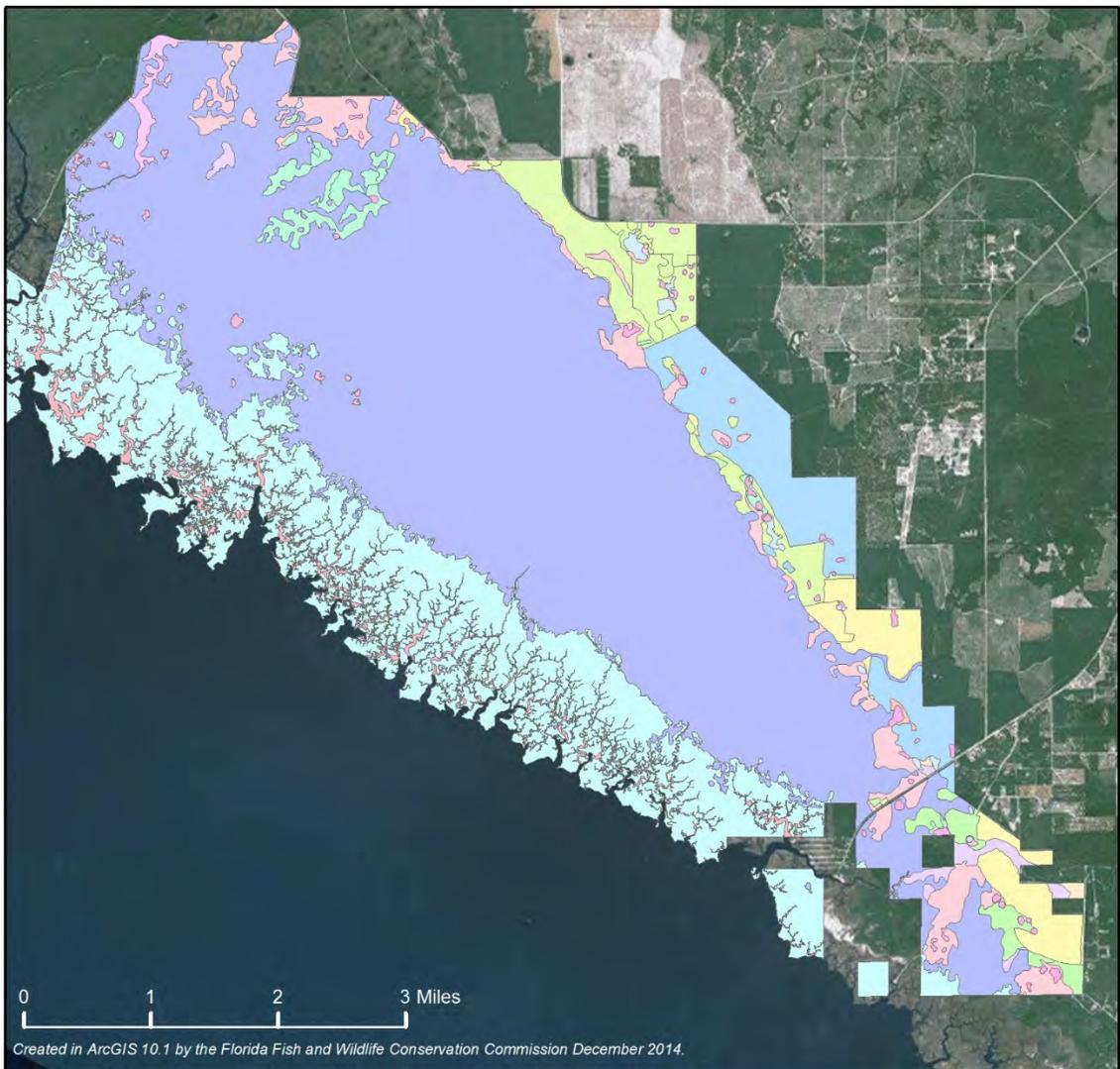


Figure 7c: FNAI Natural Communities of the Spring Creek Unit of the BBWMA

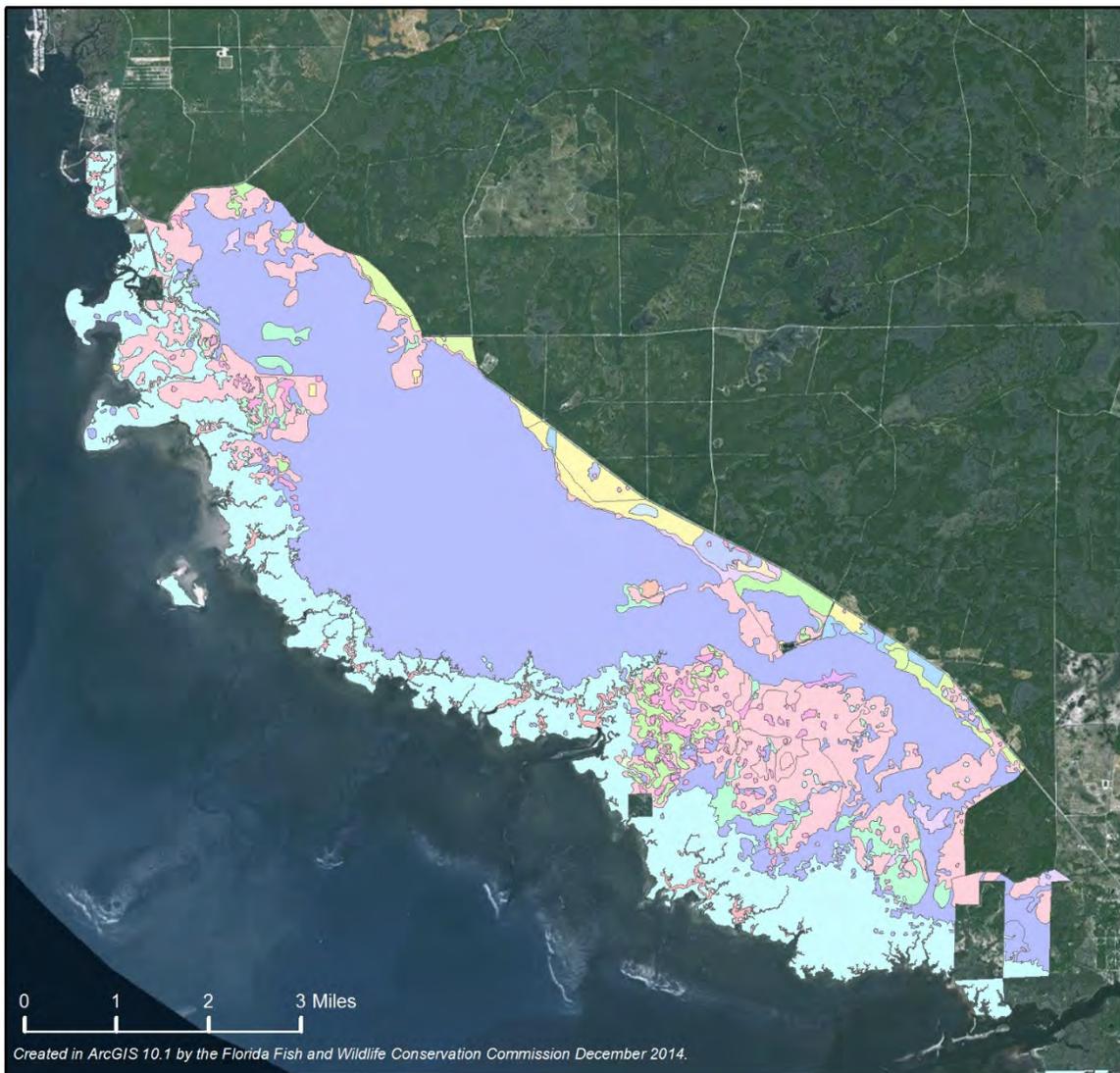


Figure 7d: FNAI Natural Communities of the Tide Swamp Unit of the BBWMA

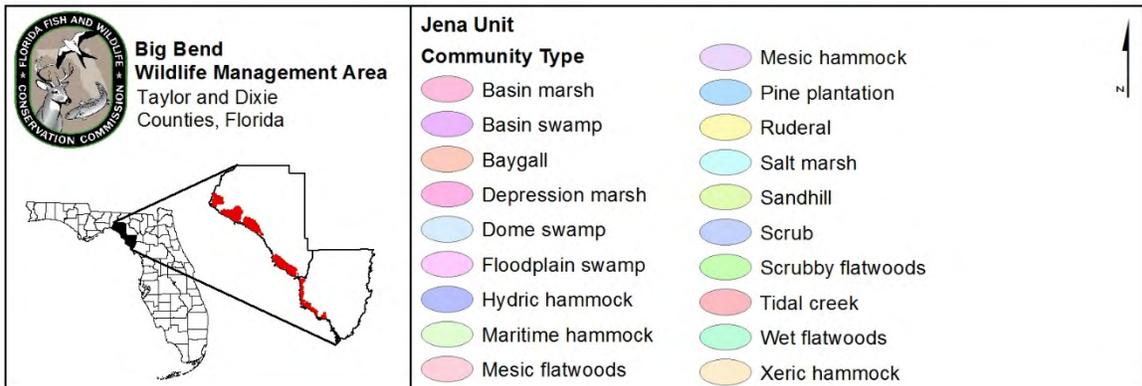
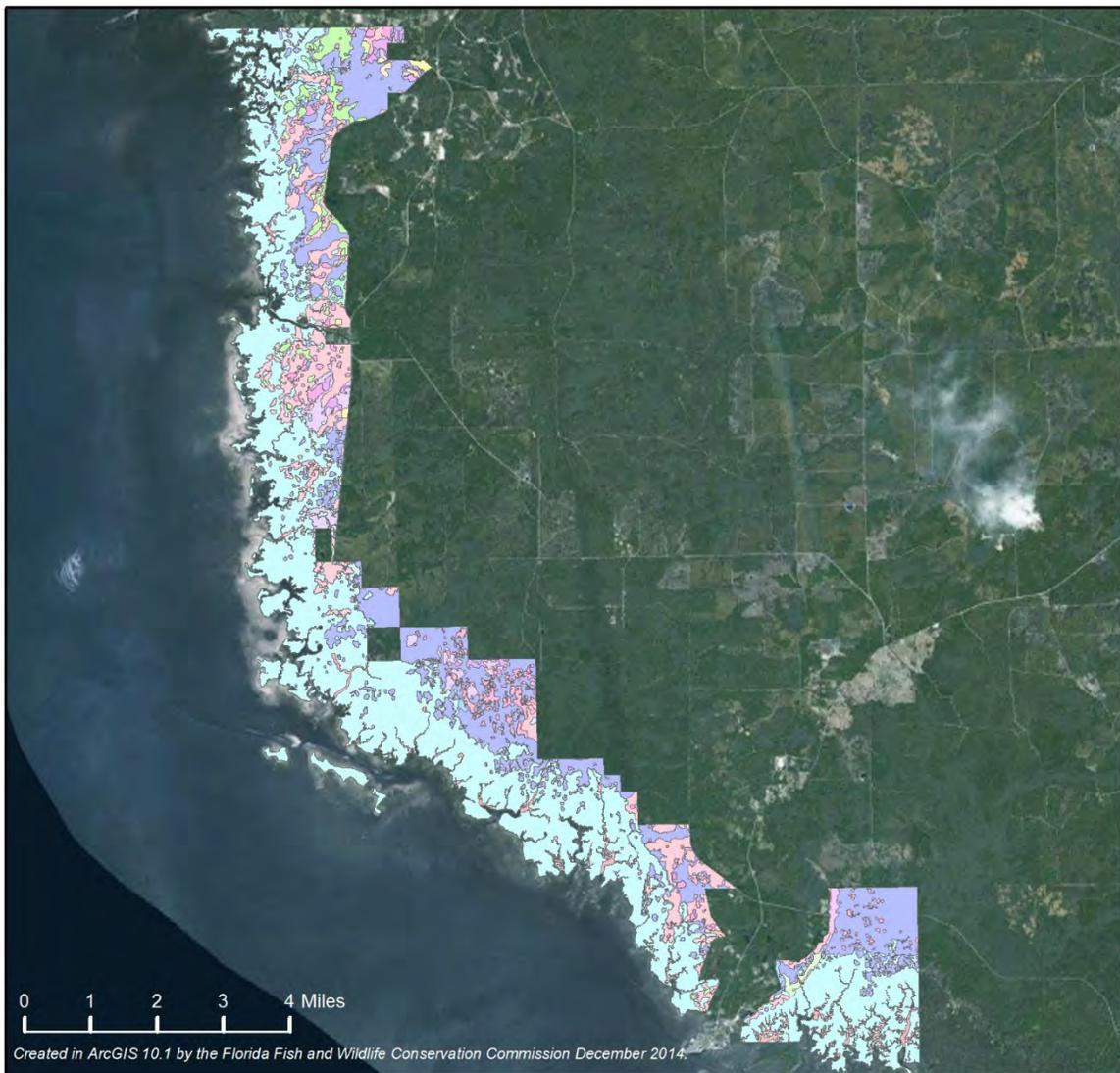


Figure 7e: FNAI Natural Communities of the Jena Unit of the BBWMA

2.3 Fish and Wildlife Resources

As described earlier, the large scale of the coastal landscape that comprises BBWMA is composed of a diverse mosaic of fish and wildlife habitats. The extensive diversity of natural communities combined with active wildlife management practices result in a wide variety of wildlife habitats occurring on the BBWMA. Consequently, a substantial number of wildlife species are found on the area. These species are listed in Tables 7 through 11. A list of non-native or exotic animals observed at the BBWMA can be found in Table 12.

Table 7: Mammal Species Observed on the BBWMA

Common Name	Scientific Name
Beaver	<i>Castor canadensis</i>
Black rat	<i>Rattus rattus</i>
Bobcat	<i>Lynx rufus</i>
Bottle-nosed dolphin	<i>Tursiops truncatus</i>
Brazilian free-tailed bat	<i>Tadarida brasiliensis</i>
Brown rat	<i>Rattus norvegicus</i>
Cotton mouse	<i>Peromyscus gossypinus</i>
Coyote	<i>Canis latrans</i>
Eastern cottontail	<i>Sylvilagus floridanus</i>
Eastern gray squirrel	<i>Sciurus carolinensis</i>
Eastern harvest mouse	<i>Reithrodontomys humulis</i>
Eastern red bat	<i>Lasiurus borealis</i>
Eastern woodrat	<i>Neotoma floridana</i>
Evening bat	<i>Nycticeius humeralis</i>
Florida black bear	<i>Ursus americanus floridanus</i>
Florida manatee	<i>Trichechus manatus latirostris</i>
Florida mouse	<i>Podomys floridanus</i>
Fox squirrel	<i>Sciurus niger</i>
Golden mouse	<i>Ochrotomys nuttalli</i>
Gray fox	<i>Urocyon cinereoargenteus</i>
Hispid cotton rat	<i>Sigmodon hispidus</i>
House mouse	<i>Mus musculus</i>
Least shrew	<i>Cryptotis parva</i>
Marsh rabbit	<i>Sylvilagus palustris</i>
Marsh rice rat	<i>Oryzomys palustris</i>
Nine-banded armadillo	<i>Dasypus novemcinctus</i>
Northern yellow bat	<i>Lasiurus intermedius</i>
Oldfield mouse	<i>Peromyscus polionotus</i>
Opossum	<i>Didelphis virginiana</i>
Raccoon	<i>Procyon lotor</i>
River otter	<i>Lontra canadensis</i>

Table 7: Mammal Species Observed on the BBWMA

Common Name	Scientific Name
Seminole bat	<i>Lasiurus seminolus</i>
Southeastern myotis	<i>Myotis austroriparius</i>
Southeastern pocket gopher	<i>Geomys pinetis</i>
Southern flying squirrel	<i>Glaucomys volans</i>
Southern short-tailed shrew	<i>Blarina carolinensis</i>
Spotted skunk	<i>Spilogale putorius</i>
Striped skunk	<i>Mephitis mephitis</i>
Tricolored bat	<i>Perimyotis subflavus</i>
White-tailed deer	<i>Odocoileus virginianus</i>

Table 8: Bird Species Observed on the BBWMA

Common Name	Scientific Name
American avocet	<i>Recurvirostra americana</i>
American bittern	<i>Botaurus lentiginosus</i>
American black duck	<i>Anas rubripes</i>
American coot	<i>Fulica americana</i>
American crow	<i>Corvus brachyrhynchos</i>
American golden plover	<i>Pluvialis dominica</i>
American goldfinch	<i>Spinus tristis</i>
American kestrel	<i>Falco sparverius</i>
American redstart	<i>Setophaga ruticilla</i>
American robin	<i>Turdus migratorius</i>
American swallow-tailed kite	<i>Elanoides forficatus</i>
American white pelican	<i>Pelecanus erythrorhynchos</i>
American wigeon	<i>Anas americana</i>
American woodcock	<i>Scolopax minor</i>
Anhinga	<i>Anhinga anhinga</i>
Bachman's sparrow	<i>Peucaea aestivalis</i>
Bald eagle	<i>Haliaeetus leucocephalus</i>
Barn swallow	<i>Hirundo rustica</i>
Barred owl	<i>Strix varia</i>
Belted kingfisher	<i>Megaceryle alcyon</i>
Black rail	<i>Laterallus jamaicensis</i>
Black skimmer	<i>Rynchops niger</i>
Black tern	<i>Chlidonias niger</i>
Black vulture	<i>Coragyps atratus</i>
Black-and-white warbler	<i>Mniotilta varia</i>

Table 8: Bird Species Observed on the BWMA

Common Name	Scientific Name
Black-bellied plover	<i>Pluvialis squatarola</i>
Black-crowned night-heron	<i>Nycticorax nycticorax</i>
Black-necked stilt	<i>Himantopus mexicanus</i>
Blue grosbeak	<i>Passerina caerulea</i>
Blue-gray gnatcatcher	<i>Polioptila caerulea</i>
Blue-winged teal	<i>Anas discors</i>
Boat-tailed grackle	<i>Quiscalus major</i>
Bobolink	<i>Dolichonyx oryzivorus</i>
Bonaparte's gull	<i>Larus philadelphia</i>
Broad-winged hawk	<i>Buteo platypterus</i>
Brown pelican	<i>Pelecanus occidentalis</i>
Brown thrasher	<i>Toxostoma rufum</i>
Brown-headed nuthatch	<i>Sitta pusilla</i>
Buff-breasted sandpiper	<i>Tryngites subruficollis</i>
Bufflehead	<i>Bucephala albeola</i>
Canvasback	<i>Aythya valisineria</i>
Carolina chickadee	<i>Poecile carolinensis</i>
Carolina wren	<i>Thryothorus ludovicianus</i>
Caspian tern	<i>Sterna caspia</i>
Cattle egret	<i>Bubulcus ibis</i>
Chipping sparrow	<i>Spizella passerina</i>
Chuck-will's widow	<i>Caprimulgus carolinensis</i>
Clapper rail	<i>Rallus longirostris</i>
Common goldeneye	<i>Bucephala clangula</i>
Common grackle	<i>Quiscalus quiscula</i>
Common ground-dove	<i>Columbina passerina</i>
Common loon	<i>Gavia immer</i>
Common gallinule	<i>Gallinula galeata</i>
Common nighthawk	<i>Chordeiles minor</i>
Common yellowthroat	<i>Geothlypis trichas</i>
Cooper's hawk	<i>Accipiter cooperii</i>
Double-crested cormorant	<i>Phalacrocorax auritus</i>
Downy woodpecker	<i>Picoides pubescens</i>
Dunlin	<i>Calidris alpina</i>
Eastern bluebird	<i>Sialia sialis</i>
Eastern kingbird	<i>Tyrannus tyrannus</i>
Eastern meadowlark	<i>Sturnella magna</i>
Eastern phoebe	<i>Sayornis phoebe</i>
Eastern screech-owl	<i>Megascops asio</i>
Eastern towhee	<i>Pipilo erythrophthalmus</i>

Table 8: Bird Species Observed on the BBWMA

Common Name	Scientific Name
Fish crow	<i>Corvus ossifragus</i>
Florida sandhill crane	<i>Grus canadensis pratensis</i>
Forster's tern	<i>Sterna forsteri</i>
Gadwall	<i>Anas strepera</i>
Gray catbird	<i>Dumetella carolinensis</i>
Gray kingbird	<i>Tyrannus dominicensis</i>
Great blue heron	<i>Ardea herodias</i>
Great crested flycatcher	<i>Myiarchus crinitus</i>
Great egret	<i>Ardea albus</i>
Great horned owl	<i>Bubo virginianus</i>
Greater scaup	<i>Aythya marila</i>
Greater yellowlegs	<i>Tringa melanoleuca</i>
Green heron	<i>Butorides striatus</i>
Green-winged teal	<i>Anas crecca</i>
Gull-billed tern	<i>Sterna nilotica</i>
Hermit thrush	<i>Catharus guttatus</i>
Herring gull	<i>Larus argentatus</i>
Hooded merganser	<i>Lophodytes cucullatus</i>
Hooded warbler	<i>Setophaga citrina</i>
Horned grebe	<i>Podiceps auritus</i>
House wren	<i>Troglodytes aedon</i>
Indigo bunting	<i>Passerina cyanea</i>
Killdeer	<i>Charadrius vociferus</i>
King rail	<i>Rallus elegans</i>
Lapland longspur	<i>Calcarius lapponicus</i>
Laughing gull	<i>Larus atricilla</i>
Least bittern	<i>Ixobrychus exilis</i>
Least sandpiper	<i>Calidris minutilla</i>
Least tern	<i>Sternula antillarum</i>
Lesser scaup	<i>Aythya affinis</i>
Lesser yellowlegs	<i>Tringa flavipes</i>
Limpkin	<i>Aramus guarauna</i>
Little blue heron	<i>Egretta caerulea</i>
Long-billed dowitcher	<i>Limnodromus scolopaceus</i>
Louisiana waterthrush	<i>Seiurus motacilla</i>
Mallard	<i>Anas platyrhynchos</i>
Marbled godwit	<i>Limosa fedoa</i>
Marian's marsh wren	<i>Cistothorus palustris marianae</i>
Merlin	<i>Falco columbarius</i>
Mississippi kite	<i>Ictinia mississippiensis</i>

Table 8: Bird Species Observed on the BWMA

Common Name	Scientific Name
Mourning dove	<i>Zenaida macroura</i>
Northern bobwhite	<i>Colinus virginianus</i>
Northern cardinal	<i>Cardinalis cardinalis</i>
Northern flicker	<i>Colaptes auratus</i>
Northern harrier	<i>Circus cyaneus</i>
Northern mockingbird	<i>Mimus polyglottos</i>
Northern parula	<i>Setophaga americana</i>
Northern pintail	<i>Anas acuta</i>
Northern shoveler	<i>Anas clypeata</i>
Orchard oriole	<i>Icterus spurius</i>
Osprey	<i>Pandion haliaetus</i>
Palm warbler	<i>Setophaga palmarum</i>
Pectoral sandpiper	<i>Calidris melanotos</i>
Peregrine falcon	<i>Falco peregrinus</i>
Pied-billed grebe	<i>Podilymbus podiceps</i>
Pileated woodpecker	<i>Dryocopus pileatus</i>
Pine warbler	<i>Setophaga pinus</i>
Piping plover	<i>Charadrius melodus</i>
Prairie warbler	<i>Setophaga discolor</i>
Prothonotary warbler	<i>Protonotaria citrea</i>
Purple martin	<i>Progne subis</i>
Red-shouldered hawk	<i>Buteo lineatus</i>
Red-bellied woodpecker	<i>Melanerpes carolinus</i>
Red-breasted merganser	<i>Mergus serrator</i>
Reddish egret	<i>Egretta rufescens</i>
Redhead	<i>Aythya americana</i>
Red-headed woodpecker	<i>Melanerpes erythrocephalus</i>
Red-tailed hawk	<i>Buteo jamaicensis</i>
Red-winged blackbird	<i>Agelaius phoeniceus</i>
Ring-billed gull	<i>Larus delawarensis</i>
Ring-necked duck	<i>Aythya collaris</i>
Roseate spoonbill	<i>Platalea ajaja</i>
Royal tern	<i>Thalasseus maxima</i>
Ruby-crowned kinglet	<i>Regulus calendula</i>
Ruby-throated hummingbird	<i>Archilochus colubris</i>
Ruddy duck	<i>Oxyura jamaicensis</i>
Ruddy turnstone	<i>Arenaria interpres</i>
Rusty blackbird	<i>Euphagus carolinus</i>
Sanderling	<i>Calidris alba</i>
Sandwich tern	<i>Sterna sandvicensis</i>

Table 8: Bird Species Observed on the BBWMA

Common Name	Scientific Name
Savannah sparrow	<i>Passerculus sandwichensis</i>
Scarlet tanager	<i>Piranga olivacea</i>
Scott's seaside sparrow	<i>Ammodramus maritimus peninsulae</i>
Sedge wren	<i>Cistothorus platensis</i>
Semipalmated plover	<i>Charadrius semipalmatus</i>
Semipalmated sandpiper	<i>Calidris pusilla</i>
Sharp-shinned hawk	<i>Accipiter striatus</i>
Sharp-tailed sparrow	<i>Ammodramus caudacutus</i>
Short-billed dowitcher	<i>Limnodromus griseus</i>
Snow goose	<i>Chen caerulescens</i>
Snowy egret	<i>Egretta thula</i>
Song sparrow	<i>Melospiza melodia</i>
Sora	<i>Porzana carolina</i>
Spotted sandpiper	<i>Actitis macularia</i>
Summer tanager	<i>Piranga rubra</i>
Swamp sparrow	<i>Melospiza georgiana</i>
Tree swallow	<i>Tachycineta bicolor</i>
Tricolored heron	<i>Egretta tricolor</i>
Tufted titmouse	<i>Baeolophus bicolor</i>
Tundra swan	<i>Cygnus columbianus</i>
Turkey vulture	<i>Cathartes aura</i>
Western sandpiper	<i>Calidris mauri</i>
Whimbrel	<i>Numenius phaeopus</i>
White ibis	<i>Eudocimus albus</i>
White-eyed vireo	<i>Vireo griseus</i>
White-throated sparrow	<i>Zonotrichia albicollis</i>
Wild turkey	<i>Meleagris gallopavo</i>
Willet	<i>Tringa semipalmata</i>
Wilson's plover	<i>Charadrius wilsonia</i>
Wilson's snipe	<i>Gallinago delicata</i>
Wood duck	<i>Aix sponsa</i>
Wood stork	<i>Mycteria americana</i>
Yellow-bellied sapsucker	<i>Sphyrapicus varius</i>
Yellow-billed cuckoo	<i>Coccyzus americanus</i>
Yellow-crowned night-heron	<i>Nyctanassa violacea</i>
Yellow-rumped warbler	<i>Setophaga coronata</i>

Table 9: Reptile and Amphibian Species Observed on the BBWMA

Common Name	Scientific Name
American alligator	<i>Alligator mississippiensis</i>
Barking treefrog	<i>Hyla gratiosa</i>
Blue-striped ribbon snake	<i>Thamnophis sauritus nitae</i>
Broadhead skink	<i>Plestiodon laticeps</i>
Bronze frog	<i>Lithobates clamitans clamitans</i>
Brown snake	<i>Storeria dekayi</i>
Bullfrog	<i>Lithobates catesbeianus</i>
Chicken turtle	<i>Deirochelys reticularia</i>
Coachwhip	<i>Masticophis flagellum</i>
Common five-lined skink	<i>Plestiodon fasciatus</i>
Cope's gray treefrog	<i>Hyla chrysocelis</i>
Dusky pigmy rattlesnake	<i>Sistrurus miliarius barbouri</i>
Dwarf salamander	<i>Eurycea quadridigitata</i>
Dwarf siren	<i>Pseudobranchius striatus</i>
Eastern coachwhip	<i>Masticophis flagellum</i>
Eastern coral snake	<i>Micrurus fulvius</i>
Eastern corn snake	<i>Pantherophis guttatus</i>
Eastern diamondback rattlesnake	<i>Crotalus adamanteus</i>
Eastern fence lizard	<i>Sceloporus undulatus</i>
Eastern glass lizard	<i>Ophisaurus ventralis</i>
Eastern hognose snake	<i>Heterodon platirhinos</i>
Eastern indigo snake	<i>Drymarchon couperi</i>
Eastern kingsnake	<i>Lampropeltis getula getula</i>
Eastern lesser siren	<i>Siren intermedia</i>
Eastern mud snake	<i>Farancia abacura</i>
Eastern mud turtle	<i>Kinosternon subrubrum</i>
Eastern musk turtle	<i>Sternotherus odoratus</i>
Eastern narrowmouth toad	<i>Gastrophryne carolinensis</i>
Eastern newt	<i>Notophthalmus viridescens</i>
Eastern racer	<i>Coluber constrictor</i>
Eastern rat snake	<i>Pantherophis alleghaniensis</i>
Eastern ribbon snake	<i>Thamnophis sauritus</i>
Eastern spadefoot	<i>Scaphiopus holbrookii</i>
Florida box turtle	<i>Terrapene carolina bauri</i>
Florida cooter	<i>Pseudemys concinna floridana</i>
Florida cottonmouth	<i>Agkistrodon piscivorus conanti</i>
Florida cricket frog	<i>Acris gryllus dorsalis</i>
Florida redbelly snake	<i>Storeria occipitomaculata obscura</i>
Florida softshell turtle	<i>Apalone ferox</i>
Garter snake	<i>Thamnophis sirtalis</i>

Table 9: Reptile and Amphibian Species Observed on the BBWMA

Common Name	Scientific Name
Glossy crayfish snake	<i>Regina rigida</i>
Gopher frog	<i>Lithobates capito</i>
Gopher tortoise	<i>Gopherus polyphemus</i>
Greater siren	<i>Siren lacertina</i>
Green anole	<i>Anolis carolinensis</i>
Green treefrog	<i>Hyla cinerea</i>
Ground skink	<i>Scincella lateralis</i>
Gulf salt marsh snake	<i>Nerodia clarkii clarkii</i>
Island glass lizard	<i>Ophisaurus compressus</i>
Lesser siren	<i>Siren intermedia</i>
Little grass frog	<i>Pseudacris ocularis</i>
Marbled salamander	<i>Ambystoma opacum</i>
Mole salamander	<i>Ambystoma talpoideum</i>
Oak toad	<i>Anaxyrus quercicus</i>
One-toed amphiuma	<i>Amphiuma pholeter</i>
Ornate chorus frog	<i>Pseudacris ornata</i>
Ornate diamondback terrapin	<i>Malaclemys terrapin ornata</i>
Peninsula ribbon snake	<i>Thamnophis sauritus sackenii</i>
Pig frog	<i>Lithobates grylio</i>
Pinewoods treefrog	<i>Hyla femoralis</i>
Ringneck snake	<i>Diadophis punctatus</i>
Rough green snake	<i>Opheodrys aestivus</i>
Scarlet kingsnake	<i>Lampropeltis elapsoides</i>
Scarlet snake	<i>Cemophora coccinea</i>
Six-lined racerunner	<i>Aspidoscelis sexlineatus</i>
Slimy salamander	<i>Plethodon grobmani</i>
Snapping turtle	<i>Chelydra serpentina</i>
Southeastern five-lined skink	<i>Plestiodon inexpectatus</i>
Southern chorus frog	<i>Pseudacris nigrita</i>
Southern leopard frog	<i>Lithobates sphenoccephalus</i>
Southern toad	<i>Anaxyrus terrestris</i>
Southern water snake	<i>Nerodia fasciata</i>
Spring peeper	<i>Pseudacris crucifer</i>
Squirrel treefrog	<i>Hyla squirella</i>
Striped crayfish snake	<i>Regina alleni</i>
Striped mud turtle	<i>Kinosternon baurii</i>
Striped newt	<i>Notophthalmus perstriatus</i>
Swamp snake	<i>Seminatrix pygaea</i>
Two-toed amphiuma	<i>Amphiuma means</i>

Table 10: Fish Species Observed on the BBWMA

Common Name	Scientific Name
Atlantic silverside	<i>Menidia menidia</i>
Black crappie	<i>Pomoxis nigromaculatus</i>
Black drum	<i>Pogonias cromis</i>
Black sea bass	<i>Centropristis striata</i>
Bluegill	<i>Lepomis macrochirus</i>
Bonnethead shark	<i>Sphyrna tiburo</i>
Bull shark	<i>Carcharhinus leucas</i>
Crevalle jack	<i>Caranx hippos</i>
Diamond killifish	<i>Adinia xenica</i>
Flagfish	<i>Jordanella floridae</i>
Gafftopsail catfish	<i>Bagre marinus</i>
Gulf flounder	<i>Paralichthys albigutta</i>
Gulf killifish	<i>Fundulus grandis</i>
Hardhead catfish	<i>Arius felis</i>
Ladyfish	<i>Elops saurus</i>
Largemouth bass	<i>Micropterus salmoides</i>
Least killifish	<i>Heterandria formosa</i>
Longnose killifish	<i>Fundulus similis</i>
Mosquitofish	<i>Gambusia holbrooki</i>
Pinfish	<i>Lagodon rhomboides</i>
Red drum	<i>Sciaenops ocellatus</i>
Redbreast sunfish	<i>Lepomis auritus</i>
Redear sunfish	<i>Lepomis microlophus</i>
Sailfin molly	<i>Poecilia latipinna</i>
Sheepshead	<i>Archosargus probatocephalus</i>
Sheepshead minnow	<i>Cyprinodon variegatus</i>
Southern stingray	<i>Dasyatis americana</i>
Spanish mackerel	<i>Scomberomorus maculatus</i>
Speckled worm-eel	<i>Myrophis punctatus</i>
Spottail pinfish	<i>Diplodus holbrookii</i>
Spotted seatrout	<i>Cynoscion nebulosus</i>
Spotted sunfish	<i>Lepomis punctatus</i>
Striped mullet	<i>Mugil cephalus</i>
Warmouth	<i>Lepomis gulosus</i>

Table 11: Invertebrate Species Observed on the BBWMA

Common Name	Scientific Name
American dog tick	<i>Dermacentor variabilis</i>
American lady	<i>Vanessa virginiensis</i>
American snout	<i>Libytheana carinenta</i>
Appalachian Brown	<i>Satyrodes appalachia</i>
Banded hairstreak	<i>Chlorostymon simaethis</i>
Barred yellow	<i>Eurema दौरa</i>
Biting midge	<i>Culicoides mississippiensis</i>
Black legged tick	<i>Ixodes scapularis</i>
Black swallowtail	<i>Papilio polyxenes</i>
Blue crab	<i>Callinectes sapidus</i>
Blue dasher	<i>Pachydiplax longipennis</i>
Blue-fronted dancer	<i>Argia apicalis</i>
Blue-ringed dancer	<i>Argia sedula</i>
Brazilian skipper	<i>Calpodēs ethlius</i>
Broad-winged skipper	<i>Poanes viator</i>
Byssus skipper	<i>Problema byssus</i>
Calhoun's (Duke's) skipper	<i>Euphyes dukesi calhouni</i>
Carolina saddlebags	<i>Tramea carolina</i>
Carolina satyr	<i>Hermeuptychia sosybius</i>
Ceraunus blue	<i>Hemiargus ceraunus</i>
Chigger	<i>Eutrombicula cinnabaris</i>
Chigger	<i>Eutrombicula splendens</i>
Clouded skipper	<i>Lerema accius</i>
Cloudless sulphur	<i>Phoebis sennae</i>
Common buckeye	<i>Junonia coenia</i>
Common white checkered skipper	<i>Pyrgus albescens</i>
Common wood nymph	<i>Cercyonis pegala</i>
Confused cloudywing	<i>Thorybes confusis</i>
Cotton rat flea	<i>Polygenis gwyni</i>
Crayfish	<i>Procambarus spp.</i>
Crossline skipper	<i>Polites origenes</i>
Dainty sulphur	<i>Nathalis iole</i>
Delaware skipper	<i>Anatrytone logan</i>
Dion skipper	<i>Euphyes dion</i>
Dorantes longtail	<i>Urbanus dorantes</i>
Double-ringed pennant	<i>Celithemis verna</i>
Dun skipper	<i>Euphyes vestris</i>
Eastern comma	<i>Polygonia comma</i>
Eastern oyster	<i>Crassostrea virginica</i>
Eastern pondhawk	<i>Erythemis simplicicollis</i>

Table 11: Invertebrate Species Observed on the BBWMA

Common Name	Scientific Name
Eastern pygmy blue	<i>Cupido comyntas</i>
Eastern tiger swallowtail	<i>Papilio glaucus</i>
Ebony jewelwing	<i>Calopteryx maculata</i>
Elusive tiger beetle	<i>Cicindela striga</i>
Eufala skipper	<i>Lerodea eufala</i>
Fiery skipper	<i>Hylephila phyleus</i>
Florida olive hairstreak	<i>Callophrys gryneus sweadneri</i>
Four-spotted pennant	<i>Brachymesia gravida</i>
Funereal duskywing	<i>Erynnis funeralis</i>
Gemmed satyr	<i>Cyllopsis gemma</i>
Giant swallowtail	<i>Papilio cresphontes</i>
Golden-winged skimmer	<i>Libellula auripennis</i>
Gray hairstreak	<i>Strymon melinus</i>
Great blue skimmer	<i>Libellula vibrans</i>
Great purple hairstreak	<i>Atlides halesus</i>
Great southern white	<i>Ascia monuste</i>
Gulf fritillary	<i>Agraulis vanillae</i>
Hackberry emperor	<i>Asterocampa celtis</i>
Halloween pennant	<i>Celithemis eponina</i>
Henry's elfin	<i>Callophrys henrici</i>
Horace's duskywing	<i>Erynnis horatius</i>
Juniper hairstreak	<i>Callophrys gryneus</i>
Lace-winged roadside skipper	<i>Amblyscirtes aesculapius</i>
Least skipper	<i>Ancyloxypha numitor</i>
Little glassywing	<i>Pompeius verna</i>
Little metalmark	<i>Calephelis virginiensis</i>
Little wood satyr	<i>Megisto cymela</i>
Lone star tick	<i>Amblyomma americanum</i>
Long-tailed skipper	<i>Urbanus proteus</i>
Luna moth	<i>Actias luna</i>
Marsupial fur mite	<i>Didelphicus serrifer</i>
Marsupial mite	<i>Ornythonyssus wernecki</i>
Monarch	<i>Danaus plexippus</i>
Mourning cloak	<i>Nymphalis antiopa</i>
Neamathla skipper	<i>Nastra neamathla</i>
Needham's skimmer	<i>Libellula needhami</i>
Northern broken dash	<i>Wallengrenia egeremet</i>
Northern cloudywing	<i>Thorybes pylades</i>
Oak hairstreak	<i>Hypaurotis crysalus</i>
Ocola skipper	<i>Panoquina ocola</i>

Table 11: Invertebrate Species Observed on the BBWMA

Common Name	Scientific Name
Orange sulphur	<i>Colias eurytheme</i>
Painted lady	<i>Vanessa cardui</i>
Palamedes swallowtail	<i>Papilio palamedes</i>
Palatka skipper	<i>Euphyes pilatka</i>
Palmetto skipper	<i>Euphyes arpa</i>
Pearl crescent	<i>Phyciodes tharos</i>
Phaon crescent	<i>Phyciodes phaon</i>
Pink shrimp	<i>Farfantepenaeus duorarum</i>
Pipevine swallowtail	<i>Battus philenor</i>
Prince baskettail	<i>Epithea princeps</i>
Queen	<i>Danaus gilippus thersippus</i>
Question mark	<i>Polygonia interrogationis</i>
Rabbit tick	<i>Haemaphysalis leporispalustris</i>
Raccoon chewing louse	<i>Amblyomma octomaculatus</i>
Rambur's forktail	<i>Ischnura ramburii</i>
Red admiral	<i>Vanessa atalanta</i>
Red-banded hairstreak	<i>Calycopis cecrops</i>
Red-legged purse-web spider	<i>Sphodros rufipes</i>
Red-spotted purple	<i>Limenitis arthemis astyanax</i>
Roseate skimmer	<i>Orthemis ferruginea</i>
Sachem	<i>Atalopedes campestris</i>
Salt marsh skipper	<i>Panoquina panoquin</i>
Seaside dragonlet	<i>Erythrodiplex berenice</i>
Silver-spotted skipper	<i>Epargyreus clarus</i>
Sleepy duskywing	<i>Erynnis brizo</i>
Sleepy orange	<i>Eurema nicippe</i>
Small mammal chigger	<i>Neotrombicula sylvilagi</i>
Southeastern spinyleg	<i>Dromogomphus armatus</i>
Southern broken dash	<i>Wallengrenia otho</i>
Southern cloudywing	<i>Thorybes bathyllus</i>
Southern deer tick	<i>Ixodes affinis</i>
Southern dogface	<i>Colias cesonia</i>
Southern hairstreak	<i>Satyrium favonius</i>
Southern pearly-eye	<i>Enodia portlandia</i>
Southern skipperling	<i>Copaeodes minima</i>
Spicebush swallowtail	<i>Papilio troilus</i>
Spring azure	<i>Celastrina ladon</i>
Squirrel flea	<i>Orchopeas howardi</i>
Sucking louse of cotton rat	<i>Hoplopleura hirsuta</i>
Swarthy skipper	<i>Nastra lherminier</i>

Table 11: Invertebrate Species Observed on the BBWMA

Common Name	Scientific Name
Tawny emperor	<i>Asterocampa clyton</i>
Tawny-edged skipper	<i>Polites themistocles</i>
Texan crescent	<i>Anthanassa texana</i>
Tiger beetle	<i>Cincindela sp.</i>
Tropical checkered skipper	<i>Pyrgus oileus</i>
Tropical rat mite	<i>Ornythonyssus bacoti</i>
Twin spot skipper	<i>Oligoria maculata</i>
Variegated fritillary	<i>Euptoieta claudia</i>
Viceroy	<i>Limenitis archippus</i>
Viola's wood-satyr	<i>Megisto viola</i>
Wandering glider	<i>Pantala flavescens</i>
Whirlabout	<i>Polites vibex</i>
White hairstreak	<i>Parrhasius m-album</i>
White peacock	<i>Anartia jatrophae</i>
Yehl skipper	<i>Poanes yehl</i>
Zabulon skipper	<i>Poanes zabulon</i>
Zarucco duskywing	<i>Erynnis zarucco</i>
Zebra longwing	<i>Heliconius charithonia</i>
Zebra swallowtail	<i>Eurytides marcellus</i>

Table 12: Exotic Animal Species of the BBWMA

Common Name	Scientific Name
Mammals	
Feral hog	<i>Sus scrofa</i>
Nine-banded armadillo	<i>Dasyus novemcinctus</i>
Birds	
Eurasian collared-dove	<i>Streptopelia decaocto</i>
European starling	<i>Sturnus vulgaris</i>
House sparrow	<i>Passer domesticus</i>
Rock pigeon	<i>Columba livia</i>
White-winged dove	<i>Zenaida asiatica</i>
Amphibians & Reptiles	
Brown anole	<i>Anolis sagrei</i>
Greenhouse frog	<i>Eleutherodactylus planirostris</i>
Yellowbelly slider	<i>Trachemys scripta scripta</i>

Table 12: Exotic Animal Species of the BBWMA

Common Name	Scientific Name
Fish	
Common carp	<i>Cyprinus carpio</i>
Flathead catfish	<i>Pylpictis olivaris</i>

2.3.1 Integrated Wildlife Habitat Ranking System

The FWC has developed the Integrated Wildlife Habitat Ranking System (IWHRS) as a Geographic Information Systems (GIS)-based assessment tool that incorporates a wide variety of land cover and wildlife species data. The IWHRS evaluates the Florida landscape based upon the habitat needs of wildlife as a way to identify ecologically significant lands in the state, and to assess the potential impacts of management and land-use changes. The IWHRS was developed to provide technical assistance to various local, regional, state, and federal agencies, and entities interested in wildlife needs and conservation in order to: (1) determine ways to avoid or minimize project impacts by evaluating alternative placements, alignments, and transportation corridors during early planning stages, (2) assess direct, secondary, and cumulative impacts to habitat and wildlife resources, and (3) identify appropriate parcels for public land acquisition for wetland and upland habitat mitigation purposes. The IWHRS (2009) indicates that BBWMA has a medium-high mean wildlife value of 6.1 out of 10 (Figures 8a through 8e).

2.3.2 Imperiled Species

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



Seventeen imperiled animal species have been documented at the BBWMA (Table 13, imperlad plant species found on the area are listed in Table 4). All abbreviations and status determinations were derived from *Florida’s Endangered and Threatened Species List* published by FWC in May 2011. The FWC maintains the state list of animals designated as Federally-

designated endangered or threatened, State-designated threatened, or State-designated

species of special concern, in accordance with Rules 68A-27.003, and 68A-27.005, respectively, Florida Administrative Code (F.A.C.).

Table 13: Rare and Imperiled Species Occurring On or Near the BBWMA

Common Name	Scientific Name	Status
Birds		
Limpkin	<i>Aramus guarauna</i>	SSC
Little blue heron	<i>Egretta caerulea</i>	SSC
Marian's marsh wren	<i>Cistothorus palustris marianae</i>	SSC
Piping plover	<i>Charadrius melodus</i>	FT
Reddish egret	<i>Egretta rufescens</i>	SSC
Scott's seaside sparrow	<i>Ammodramus maritimus peninsulae</i>	SSC
Snowy egret	<i>Egretta thula</i>	SSC
Tricolored heron	<i>Egretta tricolor</i>	SSC
White ibis	<i>Eudocimus albus</i>	SSC
Wood stork	<i>Mycteria americana</i>	FT
Mammals		
Florida manatee	<i>Trichechus manatus latirostris</i>	FE
Florida mouse	<i>Podomys floridanus</i>	SSC
Sherman's fox squirrel	<i>Sciurus niger shermani</i>	SSC
Reptiles and Amphibians		
American alligator	<i>Alligator mississippiensis</i>	FT (S/A)
Eastern indigo snake	<i>Drymarchon corais couperi</i>	FT
Gopher frog	<i>Lithobates capito</i>	SSC
Gopher tortoise	<i>Gopherus polyphemus</i>	ST

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

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

An FWC Wildlife Conservation Prioritization and Recovery Species Management Strategy (WCPR Strategy) was completed for the BBWMA in 2012. Of the 60 focal species and 1 species group, 21 were modeled to have potential habitat on the BBWMA. These species are listed in Table 14. Species that have a measurable objective are indicated with a ¹ and species for which monitoring is recommended are indicated with a ². Occasionally, models indicate a species has potential habitat on the area when using statewide data; however, the local assessment indicates there is little opportunity to manage for the species on the area and the species should not influence management decisions. These species are identified with an “*”. More information about the WCPR Strategy is found in Section 5.4.2 of this Management Plan.

Table 14: Focal Species Having Potential Habitat on the BBWMA

Common Name	Scientific Name
American swallow-tailed kite	<i>Elanoides forficatus</i>
Bachman’s sparrow ^{1, 2}	<i>Peucaea aestivalis</i>
Brown-headed nuthatch ^{1, 2}	<i>Sitta pusilla</i>
Cooper’s hawk	<i>Accipiter cooperii</i>
Flatwoods salamander*	<i>Ambystoma cingulatum</i>
Florida black bear	<i>Ursus americanus floridanus</i>
Florida mouse	<i>Podomys floridanus</i>
Florida pine snake	<i>Pituophis melanoleucus mugitus</i>
Florida salt marsh vole*	<i>Microtus pennsylvanicus dukecampbelli</i>
Gopher frog	<i>Lithobates capito</i>
Gopher tortoise ^{1, 2}	<i>Gopherus polyphemus</i>
Gulf saltmarsh watersnake	<i>Nerodia clarkii clarkii</i>
Limpkin*	<i>Aramus guarauna</i>
Louisiana waterthrush*	<i>Seiurus motacilla</i>
Northern bobwhite ^{1, 2}	<i>Colinus virginianus</i>
Scott’s seaside sparrow ^{1, 2}	<i>Ammodramus maritimus peninsulae</i>
Sherman’s fox squirrel	<i>Sciurus niger shermani</i>
Short-tailed hawk	<i>Buteo brachyurus</i>
Southeastern bat ²	<i>Myotis austroriparius</i>
Southern bald eagle	<i>Haliaeetus leucocephalus</i>
Wading birds ^{1, 2}	Multiple species

2.3.3 FWC Wildlife Observations and FNAI Element Occurrences

FNAI assigns a rank to each “element” occurrence, which is an exemplary or rare component of the natural environment. As defined by FNAI, an “element” is any exemplary or rare component of the natural environment such as a species, natural community, bird rookery, spring, sinkhole, cave, or other ecological feature. An element occurrence is a single extant habitat which sustains or otherwise contributes to the survival of a population or a distinct, self-sustaining example of a particular element. This ranking system was developed by The Nature Conservancy and the Natural Heritage Program Network based on the element’s global rank (element’s worldwide status) or state rank (status of element in Florida). The FNAI ranking system and definitions are located on the following website: www.fnai.org/ranks.cfm.

Known locations of FWC wildlife occurrences and FNAI element occurrences from the most recent GIS databases of the respective agencies are displayed in Figures 9a through 9e. Appendix 13.5 contains a letter from FNAI authorizing the FWC to utilize their database for the purpose of displaying known plant and animal resources.

2.4 Native Landscapes

As previously discussed, the BBWMA contains a substantial variety of native landscapes including the largest expanse of coastal hammock north of the Suwannee River, extensive tidal marsh along a 60 mile stretch of coastline, wet flatwoods, mesic and xeric hammocks, and sandhill community types



among others, that compose the landscape of the area. All of the natural plant community types found in this diverse landscape mosaic on the area are described in greater detail in Section 2.2 of this management plan.

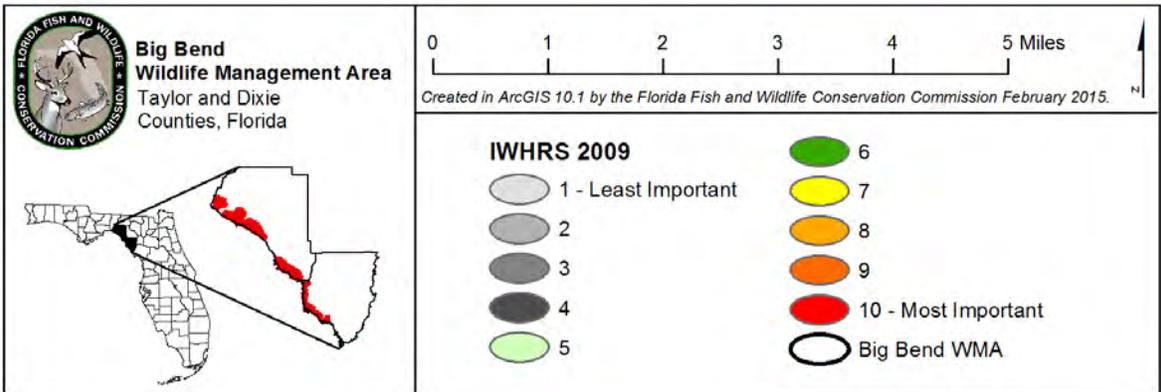
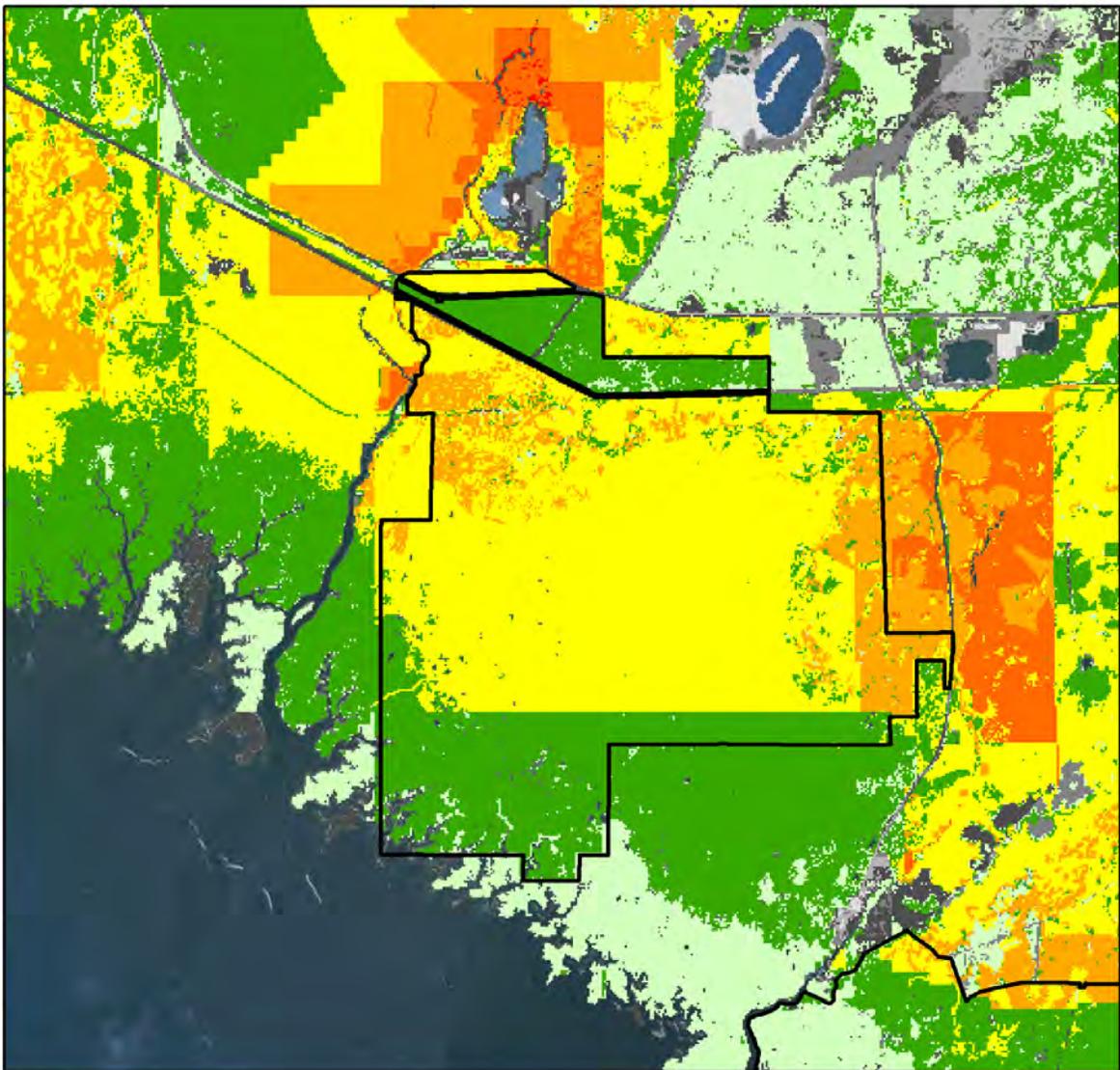


Figure 8a: IWHRs at the Snipe Island Unit of the BBWMA

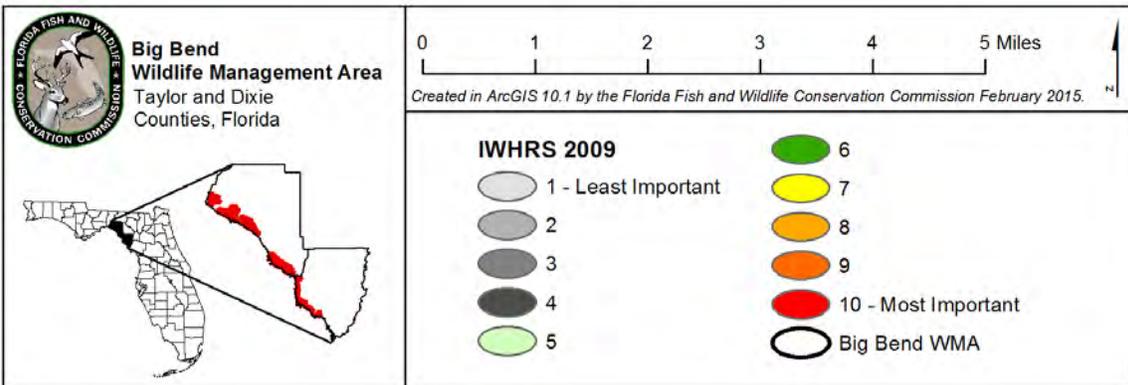
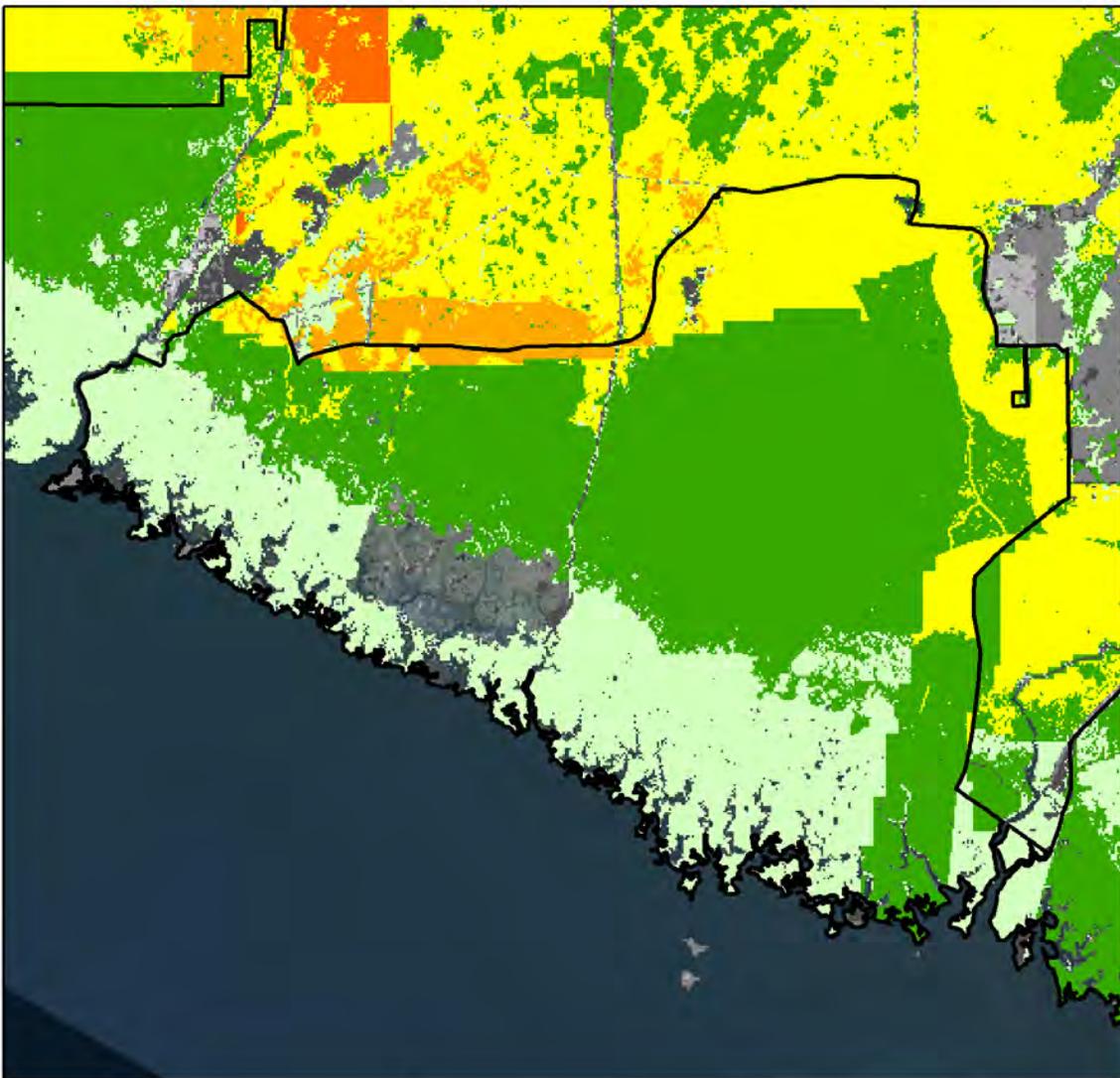


Figure 8b: IWHRs at the Hickory Mound Unit of the BBWMA

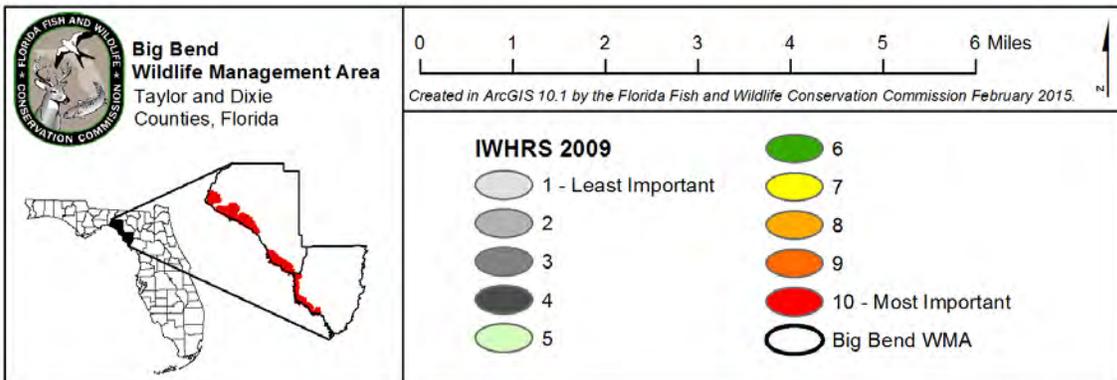
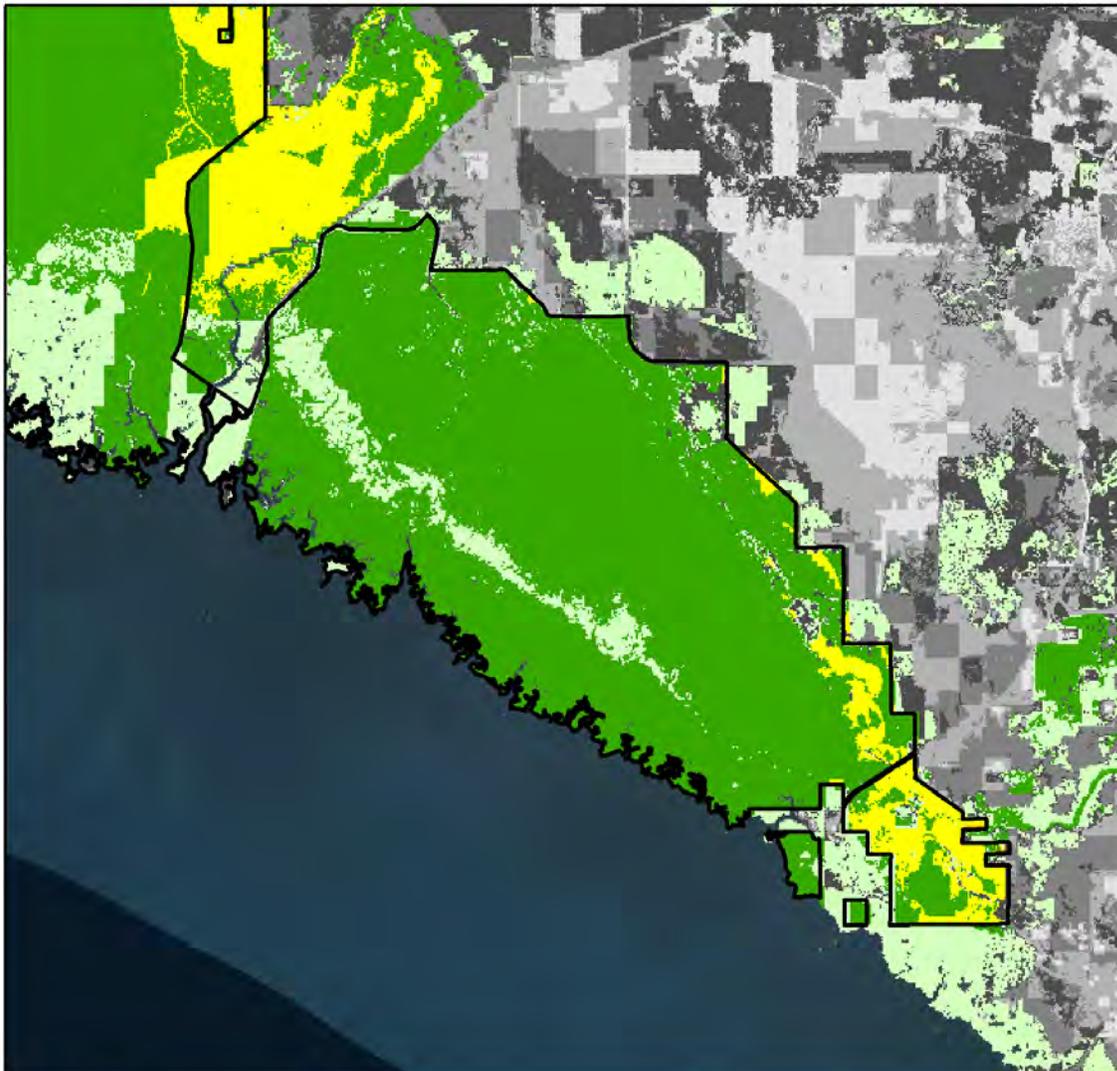


Figure 8c: IWHS at the Spring Creek Unit of the BBWMA

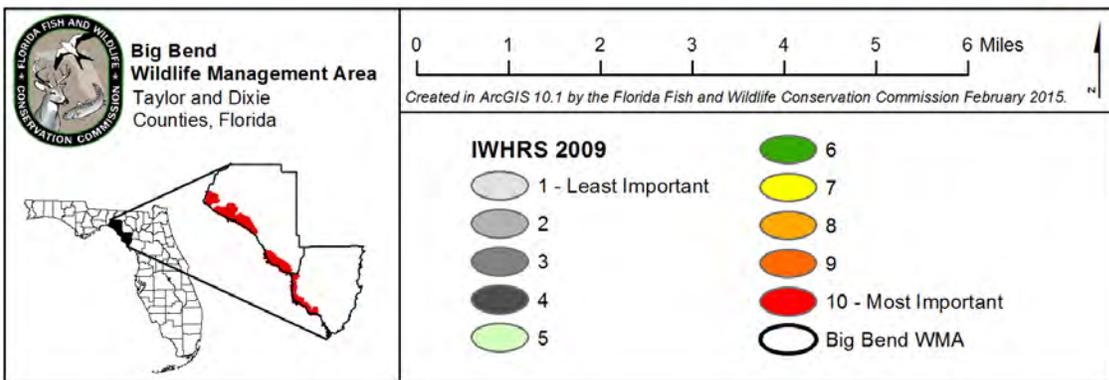
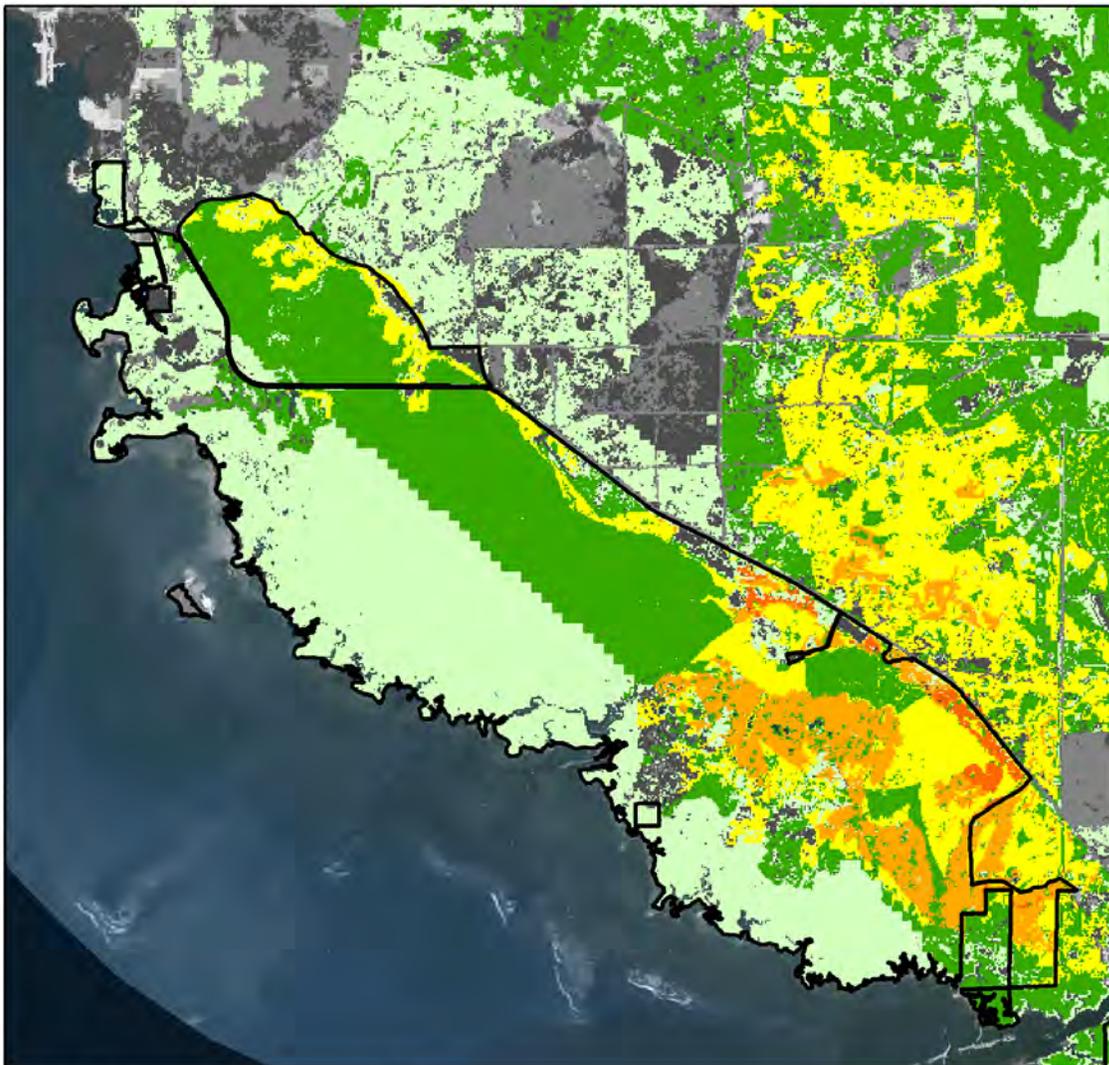


Figure 8d: IWHRs at the Tide Swamp Unit of the BBWMA

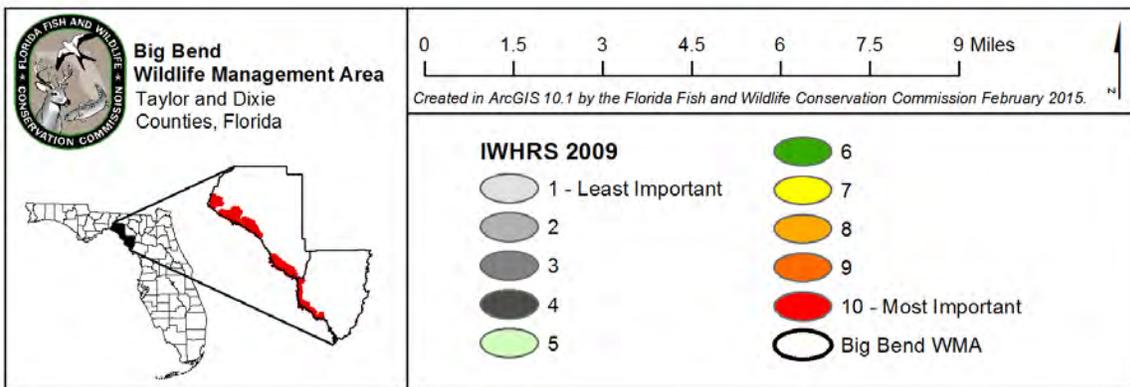
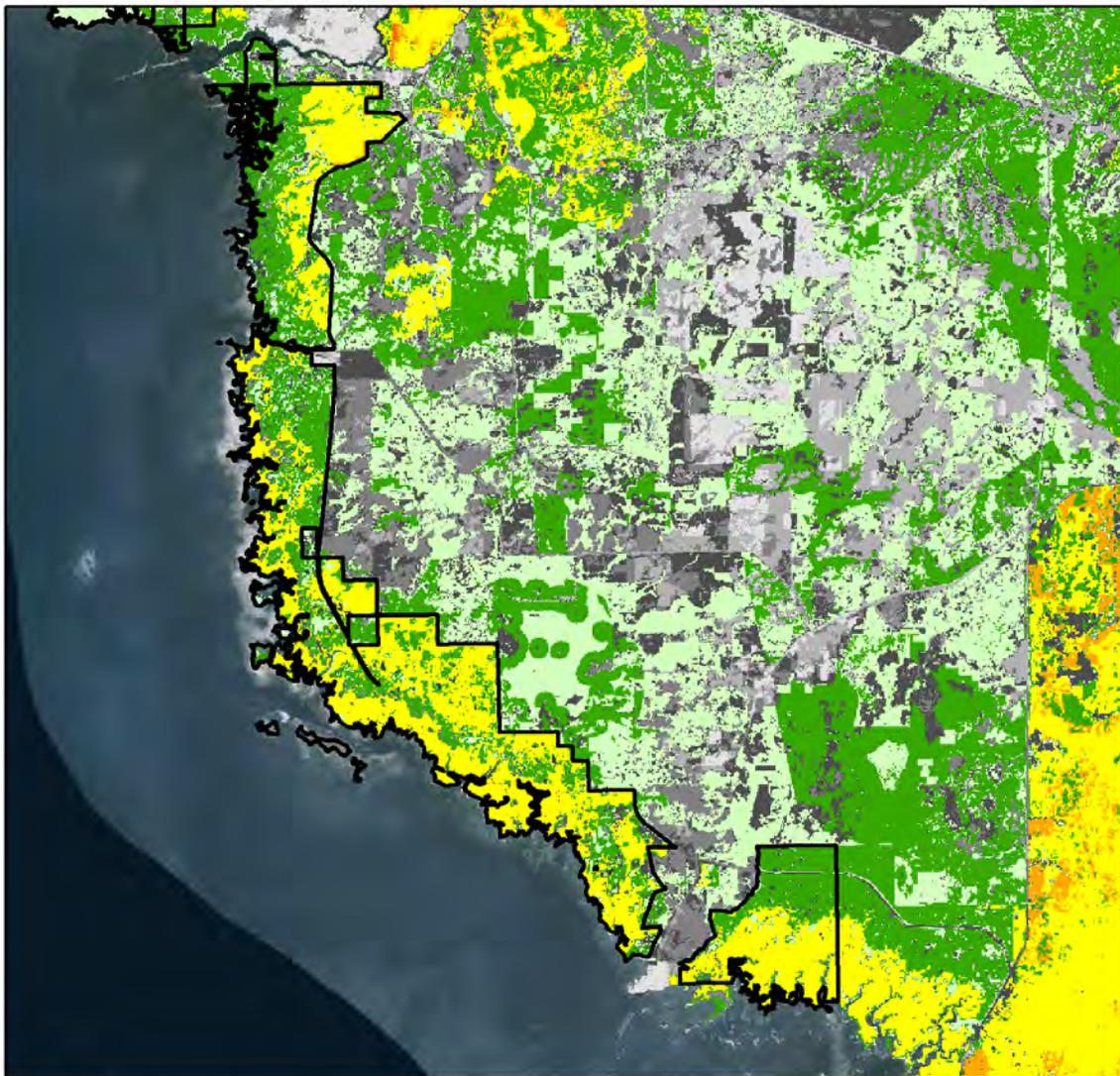


Figure 8e: IWHRs at the Jena Unit of the BBWMA

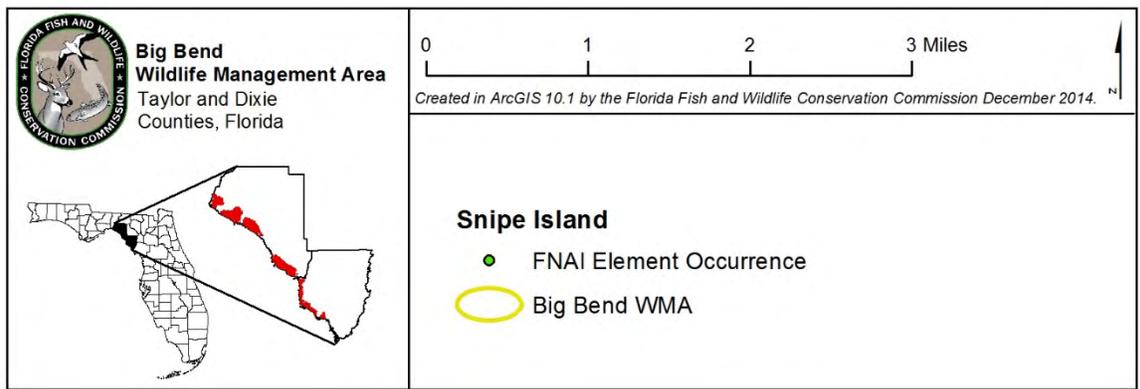
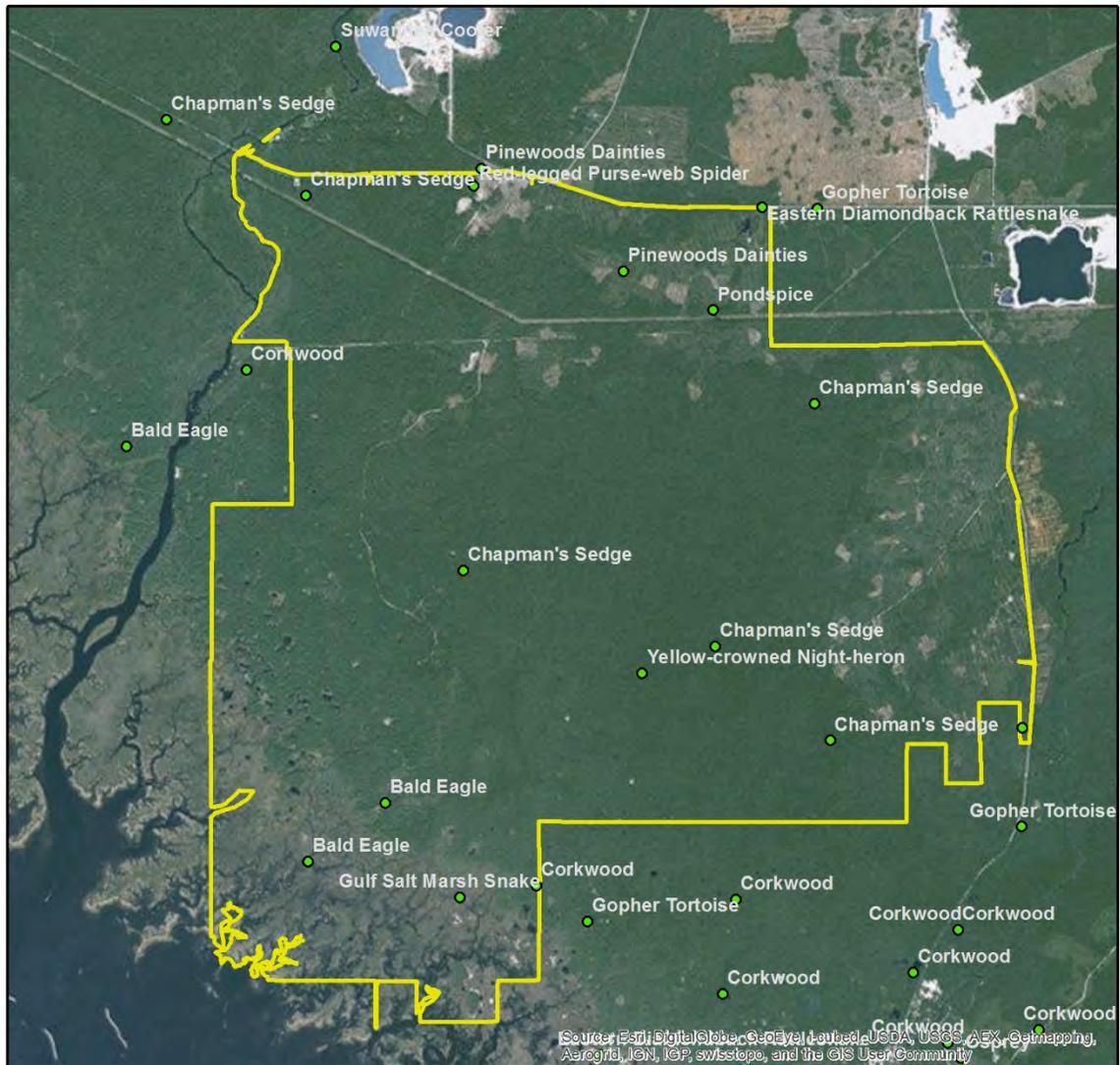


Figure 9a: FNAI Element Occurrences at the Snipe Island Unit of the BBWMA

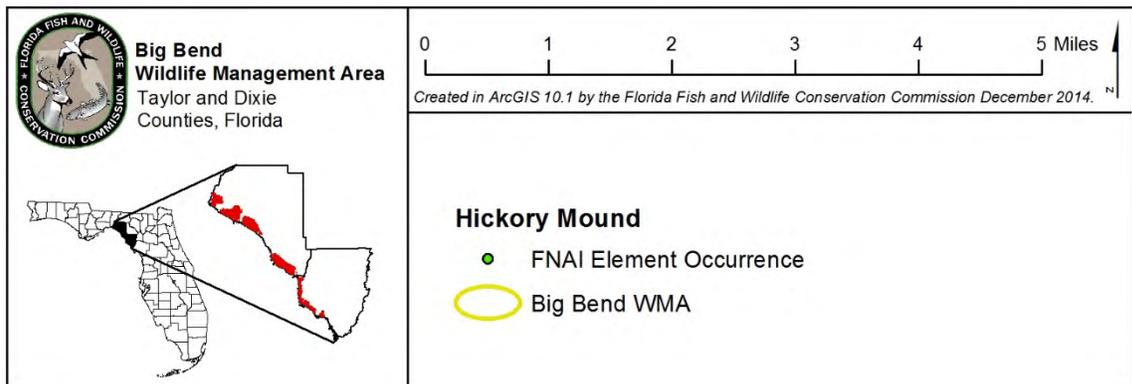


Figure 9b: FNAI Element Occurrences at the Hickory Mound Unit of the BBWMA

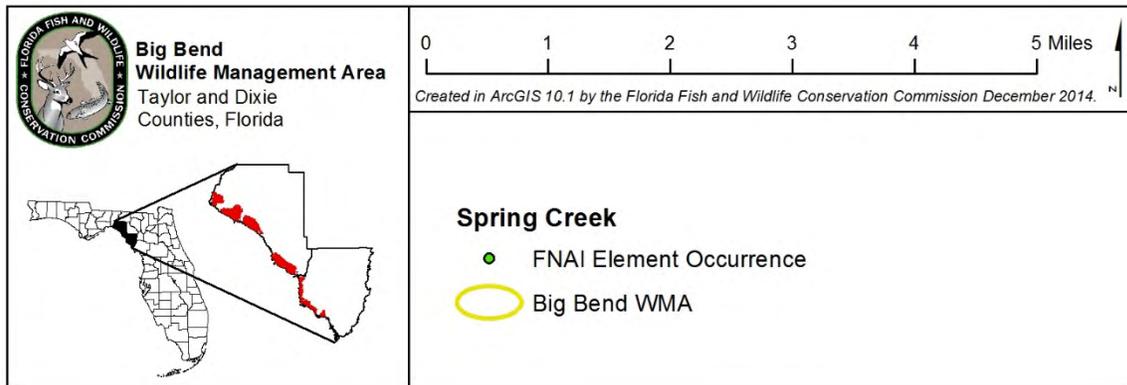


Figure 9c: FNAI Element Occurrences at the Spring Creek Unit of the BBWMA

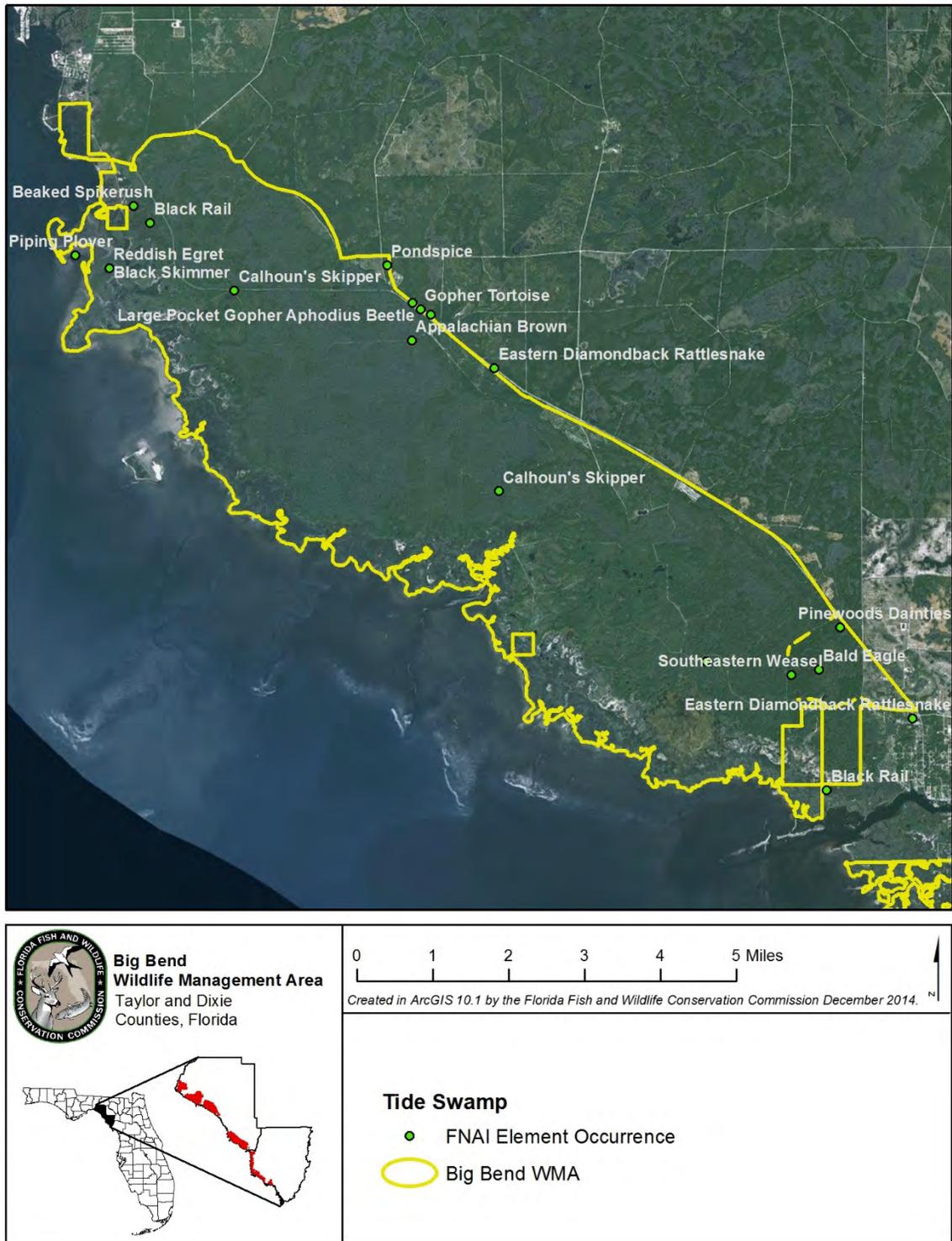


Figure 9d: FNAI Element Occurrences at the Tide Swamp Unit of the BBWMA

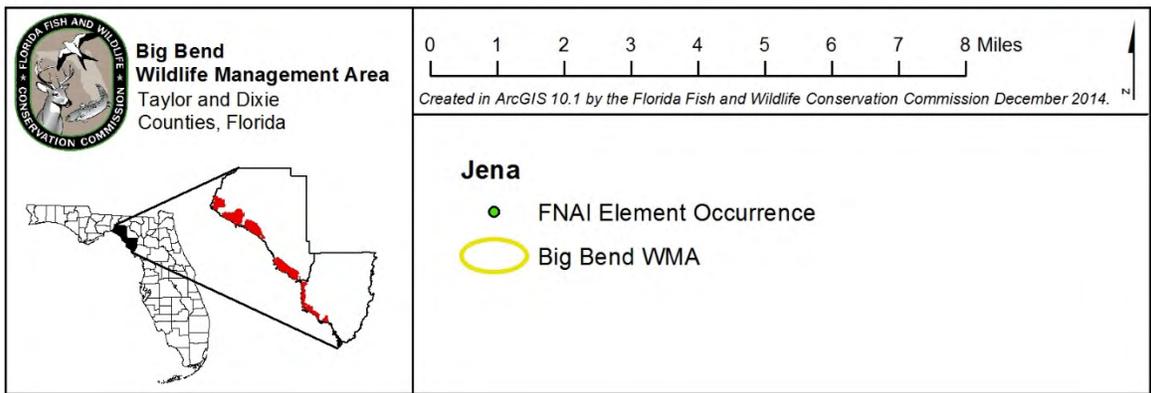
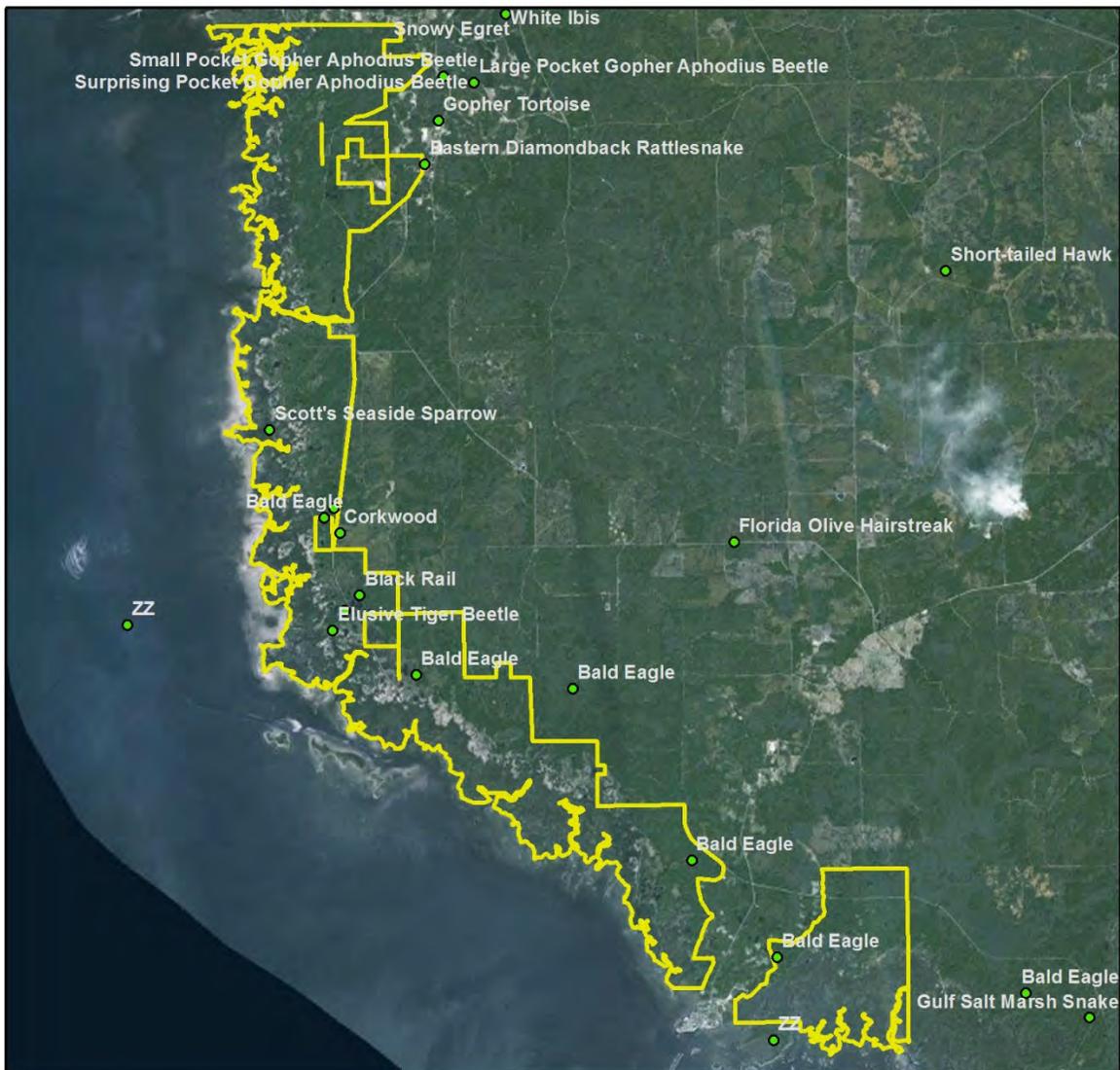


Figure 9e: FNAI Element Occurrences at the Jena Unit of the BBWMA

2.5 Water Resources

The coastal hardwood swamps along the BBWMA provide an important buffer and filter system for run-off between upland areas and the seagrass beds in the Gulf of Mexico. This filter system is very important to the quality of surface water entering the marine environment of the BBSAP. There are a few coastal brackish and freshwater ponds associated with this drainage, but they are minor in extent.

Numerous freshwater springs provide a unique habitat and constant source of fresh water that flows into the Gulf of Mexico. Hagen's, Dallus, and Big Springs are the most notable of the natural springs on the area.

An abundance of small tidal creeks and larger freshwater creeks flow through the BBWMA into the BBSAP. Among them are Butler Creek, Lolly Creek, Tripod Creek, Cow Creek, Buck Creek, Sink Creek, Days Creek, Rocky Creek, Pine Log Creek, and Porpoise Creek in Dixie County; and Biven's Creek, Salt Creek, Jack Creek, Dallus Creek, Clay Creek, Big Bear Creek, Oyster Creek, Fish Creek, Little Spring Creek, Spring Warrior Creek, Okefenokee Slough, Island Creek, Otter Creek, Brannen Creek, Eaglenest Creek, Big Spring Creek, Regular Creek, Pitts Creek, Smith-McCullan Creek, and Cabbage Creek in Taylor County (Figures 10a through 10e).

The Econfina River is bordered for several miles by state lands and features many good recreation opportunities. The Fenholloway River also flows through state conservation lands as well as privately-owned lands. All rivers, streams, and waters that are within or traverse the BBWMA are classified as Class III waters by DEP.

The DEP classification establishes criteria for water quality standards and classifies state waters according to their best use. Class III waters are classified for recreation, propagation, and maintenance of healthy, well-balanced populations of fish and wildlife. The specific criteria for Florida Water Quality Standards are described in Chapter 17.3 of the Florida Administrative Code (F.A.C.).

Within the current water quality classification system (i.e. Class III), water quality cannot be degraded to a condition lower than the minimum standards for that classification. The Outstanding Florida Waters (OFW) designation has been assigned to water bodies of the BBWMA to prevent the degradation of the water quality on natural resource lands acquired by the state. The OFW designation supersedes the water quality class system and prevents the lowering of existing water quality. Effective April 19, 1988, all waters within or adjacent to the BBWMA, with the exception of the Fenholloway River, were designated as Outstanding Florida Waters.

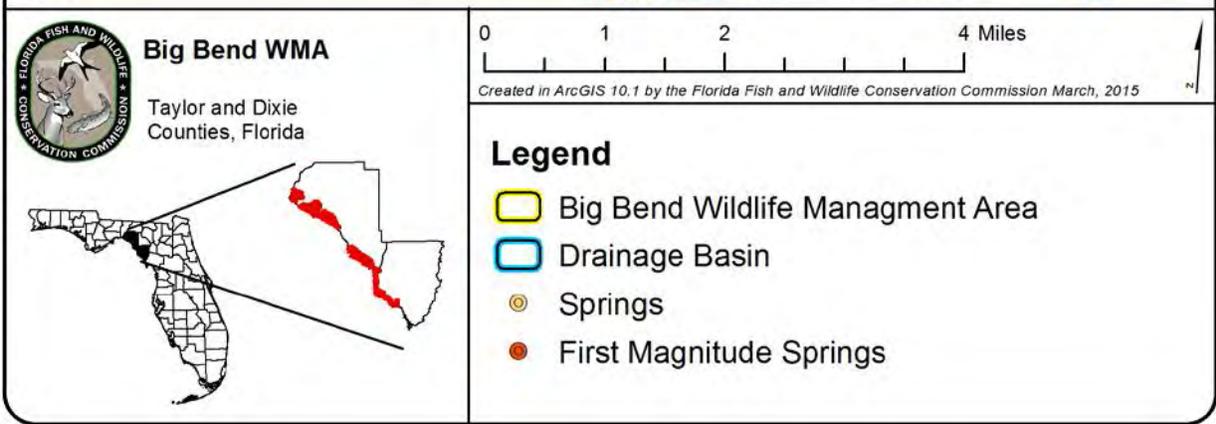
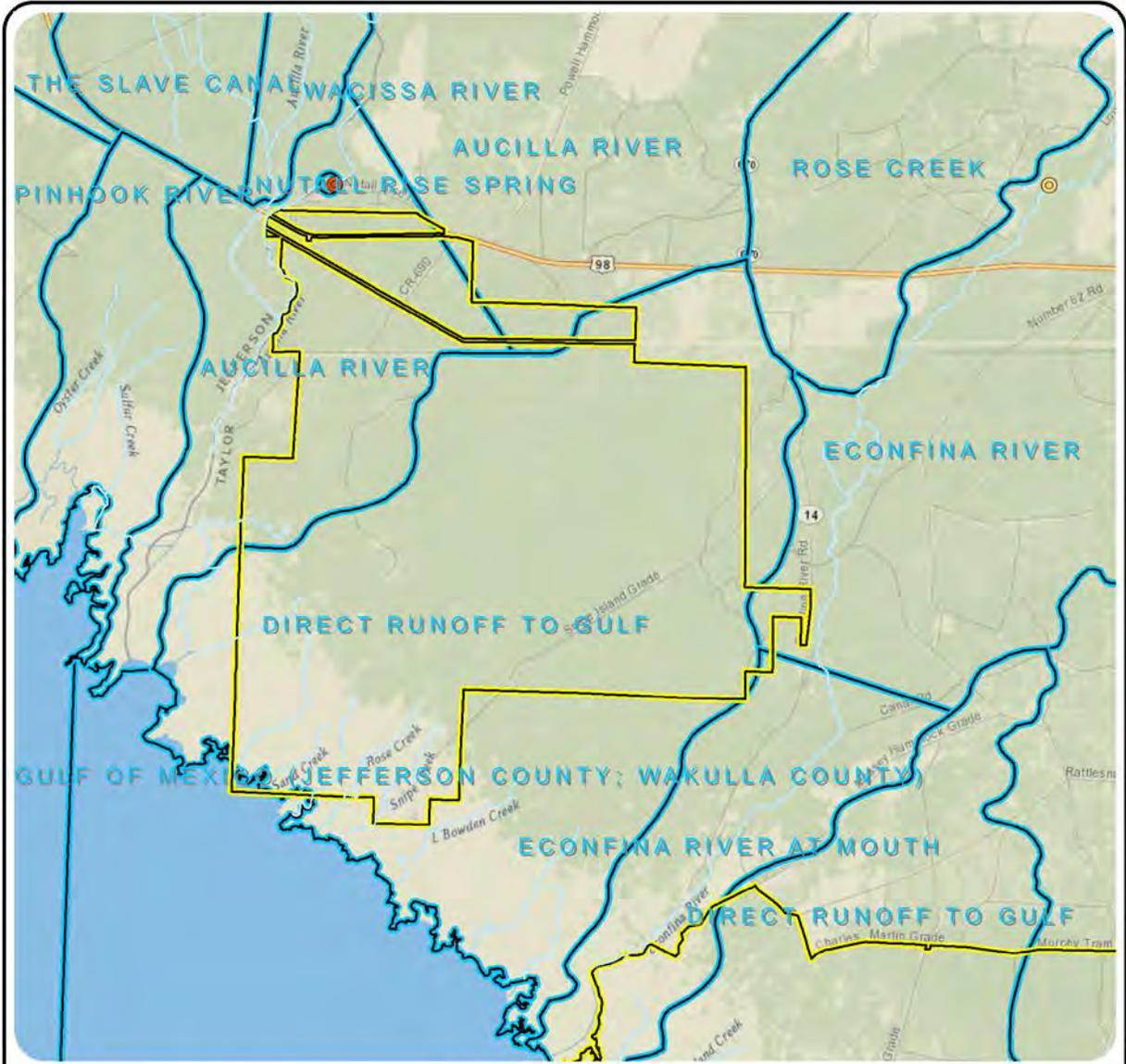


Figure 10a: Water Resources of the Snipe Island Unit



Figure 10b: Water Resources of the Hickory Mound Unit

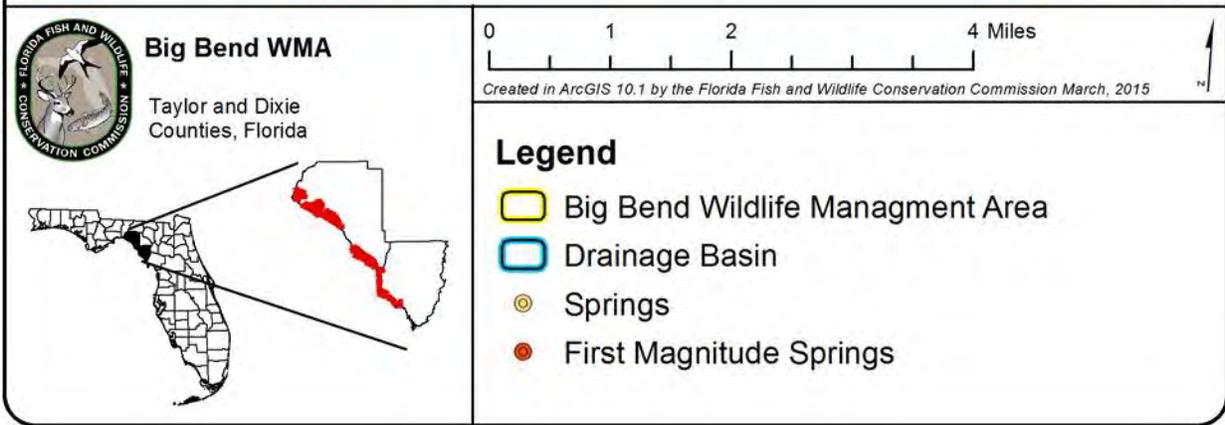
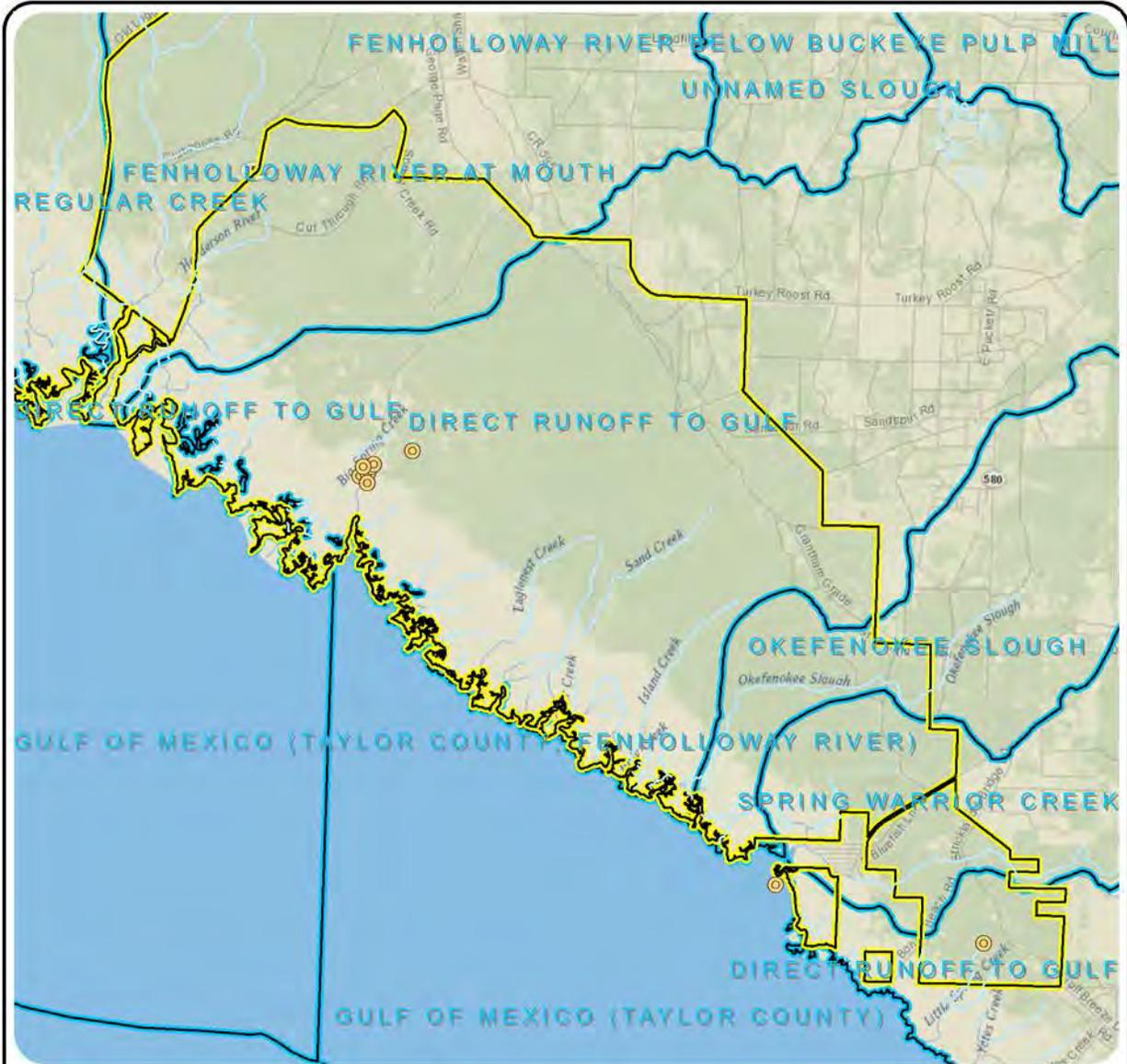


Figure 10c: Water Resources of the Spring Creek Unit

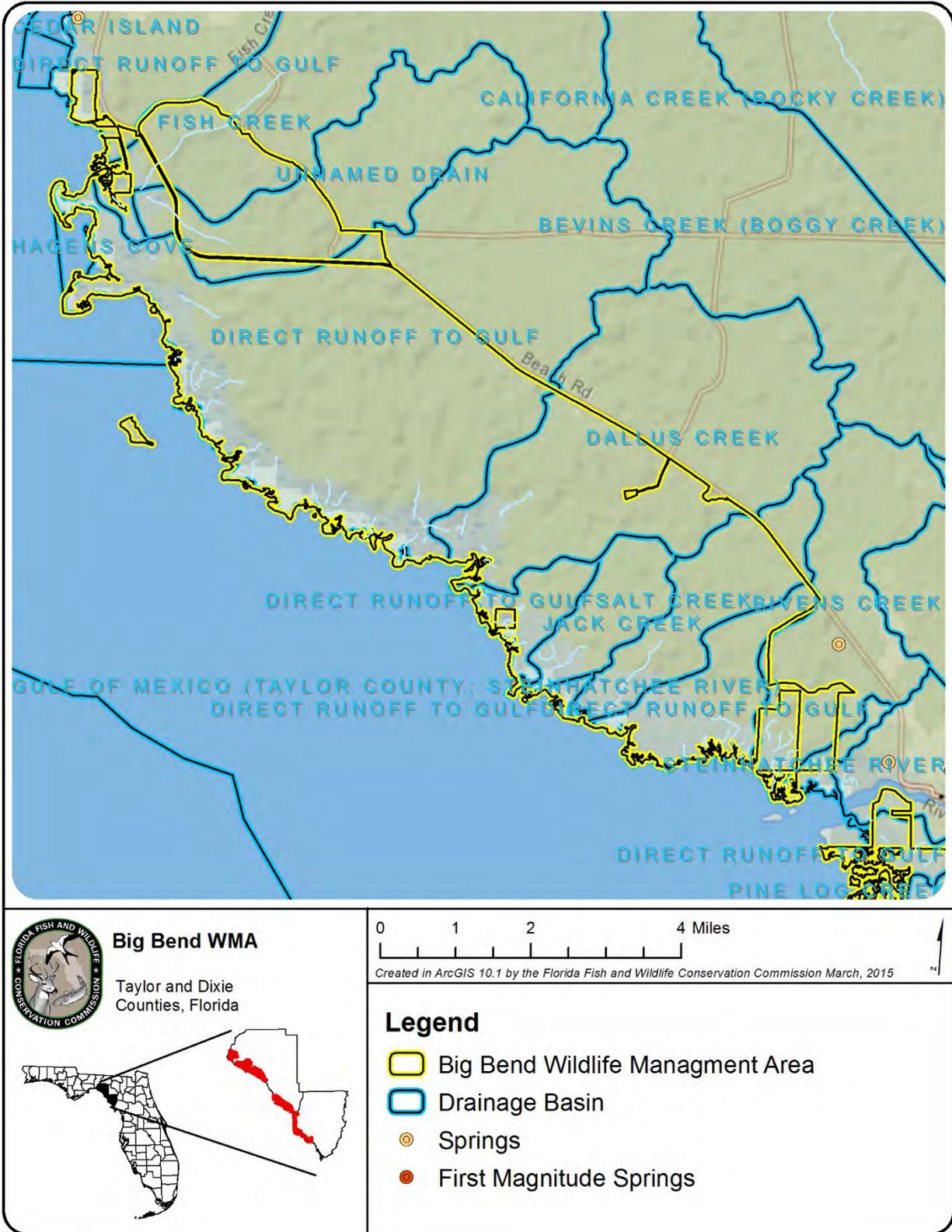


Figure 10d: Water Resources of the Tide Swamp Unit

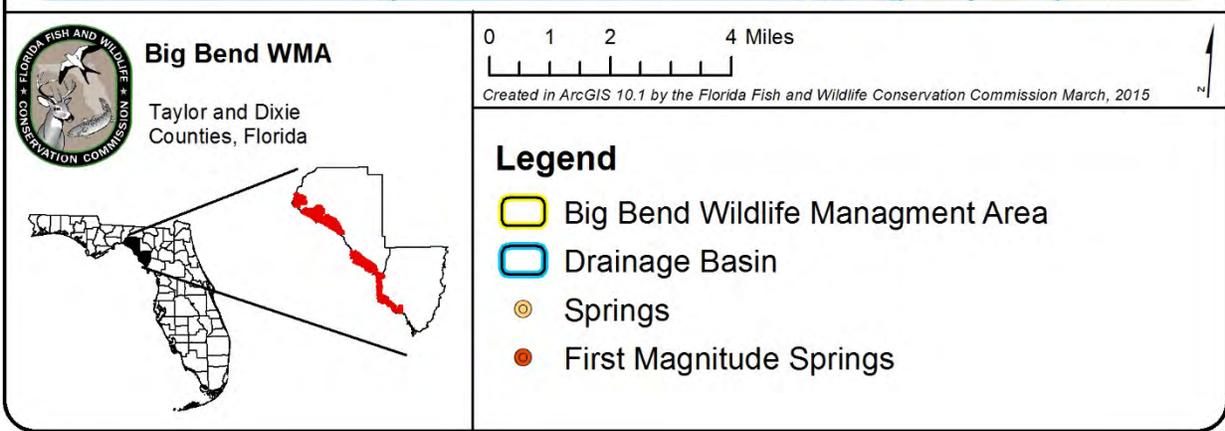


Figure 10e: Water Resources of the Jena Unit

2.6 Beaches and Dunes

Despite having over 60 miles of Gulf Coast frontage, there are no significant beaches or dunes on the BBWMA. Most of the coastline along the area is part of an extensive tidal marsh community. While there are no current beaches or dunes present on BBWMA, there is evidence of old coastal dunes that now make up some of the sandhill and scrub habitats found on the area.

2.7 Mineral Resources

The only mineral resource identified on the BBWMA at this time is lime rock deposits. Since lime rock is at or near the surface over much of the area, pits or rock mines are abundant. Within the BBWMA there are known to be seven abandoned lime rock and borrow pits that served as a source for road surfacing materials. There are three lime rock pits within the boundaries of the BBWMA that are privately owned and operated by FTLC.

2.8 Cultural Resources

The BBWMA has a rich history, and cultural resources abound on the area. One hundred ninety-one cultural and historical resources have been documented on the area (Appendix 13.6.1). These sites represent stone quarries, camps, villages, mounds, and burial sites that date back as far as 12,000 years. One notable site among many is the Garden Patch site, an ancient village site, where extensive research has been conducted. The FWC continues to cooperate with the Division of Historical Resources (DHR) to interpret the rich cultural resources history of the area and on any proposed cultural research of these sites.

The DHR observations are broken down into five categories: archeological sites, resource groups, historical structures, historic bridges, and historic cemeteries. Of the 191 documented sites, all but one are archeological sites, with one resource group, the former Scanlon Railroad line, documented at the Snipe Island Unit. All Master Site recordings, assessments, and preservation strategies will be coordinated with DHR.

2.9 Scenic Resources

The BBWMA offers stunning scenery across the breadth and depth of its coastal landscape. Panoramic vistas of the Gulf of Mexico and the adjacent tidal marshes can be viewed at numerous locations, including viewing towers at the Hickory Mound Impoundment and Hagen's Cove and at the planned Freeman Conservation Educational Facility. The Hickory Mound Impoundment also offers visitors a wonderful opportunity to view numerous species of waterfowl and wading birds along with eagles, osprey and other raptors. Inland portions of the BBWMA vary from densely-vegetated hammocks to beautiful sandhill communities.

Additionally, the FWC has developed a 13 mile scenic driving tour at the Tide Swamp Unit. This scenic road takes visitors through a verdant coastal hammock forest with resplendent wildflowers in season and a diverse, deeply shaded forest habitat that is very popular with visitors.

3 Uses of the Property

3.1 Previous Use and Development

Thousands of years before Europeans arrived; Native Americans hunted, fished, and gathered wild plants along Florida's Gulf coast. Evidence of several Native American campsites has been found within BBWMA on the same high and dry ground used as camps by 20th century hunters and fishermen. The coastal hardwood forests and the streams flowing through these lands provided rich hunting and fishing grounds for Native Americans as it does for modern Floridians. Within BBWMA are a substantial number of archaeological sites dating from 12,000 years ago to the time of Spanish exploration. Among the BBWMA's many significant cultural resource sites are the Spring Warrior and Garden Patch sites, which have had extensive and continuing research due to their significance.



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

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

The forest products industry historically has been of major importance to the BBWMA, with Taylor County being known as Florida's Forest Capital. Longleaf pine was utilized for its naval stores and high quality lumber. Live oaks provided the preferred lumber used in certain aspects of shipbuilding. The greatest exploitation of forest resources occurred after

the turn of the 20th century. In addition to extensive logging of longleaf pine, loggers moved into the hydric hammocks to begin harvesting old-growth bald cypress. This decay-resistant wood was used primarily for soda crates. In order to remove the bald cypress, railroad trams were constructed in the swamps. Many of these trams provide raised roadways for the vehicles of today's visitors, while others have grown over and are barely recognizable. Many longleaf pine stands were converted to slash, loblolly or sand pine plantations for pulpwood production.

Hunting and fishing have occurred for thousands of years prior to the area becoming a Wildlife Management Area, and these activities remain popular to this day. Natural resource-based recreation, such as sightseeing and picnicking started becoming popular in the mid-1900s. The Buckeye Cellulose Company (Buckeye) developed a recreation area at Hagen's Cove that included a pavilion, sheltered picnic tables, barbecue grills, and outhouses. Hagen's Cove became a popular site in large part due to the isolated natural beach, as well as excellent wildlife viewing and scalloping opportunities.

In the mid-1960s, Buckeye, in cooperation with the Florida Game and Freshwater Fish Commission (now the FWC), constructed a dike, which impounded approximately 1,800 acres of open marsh and timberland in the Hickory Mound Unit. Subsequent management and repair was accomplished with funding and assistance from Ducks Unlimited, the Federal Emergency Management Agency, the CARL management fund, National Fish and Wildlife Foundation, Taylor County Board of Commissioners, North American Conservation Council, and the Anderson Columbia Company. The area is popular among duck hunters and bird watchers. In addition, the impoundment provides excellent fish and crustacean habitat and is popular among crabbers and anglers.

3.2 Current Use of the Property

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

Current and anticipated resource uses of the property are diverse. Hunting continues to be a popular recreational activity on BBWMA. The area also offers excellent opportunities for bird watching, especially for wading birds. The diversity of vegetation not only harbors a variety of bird species but also provides good opportunities for mammalian and butterfly

wildlife viewing. Other uses include hiking, paddling, photography, biking, sightseeing, and horseback riding.

Due to the increase in popularity of passive, quiet outdoor activities such as hiking, paddling, and more general wildlife viewing, public use can be expected to increase as public awareness of the wide variety of fish and wildlife based public outdoor recreational opportunities available on the area increases. FWC administers hunts in the fall and spring for various game species including small game, deer, turkey, and feral hogs, which account for a little more than half of the user-days.

3.2.1 Visitation and Economic Benefits

Visitation and public use of the area for fish- and wildlife-based public outdoor recreational opportunities is the primary source of economic benefits from BBWMA, and contribute to the overall economy for the north-central region of Florida. In Fiscal Year 2013-14, an estimated 186,924 people visited the BBWMA. Primarily, as a result of this visitation and use of the area, FWC economic analysis estimates indicate that the BBWMA generated an estimated annual economic impact of \$36,523,080 for the State and the north-central region of Florida. This estimated annual economic impact has aided in the support or creation of an estimated 372 jobs.

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

3.3 Single- or Multiple-use Management

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

3.3.1 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 BBWMA. Uses classified as “Approved” are considered to be in accordance with the purposes for acquisition, as well as with the Conceptual State Lands Management Plan, and with the FWC agency mission, goals and objectives as expressed in the Agency Strategic Plan (Appendix 13.7). Uses classified as "Conditional" indicate that

the use may be acceptable but will be allowed only if approved through a process other than the management plan development and approval process (e.g., special-use permitting, managed-area regulation and rule development). Uses classified as “Rejected” are not considered to be in accordance with the original purpose of acquisition or one or more of the various forms of guidance available for planning and management:

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

3.3.2 Incompatible Uses and Linear Facilities

Consideration of incompatible uses and linear facilities on BBWMA are made in accordance with the requirements of Section 253.034(10) F.S., and other applicable Florida constitution, statute, rule, and policy requirements, as well as other provisions governing applications for proposed incompatible uses or linear facilities on state-owned conservation lands. Upon approval and implementation of this management plan, any proposed future

uses that have been classified herein as Rejected, or other proposed future uses that are determined to be incompatible with the purposes of acquisition or other management authorizations and guidance, will be forwarded for review and approval consideration to the DEP-DSL, the ARC and the Board of Trustees prior to any incompatible use or linear facility being authorized on the BBWMA.

3.3.3 Assessment of Impact of Planned Uses of the Property

To communicate FWC's planned uses and activities for the area, the agency has developed specific management intentions, long- and short-term goals with associated objectives, identified challenges, and solution strategies for the BBWMA (Sections 5 -8). 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.

3.4 Acreage That Should Be Recommended For Potential Surplus

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

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

4 Accomplished Objectives from the BBWMA Management Plan 2004 – 2014

This section is dedicated to reporting the extent to which the Objectives described in the BBWMA Management Plan 2004 – 2014 (pages 57 – 60) were successfully completed. Accomplishments for BBWMA during the previous planning timeframe are further discussed in more comprehensive detail throughout **Section 5 Management Activities and Intent** of this Management Plan.

The following **Resource Management Goals and Objectives** from the 2004 – 2014 BBWMA Management Plan describe the planned activities for BBWMA during this period. The degree to which FWC was able to accomplish the planned activities during this period is reflected as **Percent Accomplished** for each associated Objective.

Objectives Accomplished from the 2004 – 2014 Big Bend WMA Management Plan	
Goals and Objectives	Percent Accomplished
Goal 1: Protect, restore as necessary, and preserve the natural communities of Big Bend.	
Objective 1: Continue removal and restoration of off-site pine plantations. (Ongoing) <i>Comment: FWC has cut 1267 acres of sand pine, and 768 acres remain. Cut areas are at various stages of restoration. An upland restoration plan is being developed to guide future restoration before cutting the remaining portions based on available funding and resources.</i>	62%
Objective 2: Continue to construct traffic controls adjacent to gates as appropriate. (Ongoing) <i>Comment: FWC has replaced gates and installed boulders to prevent drive arounds and prevent access off of roads. FWC will continue to address this issue in the update to the Management Plan and ongoing access control management.</i>	100%
Objective 3: In cooperation with DOF, and in accord with the timber assessment and objective-based management objectives, continue thinning pine stands. (Ongoing) <i>Comment: FWC has completed the first phase of timber thinning on all slash pine stands. FWC has also completed a timber inventory on the Tide Swamp and Jena units, and is beginning to complete the 2nd & 3rd phases of timber thinning on slash pine stands.</i>	100%

Objectives Accomplished from the 2004 – 2014 Big Bend WMA Management Plan	
Goals and Objectives	Percent Accomplished
Objective 4: Continue to implement growing season burns on pine community types pursuant to the objective-based vegetative management objectives. (Ongoing) <i>Comment: FWC has shifted to implementing more growing season prescribed burns as fuel loads are adequately reduced.</i>	100%
Objective 5: By 2003 , contract with Florida Natural Areas Inventory (FNAI) to identify historic and current vegetative community types pursuant to objective-based vegetation management. <i>Comment: FWC also recertifies natural communities mapping every 5 years.</i>	100%
Objective 6: By 2004 , based on the historic vegetative analysis, identify historic hardwood stands for restoration. <i>Comment: Historic vegetation analysis has been completed. Several hydric hammocks are being restored on the Hickory Mound Unit.</i>	100%
Objective 7: By 2004 , contact the SRWMD for an assessment of the need for a hydrological study of the entire Big Bend WMA. <i>Comment: Hydrology assessments have been completed on all Big Bend WMA units, and hydrological restoration is being implemented as feasible.</i>	100%
Objective 8: By 2004 , develop a contract to survey and map exotic plant species on the Big Bend WMA. <i>Comment: Exotic plant species surveys have been completed along all road systems and disturbed areas within BBWMA.</i>	100%
Objective 9: By 2004 , formulate strategies for management based on the results of the Hickory Mound Impoundment hydro-engineering study to determine a feasible approach to upgrading the current dike system to withstand a 50-year storm event. <i>Comment: In June 2006, FWC completed a hydro-engineering study and completed construction recommendations for reinforcing the dike system to withstand a 50-year storm event.</i>	100%
Objective 10: Develop quantifiable vegetation management objectives by 2005 . <i>Comment: Through OBVM, FWC has developed quantifiable vegetation management objectives and desired future conditions for BBWMA managed habitats.</i>	100%

Objectives Accomplished from the 2004 – 2014 Big Bend WMA Management Plan	
Goals and Objectives	Percent Accomplished
Goal 2: Protect natural and cultural resources	
Objective 1: Continue covert law enforcement patrols focused on dumping, vandalism and theft or disturbance of cultural resources. (Ongoing)	100%
Objective 2: Continue to protect marine resources of the Big Bend; achieve at least 250 man-hours, through patrols directed at Gulf access points, especially during peak use seasons [trout, scallop and roe mullet seasons]. (Ongoing)	100%
Objective 3: Continue to close roads as necessary to protect natural and cultural resources (Ongoing) <i>Comment: FWC has closed several roads either seasonally or year-round where damage was occurring to sensitive habitats or where roads were in very poor shape and not conducive to vehicular access.</i>	100%
Objective 4: Continue high visibility patrols focused on illegal take of fish and wildlife and enforcement of management area regulations. (Ongoing)	100%
Objective 5: Continue to post known disturbed cultural sites, vandalized areas, dump sites and other problem sites with informational or educational signs. (Ongoing) <i>Comment: FWC continues to monitor cultural sites and report vandalism to FWC LE and DHR. In concurrence with DHR recommendations, FWC generally avoids posting notices on cultural sites as a protection measure.</i>	100%
Objective 6: In accordance with management practices recommended by DHR, continue to keep locations of undisturbed cultural sites undisclosed (Ongoing)	100%
Objective 7: As lands are added to the WMA system, we will seek to supplement law enforcement workforce in order to meet FWC staffing standards. (Ongoing)	100%
Objective 8: In order to protect the current high-quality status of natural resources on the Snipe Island Unit, achieve a level of at least 100 man-hours of directed law enforcement patrols by 2003.	100%
Goal 3: Offer Recreational opportunities consistent with the acquisition purposes of the SOC and CARL programs, and with the appropriate management of the natural communities.	

Objectives Accomplished from the 2004 – 2014 Big Bend WMA Management Plan	
Goals and Objectives	Percent Accomplished
<p>Objective 1: Continue to promote and enhance recreational hunting opportunities, including waterfowl hunting within Hickory Mound Impoundment, by maintaining parking areas, access points, trails, and boat ramps and managing the impoundment for brackish water wetland habitat attractive to waterfowl and snipe.</p> <p><i>Comment: FWC updated the Hickory Mound Impoundment management plan in 2006 in cooperation with Ducks Unlimited to better improve conditions for waterfowl as well as wading birds and marine species. Water level manipulations and prescribed fire are completed as per the management plan to promote waterfowl foods, and salinity levels are periodically monitored throughout year. Additionally, FWC continues to offer extensive hunting opportunities for all other game species on the BBWMA</i></p>	100%
<p>Objective 2: Continue to provide bank fishing access along Swartz Tram and J.C. Franklin Grade by means of mowing and brush removal.</p> <p><i>Comment: The FWC continues to mow these areas annually and conducts brush mulching to increase openings on these areas.</i></p>	100%
<p>Objective 3: Consistent with planned NBR program enhancements for Big Bend, continue to maintain, identify and mark seasonally-closed roads as hiking and biking trails on Hickory Mound and Tide Swamp Units.</p> <p><i>Comment: Trails are maintained and marked in the field, area brochures and recreational guides.</i></p>	100%
<p>Objective 4: Continue to promote wildlife viewing by developing an informational brochure detailing unique resources and opportunities throughout the area.</p> <p><i>Comment: FWC has developed recreational guides for the Tide Swamp and Hickory Mound Units. A Big Bend Birding list has been compiled. Also, portions of BBWMA have been incorporated into the Great Florida Birding Trail. Additionally, a driving tour was created in Tide Swamp, and a recreational website has been developed for each unit of BBWMA.</i></p>	100%
<p>Objective 5: By 2005, determine the feasibility of establishing a cooperative agreement with local prisons to utilize inmate labor for trimming overgrown vegetation along roadside margins.</p> <p><i>Comment: FWC has worked with DOC to use inmate labor for some management work on the area. However, due to budget constraints, there is limited capability to use this labor source currently. FWC also uses other outsource contracts to complete similar work.</i></p>	100%

Objectives Accomplished from the 2004 – 2014 Big Bend WMA Management Plan	
Goals and Objectives	Percent Accomplished
<p>Objective 6: Continue to enhance fishing and crabbing opportunities at Hickory Mound by installing additional fishing platforms and improving existing platforms by 2005.</p> <p><i>Comment: FWC has replaced and improved two crabbing platforms, and is currently working to replace another to provide better overall and ADA access.</i></p>	100%
<p>Objective 7: Continue to enhance freshwater fishing opportunities in the J.C. Franklin borrow pits by installing a fishing platform and picnic pavilion by 2005.</p> <p><i>Comment: Picnic pavilions and fishing areas have been created; additionally borrow pits were stocked with fish.</i></p>	100%
<p>Objective 8: By 2008, promote and establish non-consumptive recreational and educational opportunities consistent with the planned NBR program enhancements.</p> <p><i>Comment: New kiosk materials were created for education and wayfinding; recreational guides were developed for Tide Swamp and Hickory Mound Units to promote non-consumptive uses; a driving tour was created on the Tide Swamp Unit. Also, the FWC has developed the Big Bend Saltwater Paddling Trail.</i></p>	100%
Goal 4: Manage wildlife populations to improve recreational and educational experiences.	
<p>Objective 1: Continue to maintain at least 600 acres of wildlife openings, and develop new openings on appropriate disturbed sites, especially on newly-acquired parcels.</p>	100%
<p>Objective 2: Continue to close certain selected roads to vehicular access on a seasonal basis in order to reduce disturbance.</p>	100%
<p>Objective 3: Continue to manage Hickory Mound Impoundment for brackish water habitat attractive to waterfowl, in accordance with the FWC/Ducks Unlimited MARSH Agreement.</p> <p><i>Comment: FWC updated the Hickory Mound Impoundment management plan in 2006 in cooperation with Ducks Unlimited to better improve conditions for waterfowl as well as wading birds and marine species. Water level manipulations and prescribed fire are completed as per the management plan to promote waterfowl foods, and salinity levels are periodically monitored throughout year. Additionally, FWC continues to offer extensive hunting opportunities for all other game species on the BBWMA.</i></p>	100%

Objectives Accomplished from the 2004 – 2014 Big Bend WMA Management Plan	
Goals and Objectives	Percent Accomplished
Objective 4: Continue to utilize existing firebreaks and closed roads as wildlife openings for habitat and wildlife viewing opportunities.	100%
Objective 5: Continue to contract with private vendors for accomplishment of certain management activities to supplement current staffing. <i>Comment: Multiple contracts are effected each year to augment staffing.</i>	100%
Objective 6: As lands are added to the WMA system, we will seek to supplement the workforce in order to meet the FWC staffing standards. <i>Comment: FWC continues to supplement staff and resources consistent with legislative appropriations and budget constraints.</i>	100%
Objective 7: By 2005 , contract for construction of a Big Bend WMA office facility and equipment storage facility. <i>Comment: To date, sufficient funding has not been appropriated to accomplish this objective. In the update to the Big Bend Management Plan, FWC will continue to address augmenting office and equipment facilities.</i>	0%
Objective 8: By 2007 , establish at least one additional wildlife-viewing platform consistent with the NBR Program Enhancement Plan. <i>Comment: Multiple viewing platforms have been constructed (Hickory Mound, Spring Creek, Tide Swamp, and Jena Units).</i>	100%
Goal 5: Develop an educational program designed to inform people about the conservation and protection of the Big Bend region's natural resources.	
Objective 1: Continue to post known disturbed cultural sites, vandalized areas, dump sites, and other problem sites with informational and/or educational signs. <i>Comment: FWC continues to monitor cultural sites and report vandalism to FWC LE and DHR. In concurrence with DHR recommendations, FWC generally avoids posting notices on cultural sites as a protection measure.</i>	100%

Objectives Accomplished from the 2004 – 2014 Big Bend WMA Management Plan	
Goals and Objectives	Percent Accomplished
<p>Objective 2: Consistent with the NBR Enhancement Plan for the BBWMA, continue to recruit and support volunteer efforts to provide trail monitoring and maintenance. <i>Comment: FWC continues to develop volunteer programs and use volunteers on FWC management areas. On BBWMA, FWC has used volunteers to assist in maintaining the Big Bend Saltwater Paddling Trail and other BBWMA trails as volunteers are available.</i></p>	100%
<p>Objective 3: As lands are added to the WMA system, we will seek to supplement the workforce in order to meet the FWC staffing standards, and to implement a more aggressive educational program. <i>Comment: FWC continues to augment staffing and resource needs as feasible with multiple categories of resource operational management through outsourcing contracts. Area staff has conducted outreach and education activities in nearby communities, and FWC has used alternative delivery methods such as websites, interpretive brochures and signage to improve and enhance the educational programs related to the BBWMA.</i></p>	100%
<p>Objective 4: Consistent with the NBR Enhancement Plan, provide kiosks and informational signage by 2008 to enhance the viewing experience at wildlife openings, including those on new acquisitions. <i>Comment: FWC has constructed nine kiosks to improve education and user experiences. In addition, multiple informational signs (road signs, driving tour, etc.) have been added to improve user experiences on the area.</i></p>	100%
Goal 6: Assure an optimum boundary for Big Bend WMA by continuing to identify, support and pursue acquisition needs.	
<p>Objective 1: Maintain a current set of GIS shapefiles, acreages, and other necessary data to facilitate nominations for the FWC Inholdings and Additions Program. (Ongoing)</p>	100%
<p>Objective 2: To minimize management problems associated with multiple disjunct parcels, continue to identify certain strategic parcels for acquisition. <i>Comment: In 2012 FWC was awarded a USFWS National Coastal Wetlands Conservation Program grant to acquire coastal wetlands along BBWMA. FWC used this grant funding to acquire the Freeman tract as an addition the BBWMA Jena Unit. However, other acquisition funding has been limited; Deepwater Horizon oil spill funding proposals have been submitted to acquire priority acquisitions.</i></p>	100%

5 Management Activities and Intent

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

5.1 Land Management Review

On-site reviews of conservation and recreation lands that exceed 1,000 acres and are titled in the name of the Board of Trustees are required every five years by section 259.036, F.S. These reviews determine whether the lands are being 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 s. 259.032, F.S. According to statute, the review team "shall evaluate the extent to which the existing management plan provides sufficient protection to threatened or endangered species, unique or important natural or physical features, geological or hydrological functions or archaeological features. The review shall also evaluate the extent to which the land is being managed for the purposes for which it was acquired and the degree to which actual management practices, including public access, are in compliance with the adopted management plan."

A land management review of the BBWMA was conducted in April of 2014 and the results of that review and FWC responses to recommendations are included as Appendix 13.8. It was determined that the BBWMA is being managed in accordance with the purposes for acquisition and that management practices, including public access, are in compliance with the management plan.

5.2 Adaptive Management

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

An adaptive management process produces the strongest inference and most reliable results when experimental design components are incorporated into the monitoring process. Adaptive management is most rigorously applied in an active format when components of experimental design (i.e., controls, replication, and randomization) are included in the monitoring process.^{2, 3} Incorporating valid statistical analyses of results will further enhance the value of the adaptive management process. However, in some situations, rigorous experimental design procedures can be relaxed without invalidating monitoring results. In a passive format, adaptive management can involve applying a conservation action at a site, observing the results and adjusting the action in the future if warranted.^{2, 3}

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

5.2.1 Monitoring

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

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

For natural communities, monitoring protocols are established through FWC's Objective-Based Vegetation Management (OBVM, Section 5.3.1) program, which monitors how specific vegetative attributes are responding to FWC management. The FWC conducts a variety of wildlife monitoring and surveying on BBWMA including annual white-tailed deer spotlight surveys, black rail call back surveys, herpetological monitoring, and butterfly species diversity monitoring in conjunction with the North American Butterfly Association (NABA). Additionally, the FWC conducts waterfowl surveys on the Hickory Mound Impoundment.

For imperiled and focal fish and wildlife species, monitoring protocols are established through FWC's WCPR program (Section 5.4.2). FWC staff may monitor additional fish and wildlife species when deemed appropriate. Exotic and invasive plant and animal species (Section 5.5) are also monitored as needed and appropriate. Recreational uses are monitored through FWC's Public Access and Wildlife Viewing program, and work in conjunction with the establishment and adjustment of public access carrying capacities

(Section 5.6.3). Cultural and historical resources (Section 5.9) are monitored with guidance from the DHR.

5.2.2 Performance Measures

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

5.2.3 Implementation

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

5.3 Habitat Restoration and Improvement

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

FNAI has conducted surveys and mapped the current vegetative communities and historic vegetation communities on BBWMA. This information will be used to guide and prioritize management and restoration efforts on the area.

5.3.1 Objective-Based Vegetation Management

The FWC uses a comprehensive resource management approach to managing FWC-managed areas. Restoring the form and function of Florida's natural communities is the

foundation of this management philosophy. The FWC uses OBVM to monitor how specific vegetative attributes are responding to FWC management.

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

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

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

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

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

Initial mapping and vegetation sampling at BBWMA and other FWC areas provides FWC staff with baseline data indicating natural community structure, distribution, and condition on the area. Comparing the subsequent monitoring results to desired future conditions provides important operational information on a natural community’s vegetation structural status at a given point in time and trend over time. Using this information, managers can

evaluate, adjust and modify their management practices on BBWMA and other respective areas to meet the stated objectives. By comparing natural community mapping products through the years, managers can track progress in moving altered communities to functioning natural communities on BBWMA and other areas.

5.3.2 Prescribed Fire and Fire Management

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

Timber removal, site preparation, drainage, and lack of fire have all combined to alter the plant species composition of the area resulting in a loss of fine fuels and inhibiting the return to a more “natural” fire management regime. Site-specific combinations of



prescribed fire, mechanical and chemical vegetation control, reforestation, and restoration of natural water regimes are likely necessary actions needed to restore the area to historic natural communities.

The FWC employs a fire management regime to increase both species and habitat diversity and will continue a prescribed burning program on the BBWMA in accordance with vegetative management objectives. As

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

On some areas, prescribed burning is limited by the buildup of mid-story brush and a lack of pyrogenic groundcover fuels. This condition creates unsuitable habitat for many wildlife species. Mechanical control of brush on upland sites by roller chopping, logging, shredding,

or incidentally by equipment during commercial thinning operations, can reduce shading and encourage the grasses and forbs that are necessary to sustain prescribed fire.

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

Whenever possible, existing firebreaks such as roads and trails, as well as natural breaks such as creeks and wetlands, will be used to define burning compartments. Disk harrows, mowing, and foam lines will be used as necessary to minimize disturbance and damage created by fire plows.

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

In addition to the general prescribed fire management guidelines described above, an area-specific Prescribed Fire Plan has been developed and implemented for BBWMA (Appendix 13.16). Items covered by this plan include, but are not be limited to, delineation of burn management units, detailed descriptions of prescribed fire methodology, safety, and smoke management guidelines.

5.3.3 Habitat Restoration

Because of prior landowner alterations on the BBWMA, restoration of natural vegetative communities is a colossal task. Restoration efforts have included timber harvest, mechanical vegetation control, chemical vegetation control, prescribed burning, reforestation with appropriate pine species, and ground cover restoration. Hundreds of acres of restoration work has been completed, and area staff are continuing efforts to restore the remaining altered acreage. Due to the large overall size of the area and the extent of the habitat improvement and restoration work that needs to be done on the area, a long-term timeframe for implementation and accomplishment of DFC's on the area is required. While substantial progress has been made regarding habitat improvement and restoration on BBWMA's natural communities, much work remains to be done with some of

the most highly altered sites requiring many more years to complete habitat improvement and restoration projects on the area.

The majority of the flatwoods communities, including the mesic, scrubby, and wet flatwoods, were clear-cut of the original natural timber and then converted into industrial pine plantation by previous landowners to grow slash pine. Many of these areas were subjected to intensive disturbance from the clearcutting operations, and from site preparation activities such as bedding, possible herbicide treatments, occasional site prep prescribed fires, and mechanical planting practices. Once the slash pine trees were planted, the planted areas were allowed to develop without the introduction of prescribed fire or other mechanical treatments, which resulted in the development of robust saw palmetto and mid-story hardwood intrusions through time. The primary treatments applied to these flatwoods communities consist of timber thinning and the introduction of prescribed fire, with an ultimate goal of establishing pine stands with a basal area (BA) of 20-60 square feet/acre for flatwoods communities, depending on the productivity, soils, and hydrology of the site. Generally, a BA of 40-60 supports sufficient needle cast to carry fire and enable the introduction of prescribed burning treatments. According to FNAI, mesic and wet flatwoods are typically burned on a 2-4 year return interval, while scrubby flatwoods are burned less frequently on a 5-15 year return interval.

Usually, the first pine plantation timber thinning consists of the removal of every third or fifth row of timber, with select tree harvest in between harvest rows, to achieve a BA of 60 - 80. To date, incremental thinning has been utilized to minimize wind throw given the coastal proximity of the property and to allow adequate needle cast to support prescribed burning until an adequate herbaceous groundcover has been established. The second thinning may be a combination of tree selection schemes in the remaining rows, removing less desirable but marketable trees while leaving trees of higher quality on site to reproduce. Harvesting schemes are designed to create an uneven distribution of trees to better replicate a natural stand, and basal area targets for the second and subsequent thinnings vary depending on desired reestablishment of longleaf pine and the amount of fine fuels present for burning. If the goal is to replace off-site slash pine with longleaf pine, a flatwoods site may be heavily thinned in a real estate cut or seed tree cut, and longleaf pine seedlings are then underplanted throughout the stand, or alternatively small openings can be clearcut and then planted with longleaf pine. It is not economically feasible to remove all evidence of all past logging practices such as bedding and windrows, so ultimately, the goal of restoring a flatwoods stand from pine plantation consists of a combination of timber thinning, prescribed burning, and underplanting of native pine species as appropriate to achieve an uneven aged stand. The stand may consist of pure longleaf with a turkey oak midstory in sandhill communities, or of mixed slash and longleaf pine species, particularly in flatwoods communities, with a range of d.b.h. (diameter at breast height) measurements.

Hickory Mound and the Jena Unit have areas of pine plantation that were planted within historic hydric and mesic hammock communities through bedding and other hydrological alterations to support loblolly and slash pine plantations. On Hickory Mound, approximately 940 acres of hydric and mesic hammock were cleared of native vegetation

and planted in pines by prior landowners. In 2002, 60 acres in the Spur 5 stand were clear cut to salvage timber following a beetle infestation. In 2006, 58 acres in the Cannon Grade stand received a first third row thinning and will be scheduled for a final major thinning in the future. In 2009, 175 acres near Dees Grade and 455 acres between Mossy Hammock and Coker Roads were heavily thinned by removing the first and second rows and selectively thinning the third rows to mimic the low density of pines which occur naturally in hammock communities. The process of restoring these pine plantations to hydric and mesic hammock has been allowed to occur naturally, through the regeneration of native species. In addition, 19 loading decks, each approximately one or two acres in area, were planted with a mix of diamondleaf oaks, water oaks, and swamp chestnut oaks to accelerate natural regeneration. These oak species occur naturally in hammock communities and are all valuable to native wildlife. Three additional logging decks were planted with native blueberry and persimmon shrubs to provide additional mast for wildlife. Approximately 748 acres of hammock are in the process of being restored on this unit, leaving 192 acres of pine plantation yet to be restored.

The south central area of the Jena Unit was historically hydric or mesic hammock, basin marsh, basin swamp, depression marsh, or other wetland communities. Industrial timber companies converted 132 acres of hydric and mesic hammock into pine plantation through bedding and hydrologic alterations. At present, a timber sale is planned to conduct extreme thinning operations or clear-cuts on these acres to enable natural regeneration to restore the communities to the native species composition. Future hydrologic restorations will also be completed to further restore these areas to a more natural condition.

To facilitate the restoration of historic sandhill and scrub communities, 2,193 acres of off-site sand pine plantations have been clear-cut, primarily on the Tide Swamp and Spring Creek Units. A major impediment to the restoration of these communities is natural regeneration of sand pine, a prolific seed producer. Staff continues to contract with private vendors annually to remove invasive sand pine regeneration on 1,767 acres of restoration sites (745 acres on Tide Swamp and 1,022 acres on Spring Creek).

The primary management efforts toward restoring the historic scrub community on the BBWMA in general consist of the natural regeneration of native woody and herbaceous vegetation, removing the regenerating sandpines by hand pulling or cutting the seedlings off below the lowest branch by hand, mechanically reducing the vertical height of woody vegetation by rollerchopping, and attempting to reintroduce prescribed fire to the community. The sub-type of scrub community present on the BBWMA is coastal rosemary scrub, which historically burned on a 10-40 year return interval. Re-introduction of prescribed fire to this community has been problematic since fine fuels are typically very sparse and relatively extreme fire weather conditions are required to get fire up into the crowns of the dominant woody species, typically scrubby oaks. To date, 400 of 420 acres of historic scrub on the Spring Creek Unit have been clear-cut and are in the process of restoration including rollerchopping and prescribed burning. On the Tide Swamp Unit, 165 of the 315 acres of historic scrub are undergoing restoration treatments. The Jena Unit includes approximately 100 acres of scrub that has been clear-cut, with 62 acres being subsequently roller chopped and burned. Another experimental restoration

treatment was attempted on two blocks of scrub totaling 35 acres on the Tide Swamp Unit. Eleven openings one acre in size were created by cutting all oaks and sandpines growing there, piling them in the center of the block, and burning the piles to kill the root systems of the woody vegetation to create sandy openings within the block. The effects of this treatment are currently being evaluated.

Historically, approximately 2,198 acres of sandhill community occurred on the BBWMA, 593 acres on the Tide Swamp Unit, 1,580 acres on the Spring Creek Unit, and 25 acres on the Jena Unit. Under management for commercial timber, the native longleaf pine had been clear-cut and replaced with offsite sandpine plantations. The sandhill community requires more complex restoration treatments than flatwoods or scrub and the various blocks of historic sandhill have been subject to a variety of approaches in an attempt to evaluate the most effective methodologies. Two primary approaches to sandhill restoration have been employed. The first approach, following removal of offsite pines, involves implementing extensive management treatments to restore native sandhill ground cover, followed by hand planting containerized longleaf pine seedlings once sufficient groundcover is present to carry fire. The second approach involves first planting clusters of longleaf pine after clearcutting the site, waiting for groundcover to regenerate naturally, and then augmenting the species composition of the herbaceous vegetation with important species that had fallen out of the species assemblage in the seedbank.

Presently, all sandpines have been clear-cut from the sandhill communities on the Tide Swamp and Jena Units. On Spring Creek, 851 acres of historic sandhill have been clear-cut, leaving approximately 700 acres of sandpine that still needs to be removed. On the Tide Swamp Unit, 512.3 of the 593 acres have had one or more major restoration treatments applied, from intensive site preparation, ground cover restoration including seeding with native sandhill herbaceous species, and planting with longleaf pines. Intensive site preparation activities included stumping, root raking, disking, and grading, rollerchopping, and dragging to varying degrees between some of the sites. Some sites on the Tide Swamp and Spring Creek Units were treated with aerial applications of granulated Velpar to control the regeneration of oak species until ground cover could be established and to allow release of planted longleaf pines. A Grasslander or hayblower has been used to plant the native blend of herbaceous sandhill species. The goal of the seeding was to establish a population of wiregrass, a fire dependent and highly flammable species, to enable the reintroduction of fire to the community in a more timely manner. On the Jena Unit, a 22 acre block of sandhill was mowed, burned, and planted with 725 containerized longleaf seedlings in 2014, continuing with the restoration concept that by establishing longleaf pines, fine fuels would be created enabling the application of prescribed fire. The herbaceous ground cover that regenerates naturally will be monitored and supplemented with wiregrass in future plantings if necessary. Planting densities of containerized longleaf seedlings range from 500 to 725 trees per acre on the various sites. Cluster planting, employed on both Spring Creek and Tide Swamp sites, involves planting

500+ trees per acre in small clusters of approximately one-tenth of an acre to mimic natural regeneration. This cluster planting scheme will also better allow for augmentation of groundcover if needed in the future.

In 2009, the Coastal Plains Institute was engaged by FWC to assist FWC land managers by identifying, inventorying, and assessing the restoration needs of ephemeral wetlands across BBWMA. Ephemeral wetlands also are known as temporary ponds, Carolina bays, cypress domes, seasonal marshes, intermittent ponds, depressional wetlands, and vernal pools. There are approximately 2,500 acres of these wetlands distributed widely across the BBWMA. Historically, wildfires occurred during dry periods and burned across the Florida landscape including these wetlands. The absence of fire from an ephemeral wetland during a prolonged dry period enables the establishment of woody plants in a marsh. Woody invaders into marshes will create a shading effect over time and eliminate low-lying herbaceous vegetation through competitive exclusion. This conversion of wetland type may be a factor in the decline of some ephemeral wetland-breeding species such as the striped newt and the gopher frog as the ecological structure and function of the wetland succeeds over time.

A total of 286 wetlands were inventoried on BBWMA: 29 wetlands on Snipe Island Unit, 31 wetlands on Hickory Mound Unit, 87 wetlands on Spring Creek Unit, 69 wetlands on Tide Swamp Unit, and 70 wetlands on Jena Unit. Of these, 143 wetlands (50%) were in excellent condition with no associated disturbances or concerns. The majority of restoration concerns on BBWMA were related to encroaching woody vegetation as a result of fire exclusion by prior landowners, roads, and feral hogs. Woody encroachment affected 64 wetlands (22%), most of which was in the form of pine trees encroaching from the wetland edge. Since the encroachment of woody vegetation into wetlands due to fire suppression was the most frequently encountered restoration need, BBWMA staff initiated a series of projects using hand removal techniques and prescribed fire to reduce woody vegetation. Currently, 47 of the 64 wetlands have been treated with hand removal techniques. In addition, ephemeral wetlands targeted by the inventory are identified prior to every prescribed burn and intensive efforts are made to ignite them to ensure that those wetlands are subject to prescribed fire to help suppress further woody encroachment.

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

5.4.1 Fish and Wildlife

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

management of natural communities. As noted above, there are a wide variety of natural communities that are important to wildlife. These communities include sandhill, scrub, hydric hammock, mesic flatwoods, tidal marsh, and basin swamp, among others.

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

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

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

Concurrent with ongoing species inventory and monitoring activities, management practices are designed to restore, enhance or maintain rare and imperiled species, and their habitats. This will be further augmented by following approved Federal and FWC species recovery plans, guidelines, and other scientific recommendations for these species. Guided by these recommendations, land management activities including prescribed burning and timber stand improvements will address rare and imperiled species requirements and habitat needs. Section 5.4.2 below provides further information on FWC's comprehensive species management strategy for rare and imperiled wildlife and their respective habitats.

5.4.2 Imperiled Species: Wildlife Conservation Prioritization and Recovery

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

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

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

The WCPR program helps FWC take a proactive, science-based approach to species management on FWC-managed lands. This approach assesses information from statewide potential habitat models and Population Viability Analysis, and in conjunction with input from species experts and people with knowledge of the area, creates site-specific wildlife assessments for imperiled wildlife species and a select suite of focal species. Staff combines these assessments with area-specific management considerations to develop a wildlife management strategy for the area. Each strategy contains area-specific measurable objectives for managing priority species and their habitat, prescribes management actions to achieve these objectives, and establishes monitoring protocols to verify progress towards meeting the objectives. By providing FWC managers with information on actions they should undertake, the FWC intends for the strategy to assure the presence and persistence of Florida's endangered and threatened fish and wildlife species (see http://myfwc.com/media/1515251/Threatened_Endangered_Species.pdf), as well as selected focal species found on the area. As noted above in Section 2.3.2, the FWC completed a WCPR Strategy for BBWMA in 2012 (Appendix 13.9). More detailed habitat and species management prescriptions for imperiled and focal species on BBWMA is included in the BBWMA WCPR Strategy and associated objectives that are included in Section 6.2 below.

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

5.5 Exotic and Invasive Species Maintenance and Control

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

Exotic and invasive plant species known to occur on the BBWMA and treated annually include Chinese tallow tree, Japanese climbing fern, Old World climbing fern, and torpedo grass. Table 5, above, lists each of the species documented as occurring on the area. Exotic and invasive plant species have been identified as occurring at varying densities on approximately 231 acres of the BBWMA. However, the FWC's methodology for determining the number of acres "infested" with invasive exotic plants only represents a cumulative acreage, and does not reflect the degree of the invasive exotic occurrence. The degree of infestation among areas identified with invasive exotic plant occurrences often varies substantially by species, level of disturbance, environmental conditions, and the status of ongoing eradication and control efforts. The FWC will continue to focus treatments on areas identified as having invasive exotic plant occurrences, as well as treating any new occurrences as they are identified through continued monitoring.

Additionally, the FWC will continue efforts to control the introduction of exotic and invasive species, as well as pests and pathogens, on the BBWMA by inspecting any vehicles and equipment brought onto the area by contractors and requiring that they be free of vegetation and dirt. If vehicles or equipment used by contractors are found to be contaminated, they will be referred to an appropriate location to clean the equipment prior to being allowed on the area. This requirement is included in every contract for contractors who are conducting any operational or resource management work on the area. In this way, FWC implements a proactive approach to controlling the introduction of exotic pests and pathogens to the area.

An exotic animal species of concern on the BBWMA is the feral hog. These animals have high reproductive rates, and when populations reach high densities, feral hogs can significantly degrade natural communities through foraging activity (rooting). The FWC will consult with other regional natural resource managing agencies and private landowners to coordinate feral hog control measures as necessary. Hog populations are controlled by hunts during the wild hog-dog hunt season, archery, small game, general gun, and muzzleloading gun seasons. Trapping is another measure that may be implemented to augment ongoing feral hog control efforts and to further reduce the natural community damage and degradation caused by this species, if recreational hunting is not able to adequately control the population.

5.6 Public Access and Recreational Opportunities

5.6.1 Americans with Disabilities Act

When public facilities are developed on areas managed by FWC, every effort is made to comply with the Americans with Disabilities Act (Public Law 101-336). As new facilities are developed, the universal access requirements of this law are followed in all cases except where the law allows reasonable exceptions. Recreation facilities in semi-primitive or primitive zones will be planned to be universally accessible to the degree possible except as allowed by the ADA⁴ where:

1. Compliance will cause harm to cultural or historic sites, or significant natural features and their characteristics.
2. Compliance will substantially alter the nature of the setting and therefore the purpose of the facility.
3. Compliance would not be feasible due to terrain or prevailing construction practices.
4. Compliance would require construction methods or materials prohibited by federal or state statutes, or local regulations.

5.6.2 Recreation Master Plan

The FWC has adopted a comprehensive approach to the planning and administration of fish and wildlife resource based public outdoor recreational opportunities for BBWMA. To accomplish this, FWC will work with recreational stakeholders and the general public to develop a Recreation Master Plan for BBWMA that will be used to further design and develop appropriate infrastructure that will support the recreational use of the area by the general public. This Recreation Master Plan will include planning for parking, trail design, and area resource interpretation.

5.6.3 Public Access Carrying Capacity

Baseline carrying capacities for users on FWC-managed lands are established by conducting a site specific sensitivity analysis using available data for the site. The intent of the carrying capacity analysis is to minimize wildlife and habitat disturbance and provide the experience of being “immersed in nature” that visitors to FWC-managed areas desire. Carrying capacities are just a first step; management of recreational use requires a means of monitoring visitor impacts. Responding to these impacts may require adjusting the carrying capacities as necessary. The carrying capacities generated through this process are used as a tool to help plan and develop public access, wildlife viewing, and fish and wildlife resource based public outdoor recreation opportunities.

Based on an analysis of the overall approved uses and supported public access user opportunities, and the anticipated proportional visitation levels of the various user groups, FWC has determined that BBWMA can currently support 2,019 visitors per day. However, an objective to construct or improve facilities resulting in an increase of the public access carrying capacity has been proposed in Section 6.5 of this Management Plan.

Still, it is important to note that public access carrying capacities are not developed to serve as a goal for expanding the public use of a particular area to match the established carrying capacity. Rather, they are developed to establish maximum thresholds for public use of the respective area in order to protect the natural and cultural resources on BBWMA and to ensure that visitors will have a high-quality visitor experience. The public access carrying capacity will be periodically reevaluated, and additional capacity may be contemplated as part of the Recreation Master Plan development and implementation process.

5.6.4 Wildlife Viewing

Wildlife viewing opportunities abound at BBWMA. Observation towers, viewing platforms, and interpretive facilities have been developed at strategic locations to encourage wildlife viewing activities. The Hickory Mound, Tide Swamp, and Jena units are home to stops along the Great Florida Birding Trail. Additionally, the Tide Swamp Unit's scenic driving tour also provides visitors opportunities to view wildlife. At these designated locations and throughout the area, the observant and quiet visitor will likely be rewarded with ample wildlife observations. Furthermore, the BBWMA is nationally recognized for its outstanding butterfly watching opportunities.

5.6.5 Hunting

As noted earlier, hunting has long been a traditional and popular use on the area. Hunters have the opportunity to harvest deer, feral hog, turkey, and small game at BBWMA. Archery and general gun seasons are very popular. The BBWMA also offers a trapping season for furbearers.

5.6.6 Fishing

Fishing and crabbing are popular recreational activities, and the area remains open to these uses. Freshwater habitats on the BBWMA support many species of game fish, including largemouth bass, catfish, and several sunfish species. The BBWMA provides access to the Gulf of Mexico at several locations via boat ramps that are frequented by saltwater anglers. Additionally, the FWC has constructed fishing platforms at the Hickory Mound Impoundment, Spring Warrior Creek in the Spring Creek Unit, and Pine Log boat ramp at the Jena Unit to provide land-based fishing opportunities. Access to these sites is regularly maintained, and access points are upgraded as necessary.

5.6.7 Boating

While most water bodies on the BBWMA do not support boating, the BBWMA contains several popular boat ramp facilities that provide boaters with access to the Gulf and

saltwater creeks. These boat ramps also provide paddle sport enthusiasts with access to the Big Bend Saltwater Paddling Trail, which runs along the coastline of the BBWMA. As noted earlier, paddling on this trail is increasingly being enjoyed by visitors looking for a wilderness-like eco-adventure along the BBWMA's rugged coastline, rivers, and streams.

5.6.8 Hiking

Numerous trails exist on the BBWMA. These trails serve the needs of a variety of users. However, many trails are dead ends and are primarily used by hunters who wish to access the interior portions of the management units.

Hiking opportunities are available on all roads and trails on BBWMA. A designated, marked hiking trail is currently available at the Dallus Creek area of the Tide Swamp Unit. Opportunities exist to develop trail segments within other units and will be explored through the Recreation Master Plan.

5.6.9 Bicycling

Bicycling is permitted on all roads that are open to vehicles. Popular biking routes on the area include the dike road around the Hickory Mound Impoundment, and the Tide Swamp Driving Tour.

5.6.10 Equestrian

Equestrian activities are permitted on all roads and trails on the BBWMA. While riding horses has not been popular on the area to date, equestrian users may enjoy riding the dike road around the Hickory Mound Impoundment or the Tide Swamp Driving Tour. Currently, equestrian trailer parking is limited on the area. However, the FWC is evaluating the feasibility and need for establishing increased equestrian parking on the area.

5.6.11 Camping

Camping is not permitted on the BBWMA except at designated sites along the Big Bend Saltwater Paddling Trail. Paddlers must obtain a permit before using the camp sites. Camping opportunities are available on nearby state parks and at privately-owned campgrounds.

5.6.12 Geocaching

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

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

5.6.13 Environmental Education

5.6.13.1 Interpretation

The BBWMA offers several interpretive kiosks to educate visitors about the numerous cultural and natural resources found on the area. A BBWMA bird list has been created for bird watching enthusiasts. Recreational brochures have been created for Hickory Mound and Tide Swamp units, and a brochure has been created for the Tide Swamp Driving Tour. Also, an area website is maintained to provide educational information, as well as information about recreational opportunities.

5.6.13.2 Programs

No regularly occurring educational or recreational programs are currently taking place at BBWMA, but area staff conduct various programs on occasion upon request as feasible. However, the FWC and Dixie County are planning to expand conservation education opportunities on the area through the joint development and management of the recently acquired Freeman House located on the Jena Unit.

5.7 Hydrological Preservation and Restoration

All five units of the BBWMA share the same general hydrological characteristics, with drainage of the units occurring in a westerly to southerly pattern. Many of the roads that traverse the BBWMA alter the historical flow of water across the area. The BBWMA contains many natural streams, as previously discussed in section 2.5. There are also numerous areas of poorly drained freshwater wetlands and salt marshes.

The Hickory Mound Unit of the BBWMA contains the an impoundment, which is comprised of open marsh and hardwood forests. As described above, this impoundment was developed cooperatively by the former GFC, now FWC, and the Buckeye Company prior to the State acquiring the area in order to improve waterfowl and wading bird habitat in this region. Also, as described above, the FWC continues to partner with DU to restore and maintain the impoundment. Management within the impoundment involves water level and salinity manipulations as well as prescribed fire treatments. This management benefits many fish and wildlife species, including waterfowl and other wetland-related species. Appendix 13.10 of this management plan contains the management plan for the Hickory Mound Impoundment.

5.7.1 Hydrological Assessment

A hydrological assessment of the BBWMA, excluding the Snipe Island Unit, was completed in June 2007, while a hydrological assessment for the Snipe Island Unit was completed in October 2009 (Appendix 13.11). These assessments found that many culverts intended to help water flow under roads were in need of repair or replacement. The assessments also suggested removing abandoned roads to restore historic drainage patterns, and installing new culverts and low water crossings in appropriate locations. Many of the recommendations presented in the hydrological assessments have already been implemented.

5.8 Forest Resource Management

As described above, the FFS completed a Timber Assessment for the area in 2015. Additionally, more detailed assessments of the timber resources of the Tide Swamp and Jena units of the BBWMA were conducted by The Forestry Company, a contracted professional forester from Perry, Florida during 2014 (Appendix 13.4.2). The management of timber resources will be considered in the context of the Timber Assessment and the overall land management goals and activities.

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

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

5.9 Cultural and Historical Resources

Procedures outlined by DHR will be followed to preserve the cultural and historic sites of BBWMA. The FWC will consult with DHR in an attempt to locate any additional cultural and historic features on the area. In addition, FWC will ensure management staff has

DHR Archaeological Resources Monitoring training. The FWC will refer to and follow DHR's Management Procedures for Archaeological and Historical Sites and Properties on State-Owned or Controlled Properties for management of these resources, and prior to any facility development or other ground disturbing activities. Furthermore, as appropriate and necessary, FWC will contact professionals from DHR for assistance prior to any ground-disturbing activity on BBWMA.

To date, the DHR Master Site File indicates 191 known cultural sites on BBWMA. The FWC will submit additional cultural sites on BBWMA to DHR for inclusion in their Master Site File in the event any are located. In cooperation with DHR, 22 of the overall known cultural sites on BBWMA have been identified as meeting the DHR's special criteria for annual monitoring and reporting; FWC will continue to monitor and report on these sites annually. FWC will also continue to monitor the remaining 169 sites that are located on the area on a rotating, regular basis.

5.10 Capital Facilities and Infrastructure

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

Current facilities on BBWMA include eight check stations, five storage facilities, seven kiosks, five fishing platforms, two wildlife viewing towers, 20 table shelters, and one vault toilet (Figures 11a through 11e). Additionally, the area has 231.5 miles of roads, 92.6 miles of paddling trails, eight boat ramps, 111.4 miles of trails, and a 13.5 mile driving tour. New facilities planned to be developed on the area during this planning cycle include an office facility, four small storage facilities, four interpretive kiosks, entrance packages at Garden Patch and Horseshoe Beach, and four new trails including a through trail connecting all five units (Section 6.9.9).

As described in Section 2.4.1 of this Management Plan, for any public facilities that are developed on areas managed by FWC, every effort is made to comply with the Americans with Disabilities Act (Public Law 101-336).

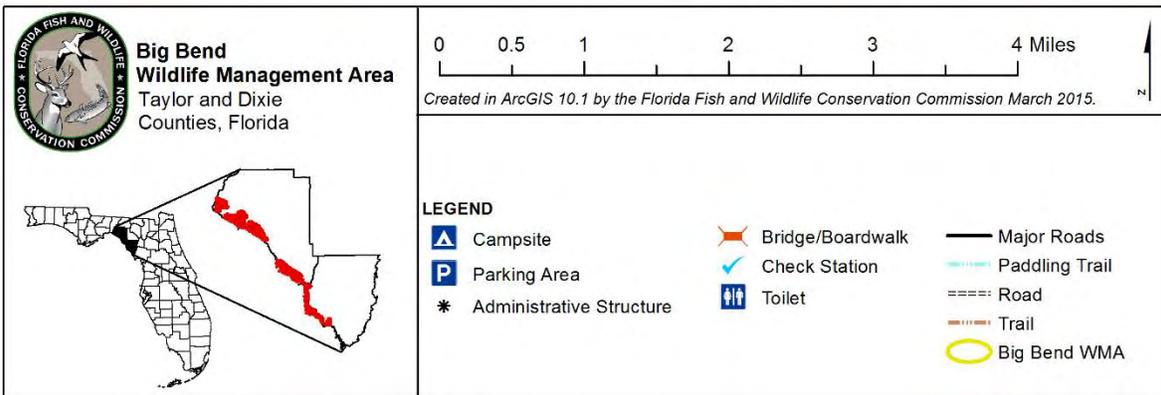
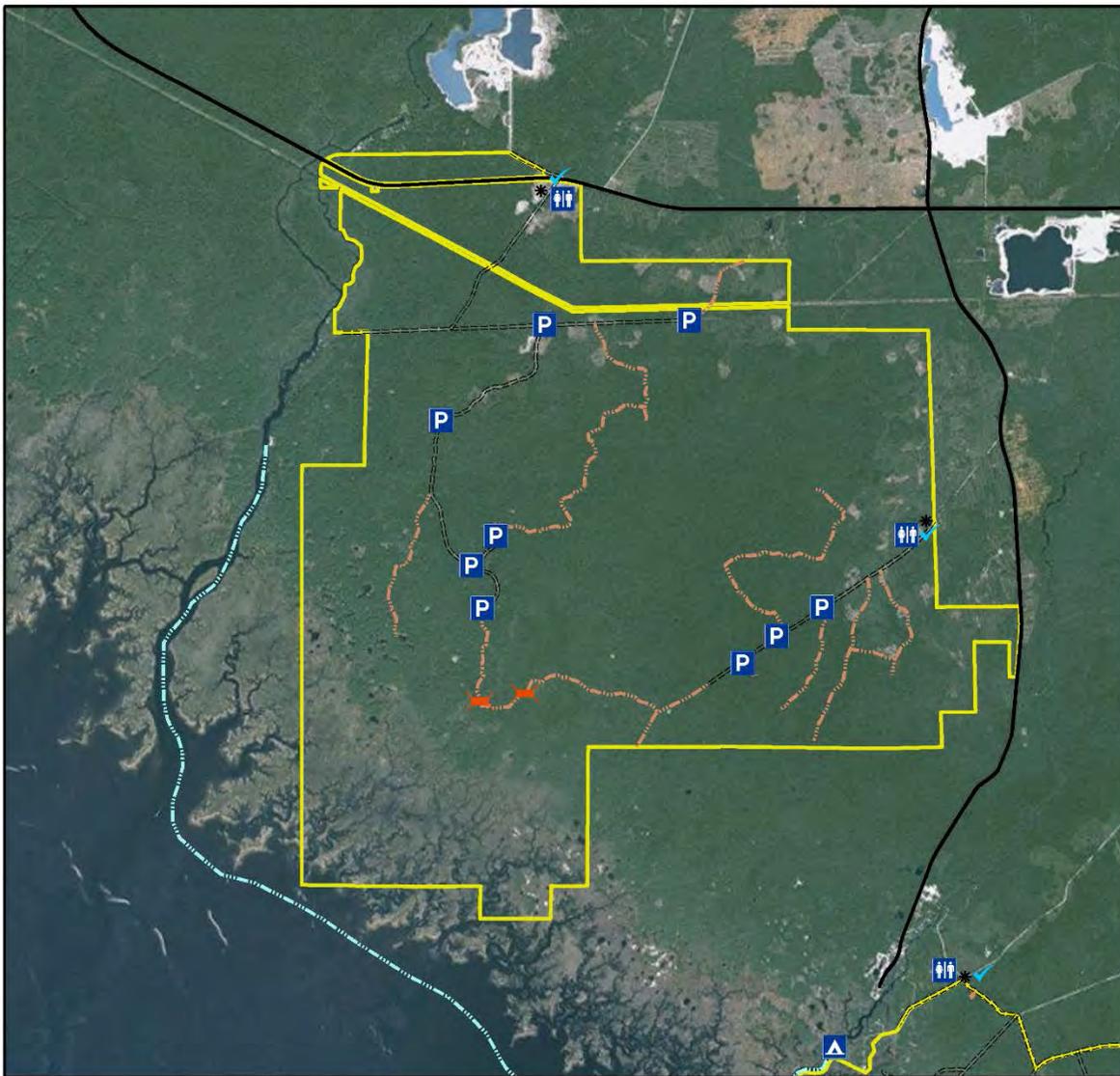


Figure 11a: Facilities on the Snipe Island Unit of the BBWMA

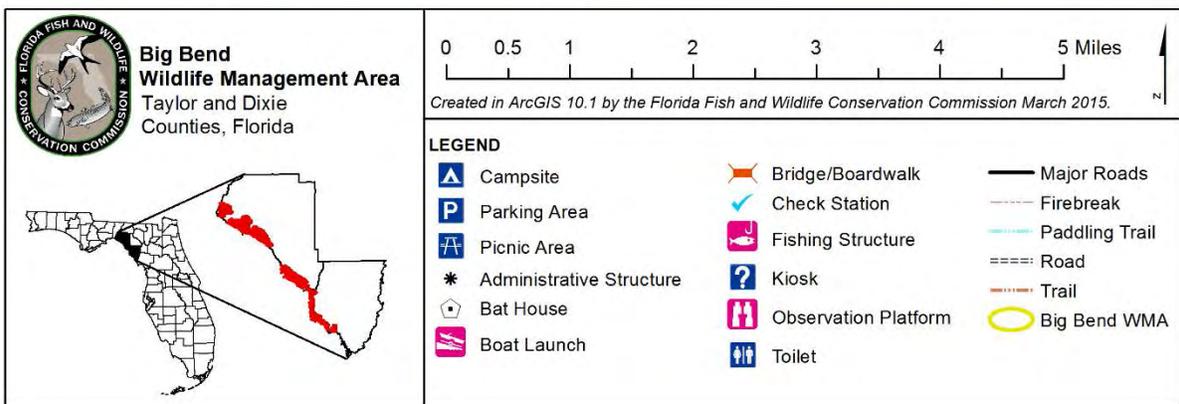
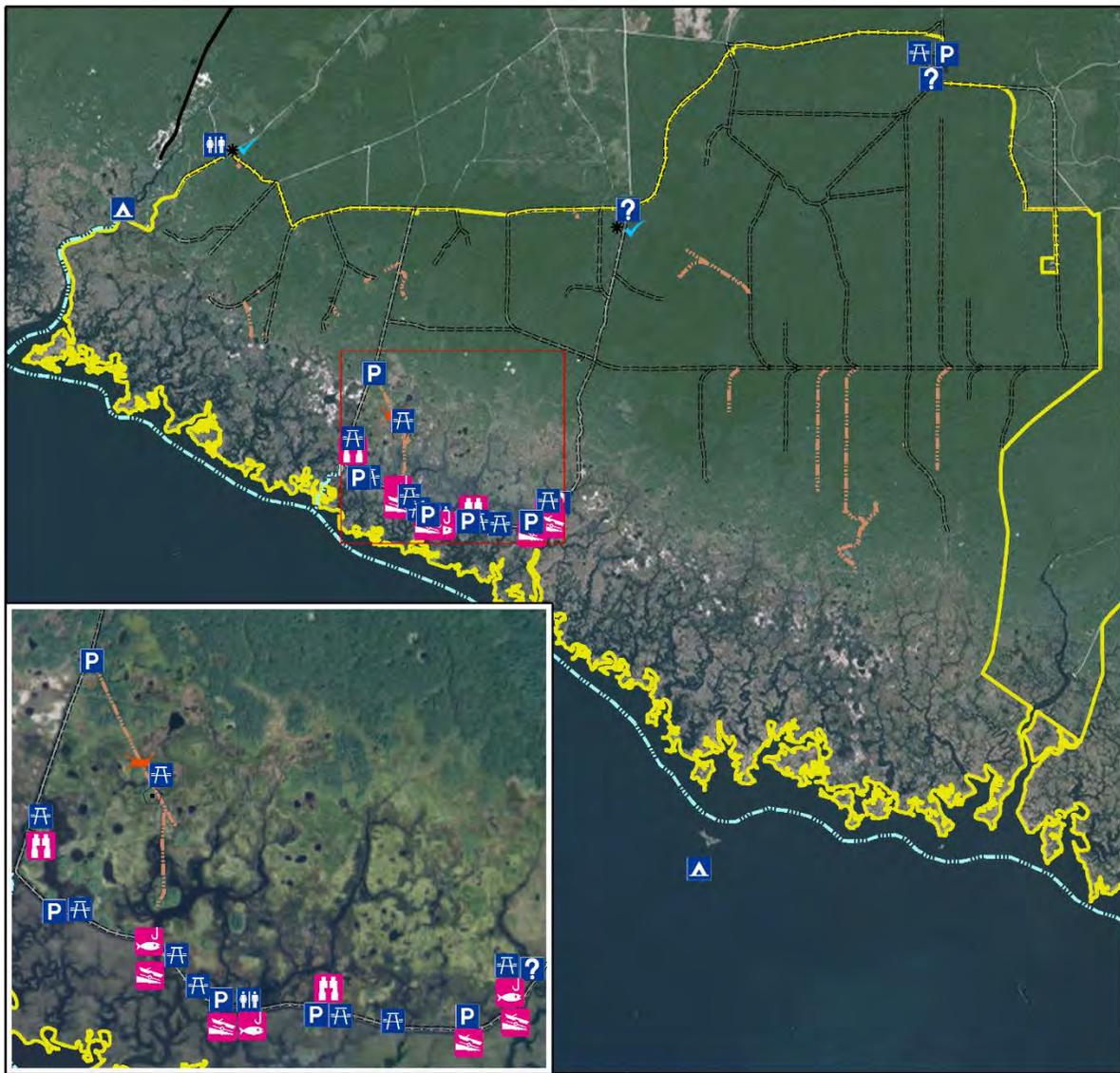


Figure 11b: Facilities on the Hickory Mound Unit of the BBWMA

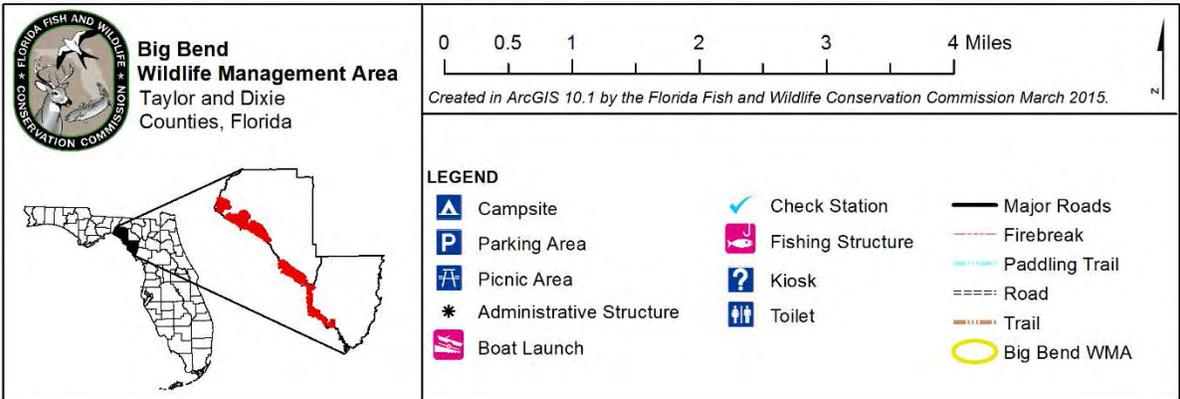


Figure 11c: Facilities on the Spring Creek Unit of the BBWMA

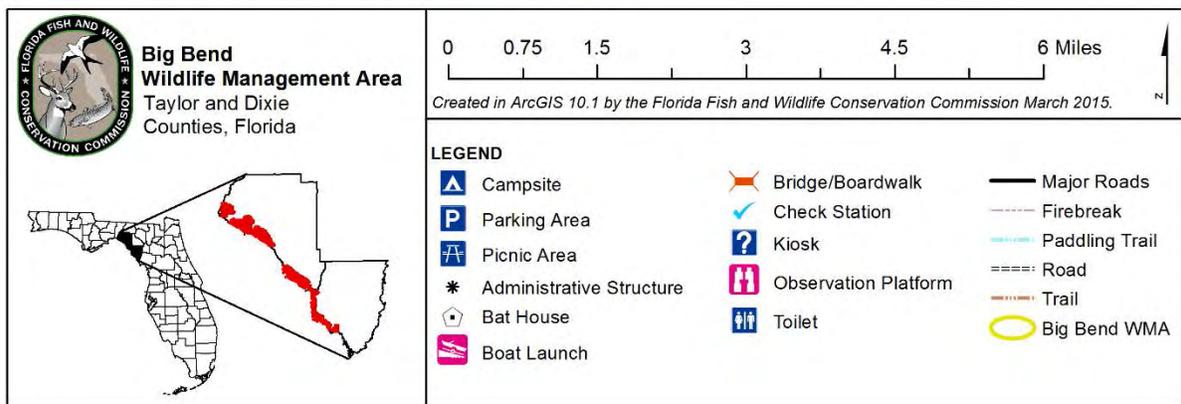
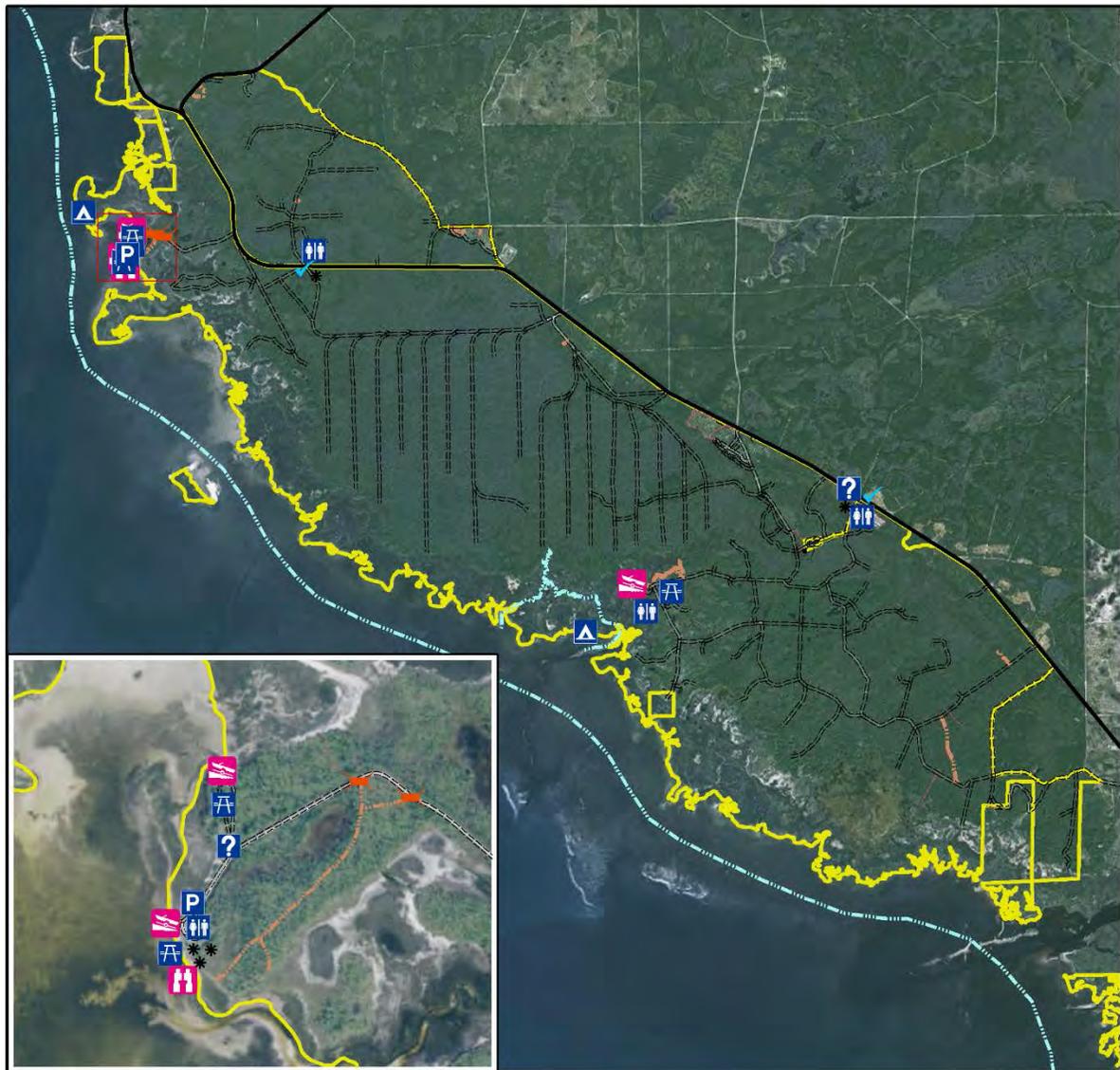


Figure 11d: Facilities on the Tide Swamp Unit of the BBWMA

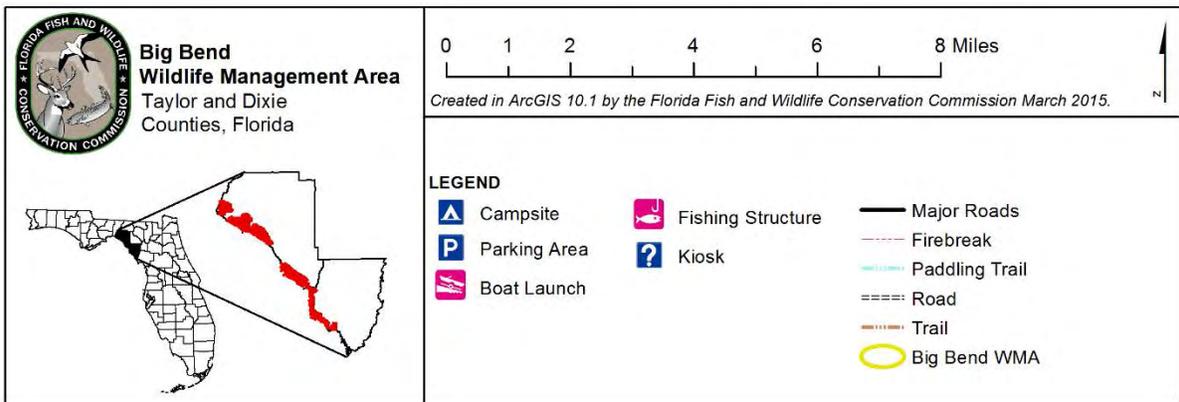
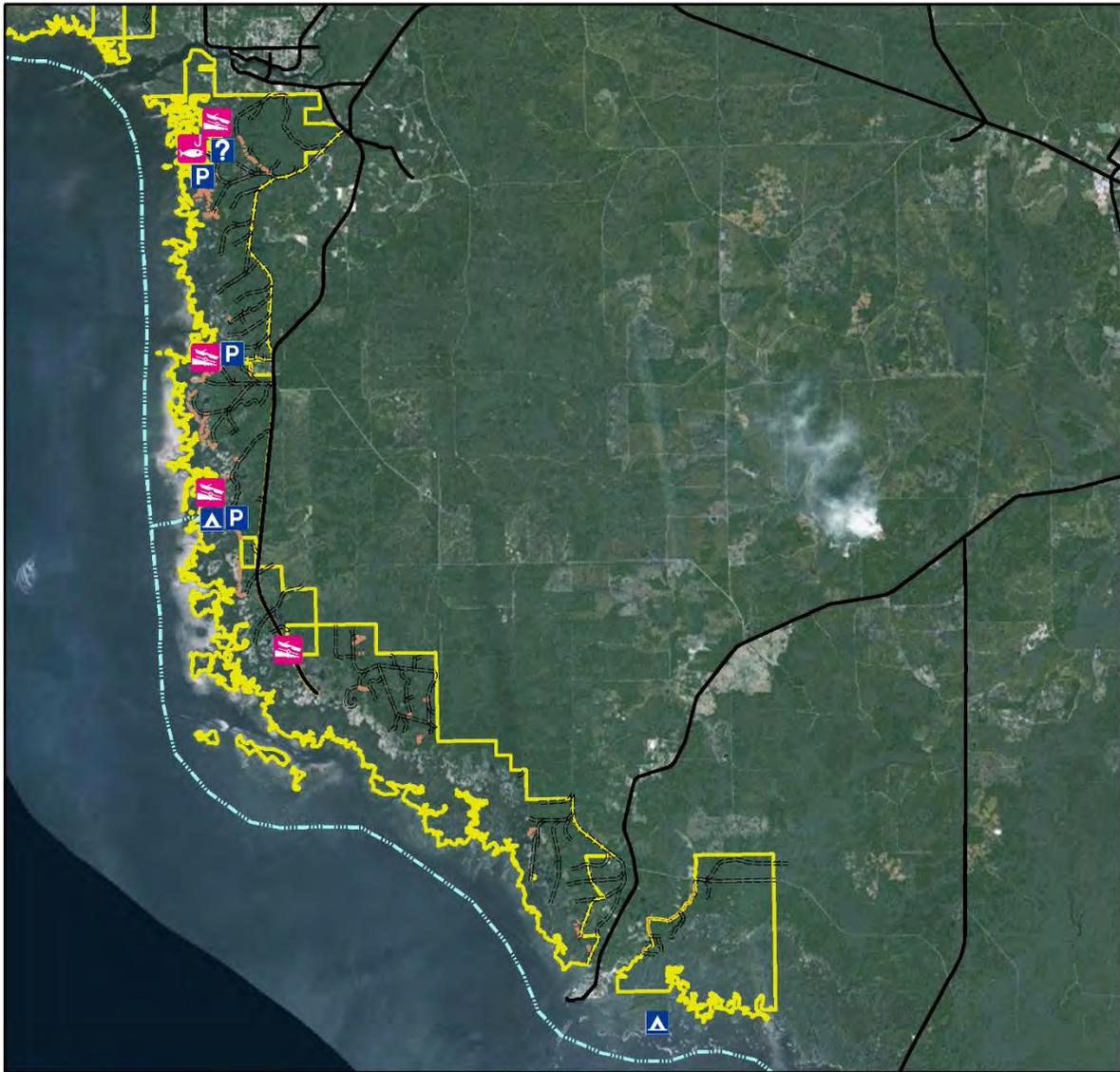


Figure 11e: Facilities on the Jena Unit of the BBWMA

5.11 Land Conservation and Stewardship Partnerships

The FWC utilizes a three-tiered approach to identifying, acquiring or otherwise protecting important conservation lands adjacent to or in proximity to existing FWC-managed areas. This involves development of an Optimal Resource Boundary (ORB), Optimal Conservation Planning Boundary (OCPB) and associated Conservation Action Strategy (CAS).

Increasingly, cooperative land steward partnership efforts with private landowners plays an integral role in this effort as does ongoing land conservation, either through fee-simple or less-than-fee conservation easements. In combination, this tiered model helps FWC to further the regional conservation of important fish and wildlife habitats through a proactive, comprehensive, and cooperative approach towards conservation.

5.11.1 Optimal Resource Boundary

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

5.11.2 Optimal Conservation Planning Boundary

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

The OCPB provides the basis for development of a broader CAS for BBWMA. Although the OCPB provides the basis for potential future voluntary, willing-seller conservation acquisitions, it is designed to function primarily as a conservation planning boundary. The OCPB identifies surrounding lands and natural resources that may be important to the continued viability of fish and wildlife populations in the region (Figure 12). As they are currently managed, these lands appear to contribute to regional conservation and may support conservation landscape linkages.

5.11.3 Conservation Action Strategy

The CAS is the third tier, and implements the results of the ORB and OCPB tiers. This element of the process incorporates the conservation planning recommendations into an action strategy that prioritizes conservation needs. The CAS is integral to the development

of conservation stewardship partnerships and also implements the current approved process for establishing the FWC Florida Forever Inholdings and Additions acquisition list.

Primary components of the CAS may include:

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

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

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

5.11.4 FWC Florida Forever Additions and Inholdings Acquisition List

Currently, FWC has identified 4,530 acres of potential additions or privately held inholdings for BBWMA. In addition, 46,441 acres of the Lower Suwannee River Florida Forever project remain to be acquired. Upon completion of the BBWMA CAS, additions to the FWC Florida Forever Additions and Inholdings acquisition list may be recommended.

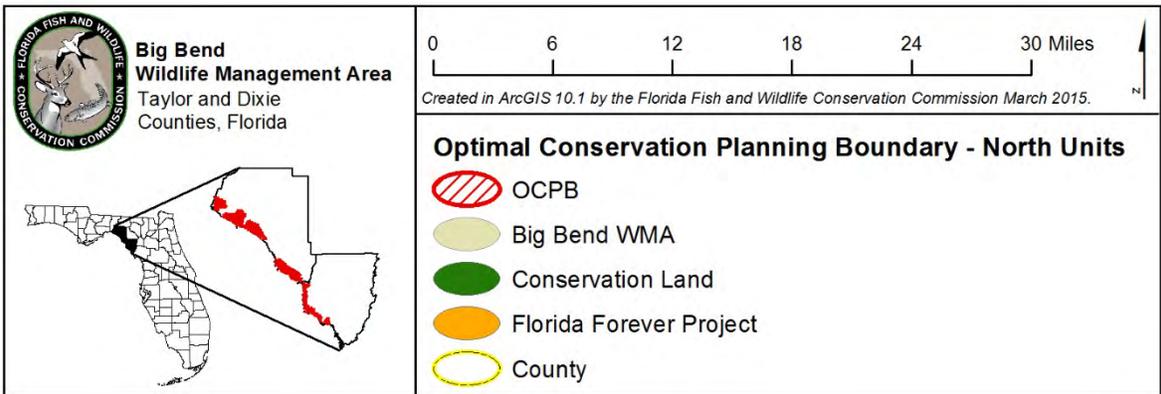
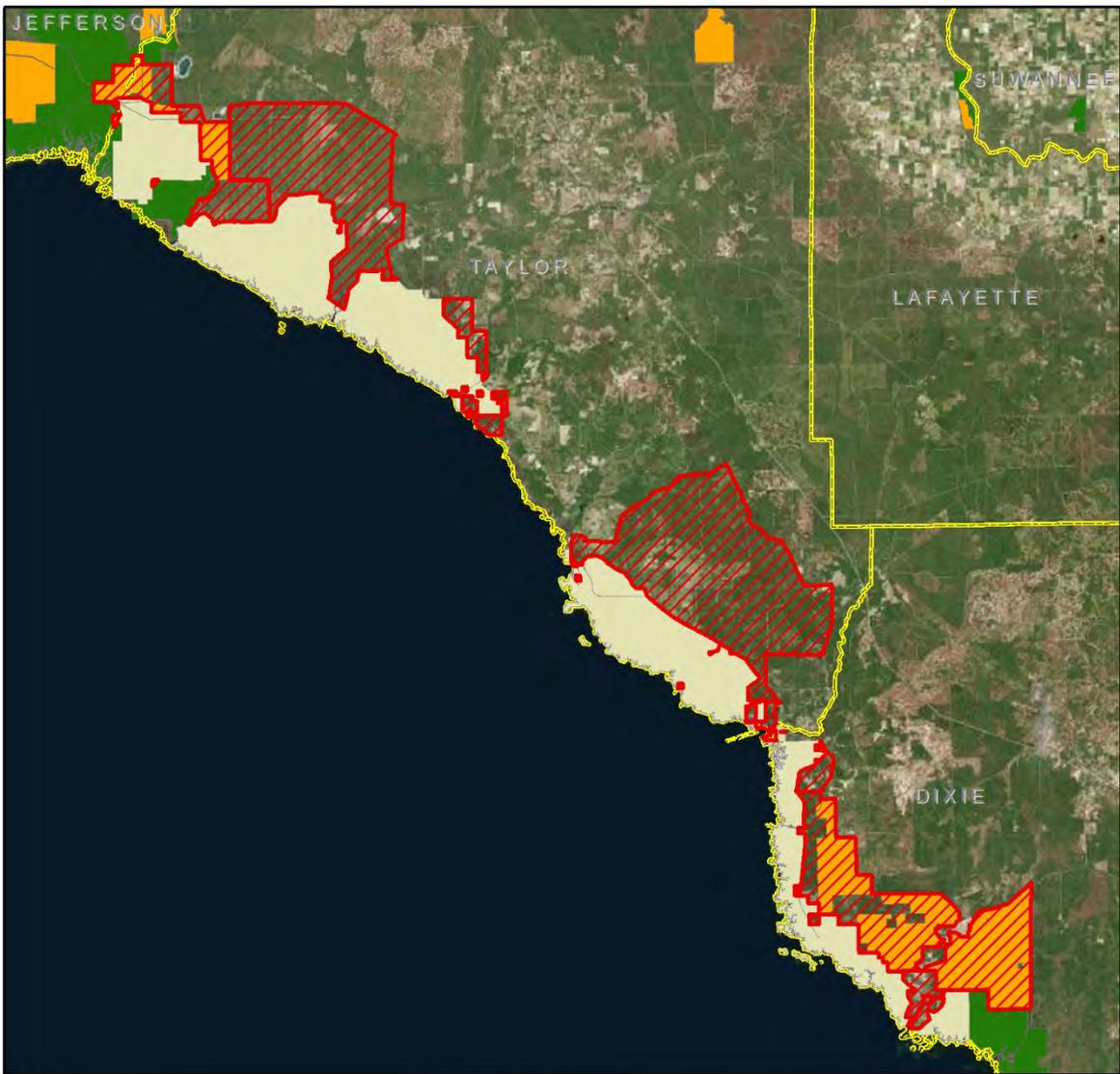


Figure 12: Optimal Conservation Planning Boundary

5.12 Research Opportunities

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

5.13 Cooperative Management and Special Uses

5.13.1 Cooperative Management

The FWC is responsible for the overall management and operation of BBWMA as set forth in the lease agreement with the Board of Trustees. In keeping with the lease agreement, and in order to conduct its management operations in the most effective and efficient manner, the FWC cooperates with other agencies to achieve management goals and objectives described in this management plan. These include cooperating with DHR to ensure the requirements of the Management Procedures Guidelines - Management of Archaeological and Historical Resources document (Appendix 13.6.2) are followed with regard to any ground-disturbing activities.

In addition, the FFS is a designated cooperating agency, and assists FWC by providing technical assistance on forest resource management (Appendix 13.4.1). Also, FWC cooperates and consults with the SRWMD and DEP for the monitoring and management of both ground and surface water resources and the overall management of BBWMA.



5.13.2 First Responder and Military Training

First-responder (public governmental police department or agency, fire and emergency medical service personnel) training and military training are conditionally allowed on BBWMA. 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 BBWMA, and causes no measurable long-term impact to the natural resources of the area. Additionally, FWC staff must be notified and approve the training through issuance of a permit prior to any such training taking place on BBWMA. Any first-responder or military training that is not low-impact, intermittent and

occasional would require an amendment to this management plan, and therefore will be submitted by FWC to DSL and ARC for approval consideration prior to authorization.

5.13.3 Apiaries

Currently, two apiaries operate seasonally on BBWMA. The use of apiaries is conditionally approved for BBWMA, and is deemed to be consistent with purposes for acquisition, is in compliance with the Conceptual State Lands Management Plan, and is consistent with the FWC agency mission, goals, and objectives as expressed in the agency Strategic Plan and priorities document (Appendix 13.7). Location, management, and administration of apiaries on BBWMA is guided by the FWC Apiary Policy and the BBWMA Apiary Assessment (Appendix 13.12).

5.14 Climate Change

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

The Intergovernmental Panel on Climate Change (IPCC), a multi-national scientific body, reports that climate change is likely proceeding at a rate where there will be unavoidable impacts to humans, wildlife, and habitat. Given current levels of heat-trapping greenhouse gas emissions, shifts in local, regional, and national climate patterns including changes in precipitation, temperature, increased frequency and intensity of extreme weather events, rising sea levels, tidal fluctuations, and ocean acidification are projected. The current trend of global temperature increase has appeared to accelerate in recent decades, and continued greenhouse gas emissions may result in projected global average increases of 2 –11.5° F by the end of the century.⁵

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

Potential impacts that may be occurring as a result of climate change include: change in the timing of biological processes, such as flowering, breeding, hibernation, and migration;^{6, 7, 8} more frequent invasions and outbreaks of exotic invasive species;⁹ and loss of habitat in

coastal areas due to sea level rise.¹⁰ Some species are projected to adjust to these conditions through ecological or evolutionary adaptation, whereas others are projected to exhibit range shifts as their distributions track changing climatic conditions. Those species that are unable to respond to changing climatic conditions are projected to go extinct. Some estimates suggest that as many as 20% to 30% of the species currently assessed by the IPCC are at risk of extinction within this century if global mean temperatures exceed increases of 2.7 – 4.5° F.¹¹ A number of ecosystems are projected to be affected at temperature increases well below these levels.



At this time, the potential effects of climate change on Florida's conservation lands are just beginning to be studied and are not yet well understood. For example, FWC has begun a process for currently developing climate change adaptation strategies for monitoring, evaluating, and determining what specific actions, if any, may be recommended to ameliorate the projected impacts of climate change on fish and wildlife resources, native vegetation, and the possible spread of

exotic and invasive species. Currently, FWC is continuing its work on the development of these potential adaptation strategies. However, as noted above, the effects of climate change may become more frequent and severe within the time period covered by this Management Plan.

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

Elements of climate change that may potentially affect BBWMA include inundation and saltwater intrusion from sea level rise (Figures 13a and 13b), more frequent and more potent storm events, alteration of vegetation reproductive cycles, and changes in the fire regime. The results of a Sea Level Affecting Marsh Model for the BBWMA show habitats that may potentially be impacted. The low-lying coastal habitats, such as salt marsh and hardwood swamp natural communities are projected to face the most direct and dramatic impacts of climate change, particularly from a projected rising sea level and from the projected increased frequency and intensity of coastal storms.^{12, 13, 14, 15} The effects of sea level rise in the recent past have been observed on the BBWMA; cabbage palms have been dying on coastal islands due to salinity increases. The potential loss of habitat may result in the loss of species using that habitat, including amphibians and migrating and nesting birds. Storm events also cause considerable physical damage to native vegetation along vulnerable shorelines, impacting nesting habitat for sea life and shorebirds. The projected rise in sea levels may decrease the availability and abundance of prey for wading birds that forage in shallow waters on the expansive tidal flats of the Gulf Coast. Climate change may amplify and hasten these effects, potentially at rates that exceed the normal resiliency of plant communities to recover, shift or adapt accordingly.^{16, 17} Projected salt water intrusion into the subsurface freshwater lens from potential sea level rise and saltwater inundation of surface freshwaters from storm surges may alter coastal ecosystems and freshwater marshes, possibly resulting in more salt-tolerant aquatic plant communities.

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

5.15 Soil and Water Conservation

Soil-disturbing activities will be confined to areas that have the least likelihood of experiencing erosion challenges. On areas that have been disturbed prior to acquisition, an assessment will be made to determine whether soil erosion is occurring, and if so, appropriate measures will be implemented to stop or control the effects of this erosion.

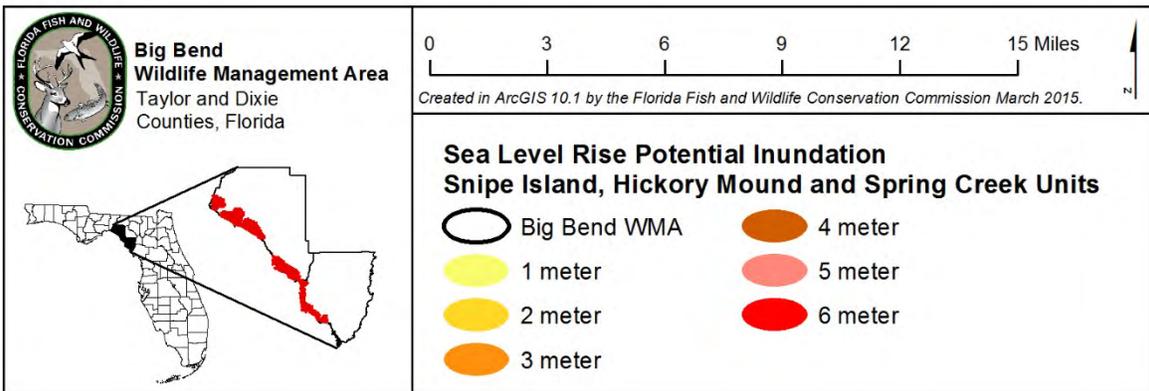
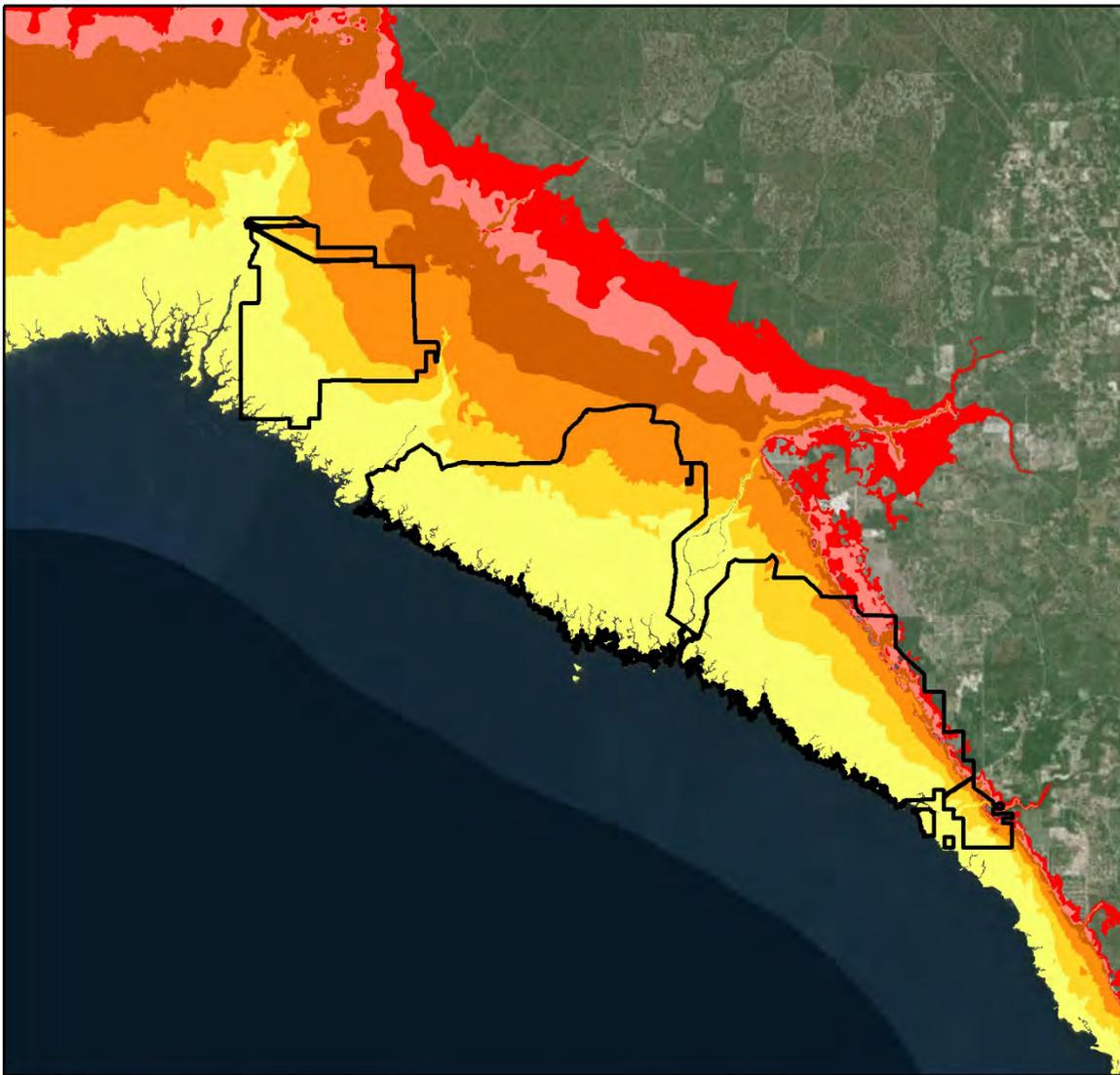


Figure 13a: Potential Inundation Due to Sea Level Rise

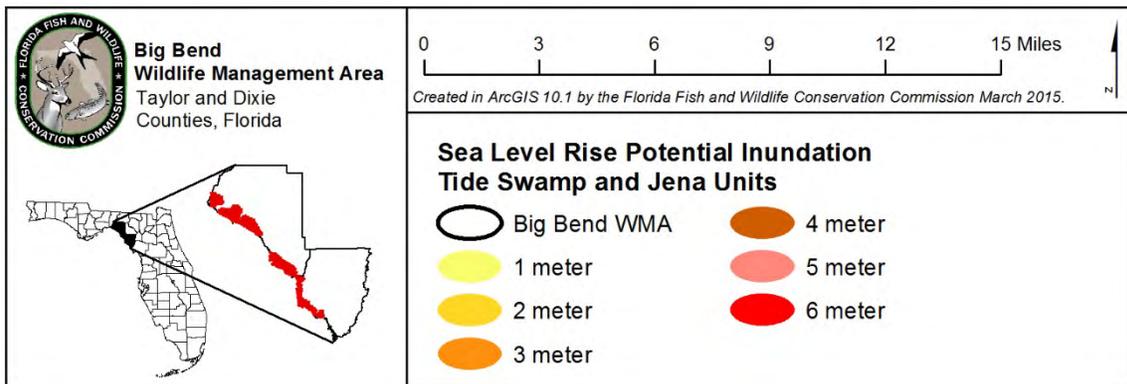
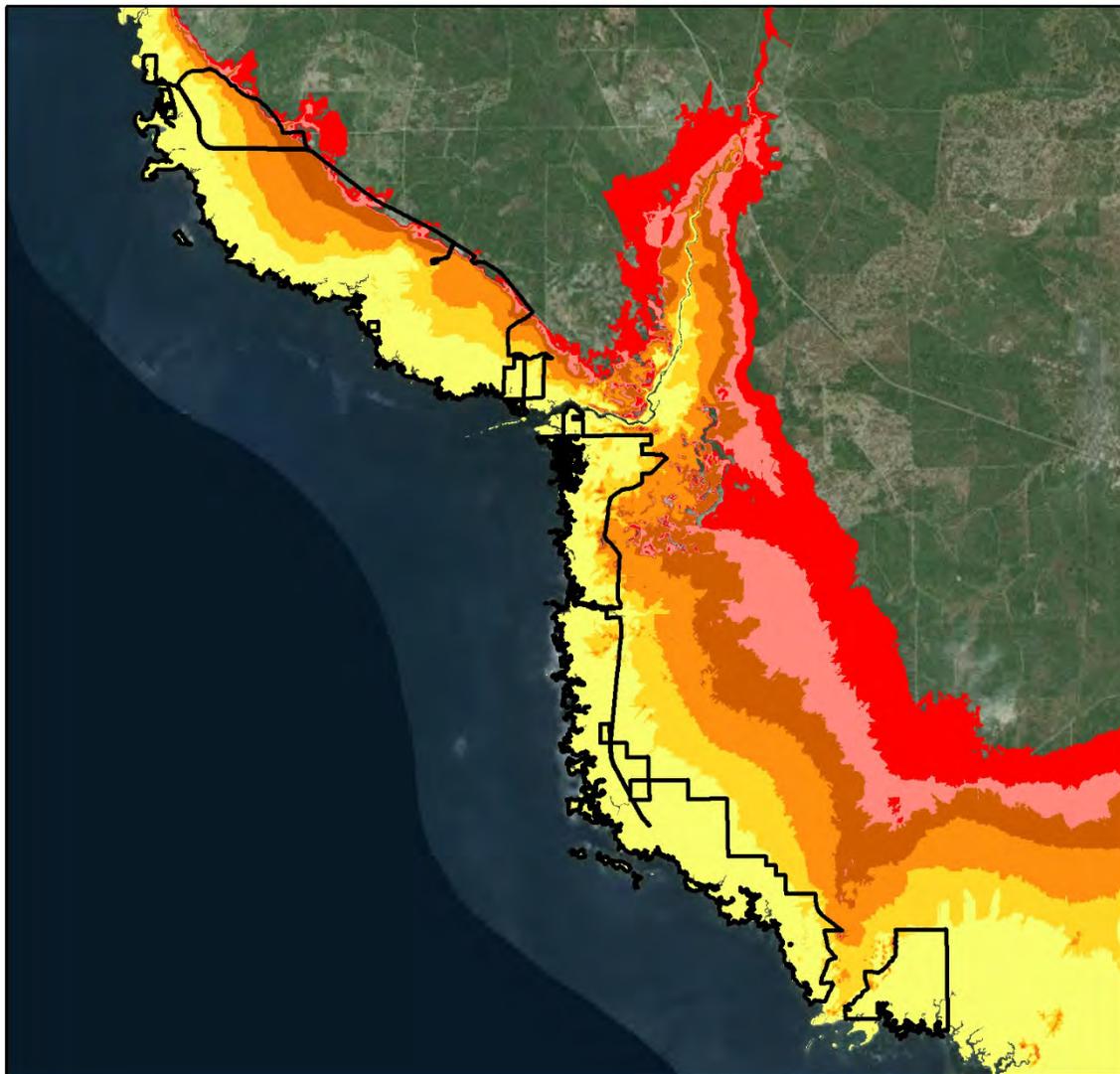


Figure 13b: Potential Inundation Due to Sea Level Rise

6 Resource Management Goals and Objectives

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

6.1 Habitat Restoration and Improvement

Goal: Improve extant habitat and restore disturbed areas.

Short-term

- 6.1.1** Conduct prescribed burning on 3,423 acres of fire-adapted natural communities on the area per year, including, sandhill, scrub, scrubby flatwoods, mesic flatwoods, wet flatwoods, pine plantation, basin marsh, depression marsh, and impounded tidal marsh, per year.
- 6.1.2** Maintain approximately 14,766 acres of fire-adapted communities (97%) within the following target fire return intervals: 1 – 3 years for sandhill, 5 – 20 years for scrub, 5 – 15 years for scrubby flatwoods, 2 – 4 years for mesic flatwoods, 5 – 10 years for wet flatwoods, 3 – 5 years for pine plantation, and 2 – 3 years for impounded tidal marsh.
- 6.1.3** Update and continue to implement the area’s prescribed burning plan.
- 6.1.4** Develop an upland restoration plan for the strategic management areas identified on the Tide Swamp and Spring Creek units.
- 6.1.5** Conduct habitat/natural community improvement on 700 acres on the area per year including 500 acres of mechanical fuel reduction within upland plant communities and removing sand pine and undesirable hardwoods from 200 acres of sandhill restoration sites (Figure 14).
- 6.1.6** Conduct an annual assessment of conditions of blocks of managed community types and determine how many acres may require specific management treatments based upon OBVM DFCs and general conditions. Implement identified management treatments based on available budgets and resources annually to achieve/maintain DFCs.

6.1.7 Conduct habitat/natural community restoration activities including restoration of remaining sand pine plantations to sandhill and scrub communities on 50 acres per year.

6.1.8 Continue to implement OBVM on the area.

Long-term

6.1.9 Conduct prescribed burning on 3,423 acres of fire-adapted natural communities on the area per year, including, sandhill, scrub, scrubby flatwoods, mesic flatwoods, wet flatwoods, pine plantation, basin marsh, depression marsh, and impounded tidal marsh.

6.1.10 Continue to maintain approximately 14,766 acres of fire adapted communities (97%) within 2 - 3 year target fire return interval for sandhill, 10 - 20 for scrub, 5 - 7 for scrubby flatwoods, 2 - 4 years for mesic flatwoods, 2 - 4 wet flatwoods, 3 – 5 for pine plantation, and 2 – 3 years for impounded tidal marsh.

6.1.11 Continue to contract for recertification mapping of historic and current natural communities at 5-year intervals to account for restoration work completed to date and to correct previous natural community maps.

6.1.12 Conduct timber harvest for the purposes of habitat restoration on 50 – 100 acres annually to begin restoration process for remaining acreage of sand pine plantation on historic sandhill communities as per upland restoration plan when completed (Figure 14).

6.1.13 Continue to conduct habitat/natural community improvement on 700 acres per year including 500 acres of mechanical fuel reduction within upland natural communities and removing sand pine and undesirable hardwoods from 200 acres of sandhill.

6.1.14 Continue to conduct habitat/natural community restoration activities including restoration of remaining sandpine plantations to sandhill and scrub communities on 50 acres per year.

6.1.15 Continue to conduct timber harvest for the purposes of habitat restoration on 700 acres of sand pine plantation and 1,000 acres of slash pine plantation.

6.1.16 Implement the upland restoration plan for the strategic management areas identified on the Tide Swamp and Spring Creek Units.

6.1.17 To promote suitable Florida black bear habitat, on a rotational basis, continue to maintain 869 acres of mesic flatwoods and wet flatwoods within the black bear management area designated in the BBWMA WCPR within a 4 - 5 year fire return interval.

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

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

Short-term

- 6.2.1** Implement the WCPR strategy for BBWMA.
- 6.2.2** As described in the BBWMA WCPR Strategy, monitor Bachman's sparrow, brown-headed nuthatch, northern bobwhite, and wading birds on the area.
- 6.2.3** Maintain and monitor at least 20 functional southeastern American kestrel nest boxes within suitable habitat on BBWMA.
- 6.2.4** Continue to collect opportunistic wildlife species occurrence data on the area.
- 6.2.5** Continue periodic aerial surveys for bald eagle nesting activity on the area.
- 6.2.6** Continue to monitor for imperiled plant species on the area utilizing FWC Fish and Wildlife Research Institute (FWRI), OBVM, and FNAI.

Long-term

- 6.2.7** Continue to implement the WCPR strategy for BBWMA.
- 6.2.8** As described in the BBWMA WCPR Strategy, conduct a baseline gopher tortoise survey in the upland habitat restoration SMA on the Spring Creek and Tide Swamp units (Figure 14).
- 6.2.9** As described in the BBWMA WCPR Strategy, monitor Bachman's sparrow, brown-headed nuthatch, northern bobwhite, southeastern bat, and wading birds on the area.
- 6.2.10** As described in the BBWMA WCPR Strategy, continue to maintain at least 20 functional southeastern American kestrel nest boxes within suitable habitat on BBWMA.
- 6.2.11** Evaluate the use of the available southeastern American kestrel nest boxes and the suitability of recently restored habitat to determine the need for additional nest boxes on the area by 2019.
- 6.2.12** Continue to collect opportunistic wildlife species occurrence data on the area.
- 6.2.13** Continue periodic aerial surveys for bald eagle nesting activity on the area.
- 6.2.14** By 2022, revise and update the BBWMA WCPR Strategy.

6.2.15 Continue to opportunistically monitor for imperiled plant species on the area utilizing FWC-FWRI, OBVM, and FNAI.

6.2.16 Contract for a systematic imperiled plant species survey on the area.

6.3 Other Wildlife (Game and Nongame) habitat maintenance, enhancement, restoration, or population restoration

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

Short-term

6.3.1 Continue to conduct annual spotlight distance surveys for white-tailed deer on the Tide Swamp and Spring Creek units.

6.3.2 Continue to collect biological harvest data at check stations on Snipe Island, Hickory Mound, Spring Creek, and Tide Swamp units during the first 16 days of archery, general gun, and spring turkey seasons and for the entire muzzleloading gun and youth turkey hunts. Continue to evaluate the need to collect harvest and biological data from the Jena Unit.

6.3.3 Continue to collect opportunistic wildlife occurrence data on the area.

6.3.4 As funding and resources allow, plant wildlife openings, closed roads, and firebreaks for increased wildlife viewing and hunter satisfaction. Alternatively, manage wildlife openings and closed roads to promote native early successional plant species.

6.3.5 Continue to adjust portions of roadside and wildlife mowing activities on the area during critical time periods to promote flowering and germination of native herbaceous species to benefit pollinators and other non-game and game species.

6.3.6 Continue to conduct small mammal presence-absence monitoring across identified natural communities on BBWMA.

6.3.7 Continue to conduct waterfowl surveys on Hickory Mound Impoundment to monitor waterfowl and other bird usage both inside and outside of the Impoundment to evaluate effectiveness of management strategies.

6.3.8 Continue to implement the Hickory Mound Impoundment Management Plan (Appendix 13.10), including water level management, salinity monitoring, and prescribed burning.

- 6.3.9** Continue to conduct black rail call back survey on the Tide Swamp and Jena units in an effort to document presence, as this species was last documented at this location in the mid-1990s.
- 6.3.10** Continue to conduct herpetological monitoring in natural communities across BBWMA to document species presence and provide baseline data for future monitoring of management actions or natural events.
- 6.3.11** Continue to coordinate and cooperate with North American Butterfly Association (NABA) to monitor butterfly species diversity and composition across units of BBWMA.
- 6.3.12** Develop volunteer network to monitor additional species as identified and as protocols are designed and approved to supplement FWC staffing.

Long-term

- 6.3.13** Evaluate the value of the data obtained to determine the feasibility of continuing to conduct annual spotlight distance surveys for white-tailed deer on Tide Swamp and Spring Creek Units.
- 6.3.14** Continue to collect biological harvest data at check stations on Snipe Island, Hickory Mound, Spring Creek, and Tide Swamp units during the first 16 days of archery, general gun, and spring turkey seasons and for the entire muzzleloading gun and youth turkey hunts. Continue to evaluate the need to collect harvest and biological data at the Jena Unit.
- 6.3.15** Continue to collect opportunistic wildlife occurrence data on the area.
- 6.3.16** As funding and resources allow, plant wildlife openings, closed roads, and firebreaks for increased wildlife viewing and hunter satisfaction. Alternatively, manage wildlife openings and closed roads to promote native early successional plant species.
- 6.3.17** Continue to adjust portions of roadside and wildlife mowing activities on the area during critical time periods to promote flowering and germination of native herbaceous species to benefit pollinators and other non-game and game species.
- 6.3.18** Evaluate the feasibility of continuing to conduct small mammal presence-absence monitoring across identified natural communities on BBWMA, or the need to conduct more focused small mammal surveys.

- 6.3.19** Continue to conduct waterfowl surveys annually on the Hickory Mound Impoundment to monitor waterfowl and other bird usage both inside and outside of the Impoundment to evaluate effectiveness of management strategies.
- 6.3.20** Evaluate the feasibility of continuing to conduct a black rail call back survey on the Tide Swamp and Jena units in an effort to document presence, as this species was last documented at this location in the mid-1990's.
- 6.3.21** Continue to conduct herpetological monitoring in natural communities across BWMA to document species presence and provide baseline data for future monitoring of management actions or natural events.
- 6.3.22** Continue to coordinate and cooperate with NABA to monitor butterfly species diversity and composition across units of BWMA.
- 6.3.23** Continue to develop a volunteer network to supplement FWC staffing for monitoring additional species on the area as needed and when protocols are designed and approved.
- 6.3.24** Continue to evaluate need for monitoring other species on the area.

6.4 Exotic and Invasive Species Maintenance and Control

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

Short-term

- 6.4.1** Continue to monitor and treat as necessary 231 acres of hairy indigo.
- 6.4.2** Opportunistically monitor for, and treat as found, EPPC Category I and Category II invasive exotic species including Japanese climbing fern, cogon grass, torpedo grass, Chinese tallow, mimosa, Chinese brake fern, ladder brake fern, purple sesbain, Chinese privet, Japanese honeysuckle, and Old World climbing fern.
- 6.4.3** Implement control measures on one exotic and nuisance animal species (feral hog) through increasing public hunting and other control measures, including trapping as appropriate.

Long-term

- 6.4.4** Continue to monitor and treat as necessary 231 acres of hairy indigo.
- 6.4.5** Opportunistically monitor for, and treat as found, EPPC Category I and Category II invasive exotic species including Japanese climbing fern, cogon grass, torpedo grass,

Chinese tallow, mimosa, Chinese brake fern, ladder brake fern, purple sesbain, Chinese privet, Japanese honeysuckle, and Old World climbing fern.

- 6.4.6 Implement control measures on one exotic and nuisance animal species (feral hog) through increasing public hunting and other control measures, including trapping as appropriate.
- 6.4.7 Conduct a systematic exotic species survey on at least one unit to determine the effectiveness and need to expand surveys to other units, outside of previously completed road and road margin exotic plant surveys.
- 6.4.8 Continue to evaluate the need to re-conduct exotic plant species surveys based on FWC staff and/or contractor ancillary observations of exotic plant species.

6.5 Public Access and Recreational Opportunities

Goal: Provide public access and recreational opportunities.

Short-term

- 6.5.1 Develop a BBWMA Recreation Master Plan.
- 6.5.2 Monitor trails on the area annually for visitor impacts.
- 6.5.3 Maintain public access and recreational opportunities to allow for a recreational carrying capacity of 2,019 visitors per day on the area.
- 6.5.4 Develop additional public access and recreational opportunities to allow for a feasible carrying capacity as determined by the Recreational Master Plan.
- 6.5.5 Continue to provide a website, two recreation guides, nine kiosks, a bird list, the Tide Swamp Unit driving tour brochure, and the Big Bend Saltwater Paddling Trail Guide for interpretation and education.
- 6.5.6 Develop new interpretive programs as recommended by the BBWMA Recreation Master Plan.
- 6.5.7 Maintain, design, and/or develop trails as recommended by the BBWMA Recreation Master Plan.
- 6.5.8 Continue to provide hunting opportunities for deer, turkey, small game, waterfowl, furbearers, and feral hogs on the area.
- 6.5.9 Continue to provide fishing opportunities on appropriate water bodies on the area.
- 6.5.10 Coordinate with the tourism development councils of Taylor and Dixie counties to promote the BBWMA as a recreation destination.

6.5.11 Coordinate with the Office of Greenways and Trails and USFS/Florida National Scenic Trail (FNST) to evaluate the potential for a through hiking trail on the BBWMA as part of the western loop of the FNST.

Long-term

6.5.12 Implement the BBWMA Recreation Master Plan.

6.5.13 Continue to monitor trails on the area annually for visitor impacts.

6.5.14 Reassess recreational opportunities on the area every three years.

6.5.15 Develop three new kiosks (two at Snipe Island, one at Spring Creek), recreation guides, and butterfly guides for education and interpretation on the area.

6.5.16 Continue to provide hunting opportunities for deer, turkey, small game, waterfowl, furbearers, and feral hogs on the area.

6.5.17 Continue to provide paddling opportunities via the Big Bend Saltwater Paddling Trail and explore opportunities to expand paddling opportunities on the area.

6.5.18 Continue to provide fishing opportunities on appropriate water bodies on the area.

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

6.5.20 Continue to identify partnerships that could provide for environmental education programs and outreach on the area.

6.5.21 Continue to coordinate with the tourism development councils of Taylor and Dixie counties to promote the BBWMA as a recreation destination.

6.5.22 Coordinate with the Office of Greenways and Trails and USFS/FNST to evaluate the potential for a through hiking trail on the BBWMA as part of the western loop of the FNST.

6.6 Hydrological Preservation and Restoration

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

Short-term

6.6.1 Conduct or obtain a site-specific hydrological assessment to identify more specific hydrology restoration needs for the “Diamond” area of the Jena Unit.

- 6.6.2** Continue to cooperate with the SRWMD for the monitoring of surface and ground water quality and quantity.
- 6.6.3** As recommended by the Hydrology Assessment and Conceptual Restoration Plan, continue to install and maintain low-water crossings and culverts as appropriate to maintain and enhance natural hydrological functions.

Long-term

- 6.6.4** To enhance natural hydrological functions, continue to install and maintain low-water crossings and culverts as appropriate.
- 6.6.5** Continue to implement the Hydrology Assessment and Conceptual Restoration Plan.
- 6.6.6** Explore the feasibility of conducting a ground water monitoring project to determine the quantity, quality, and salinity of ground water in coordination with the SRWMD and the Florida Geological Survey.
- 6.6.7** Conduct a survey to locate natural springs on the area, and develop protocols for the protection of springs and springsheds.

6.7 Forest Resource Management

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

Short-term

- 6.7.1** Implement management recommendations based on the timber inventory and forest management recommendations completed under contract for the Tide Swamp and Jena units.
- 6.7.2** Continue to consult and coordinate with the FFS or a professional forestry consultant regarding forest management activities and/or timber harvests as appropriate.

Long-term

- 6.7.3** Continue to implement the Forest Management Plan, including reforestation, harvesting, and prescribed burning activities based on restoration and maintenance needs of the natural communities and other goals established for management of BBWMA.
- 6.7.4** Continue to consult with the FFS or a professional forestry consultant regarding forest management activities and/or timber harvests as appropriate.

- 6.7.5** Contract for the completion of a Forest Management Plan for the Spring Creek, Hickory Mound, and Snipe Island units.

6.8 Cultural and Historical Resources

Goal: Protect, preserve and maintain cultural and historic resources.

Short-term

- 6.8.1** Ensure all known sites are recorded in the Florida Division of Historical Resources Master Site file.
- 6.8.2** Continue to coordinate with DHR personnel to identify and locate a priority subset of the 191 cultural resource sites across BBWMA that require annual monitoring based upon site importance and historical value that can be realistically monitored given available staff and resources. Monitor additional sites regularly on a rotating basis as staffing and time allow.
- 6.8.3** Ensure management staff has DHR Archaeological Resources Monitoring training.
- 6.8.4** Coordinate with DHR to assess the need for conducting additional or updated cultural resource surveys as required.
- 6.8.5** Follow DHR archeological guidelines for determining what activities require site evaluation and monitoring for cultural resources before, during and/or after management activities.
- 6.8.6** Continue to coordinate with DHR and archeological research institutions to complete additional research concerning cultural sites of high significance (e.g., Garden Patch, Spring Warrior Complex, etc.).

Long-term

- 6.8.7** Cooperate with DHR in designing site plans for development of infrastructure as required.
- 6.8.8** Continue to cooperate with DHR to manage and maintain known existing cultural resources.
- 6.8.9** Continue to coordinate with DHR personnel to identify and locate a priority subset of the 191 cultural resource sites across BBWMA that require annual monitoring, based upon site importance and historical value. Monitor additional sites regularly on a rotating basis as staffing and time allow.
- 6.8.10** Coordinate with DHR for cultural resource management guideline staff training.

- 6.8.11 Continue to follow 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.
- 6.8.12 Explore the feasibility of expanding and developing new interpretive exhibits and information to increase public knowledge and education about the cultural resources on the area.

6.9 Capital Facilities and Infrastructure

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

Short-term

- 6.9.1 Continue to maintain, improve or repair 48 facilities on the area.
- 6.9.2 Maintain 231.5 miles of roads on the area.
- 6.9.3 Maintain 92.6 miles of paddling trails and associated campsites, 13.5 miles of driving tour, and 111.4 miles of trails existing on the area.
- 6.9.4 Continue to improve or repair 10 facilities and 12 miles of roads annually on the area.

Long-term

- 6.9.5 Monitor trails and infrastructure on the area annually for visitor impacts.
- 6.9.6 Continue to maintain 48 facilities on the area.
- 6.9.7 Continue to maintain 231.5 miles of roads on the area.
- 6.9.8 Continue to maintain 92.6 miles of paddling trails, 13.5 miles of driving tour, and 111.4 miles of trails existing on the area.
- 6.9.9 Construct 15 facilities on the area including an office facility, four small storage facilities, four interpretive kiosks, entrance packages at Garden Patch and Horseshoe Beach, and four new trails including a through trail connecting all five units (Figure 14).

6.10 Land Conservation and Stewardship Partnerships

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

Short-term

- 6.10.1** Identify potential important wildlife habitat, landscape-scale linkages, wildlife corridors, and operational and resource management needs.
- 6.10.2** Identify and develop conservation stewardship partnerships.
- 6.10.3** Identify and pursue conservation acquisition needs.
- 6.10.4** Develop and maintain a GIS shapefile and other necessary data to facilitate nominations from the FWC OCPB and for FWC's LAP and Land Acquisition Programs.
- 6.10.5** Develop a CAS for the area.
- 6.10.6** Contact and inform adjoining landowners about the FWC LAP to pursue non-acquisition conservation stewardship partnerships and potential conservation easements.
- 6.10.7** Determine which parcels should be added to the FWC acquisition list.
- 6.10.8** Identify potential non-governmental organization partnerships and grant program opportunities.
- 6.10.9** Determine efficacy of conducting a workshop on adjacent landowner's assistance and conservation stewardship partnership.
- 6.10.10** Identify potential conservation easements donations.
- 6.10.11** Evaluate and determine whether any portions of BBWMA should be recommended for potential surplus evaluation.
- 6.10.12** Coordinate and cooperate with Department of Defense military branches to allow for training opportunities for military personnel as appropriate and compatible with the conservation of BBWMA.

Long-term

- 6.10.13** To minimize fragmentation of the area, continue to identify strategic parcels to revise the completed OCPB for BBWMA as appropriate and necessary.
- 6.10.14** Continue to identify and develop conservation stewardship partnerships.

- 6.10.15 Continue to identify and pursue conservation acquisition needs.
- 6.10.16 Continue to maintain a GIS shapefile and other necessary data to facilitate nominations from the FWC OCPB and for the FWC LAP and Land Acquisition Program.
- 6.10.17 Continue to propose nominations of selected properties as additions to the FWC acquisition list.
- 6.10.18 Continue to pursue acquisition of parcels added to the FWC acquisition list as acquisition work plan priorities and funding allow.
- 6.10.19 As feasible, continue to periodically contact and meet with adjacent landowners for willingness to participate in the CAS, and coordinate landowner assistance and conservation stewardship partnership workshops as deemed appropriate.
- 6.10.20 Continue to identify potential conservation easements donations.
- 6.10.21 Continue to evaluate and determine whether any portions of BBWMA should be recommended for potential surplus evaluation.
- 6.10.22 Continue to coordinate and cooperate with Department of Defense military branches to allow for training opportunities for military personnel such as Gulf Regional Air Space Initiative (GRASI) and other initiatives as appropriate and compatible with the conservation of BBWMA.

6.11 Cooperative Management and Special Uses

Goal: Provide access and use of BBWMA for cooperative management and special uses and continue collaborative management efforts.

Short-term

- 6.11.1 Continue to cooperate with Dixie County on Rocky Creek boat ramp improvements.
- 6.11.2 Continue to cooperate with Dixie County on the existing Memorandum of Agreement with Dixie County for cooperative management of the Freeman House for public outreach and conservation education.
- 6.11.3 Foster and maintain amenable and productive relations between FWC and owners of adjacent properties to maintain open lines of communication and use them regularly to ensure that issues are promptly identified, discussed, and resolved.
- 6.11.4 Continue to cooperate with Taylor County on potential management projects.
- 6.11.5 Continue to cooperate with Ducks Unlimited through existing Site Specific Agreement for the Management of the Hickory Mound Impoundment.

Long-term

- 6.11.6 Continue to cooperate with Dixie County on Rocky Creek boat ramp improvements.
- 6.11.7 Continue to cooperate with Dixie County on the existing Memorandum of Agreement with Dixie County for cooperative management of the Freeman House for public outreach and conservation education.
- 6.11.8 Continue to cooperate with first responders and military as appropriate through existing permitting and approval processes.
- 6.11.9 Continue to cooperate with Taylor and Dixie County on potential management projects.
- 6.11.10 Continue to cooperate with Florida Department of Transportation (FDOT) to maintain the BBWMA office facilities located on FDOT property.
- 6.11.11 Continue to foster and maintain amenable and productive relations between FWC and owners of adjacent properties to maintain open lines of communication and use them regularly to ensure that issues are promptly identified, discussed, and resolved.
- 6.11.12 Continue to cooperate with Ducks Unlimited through the existing Site Specific Agreement for the management of the Hickory Mound Impoundment.

6.12 Climate Change

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

Short-term

- 6.12.1 Coordinate with FWC-FWRI Climate Change Adaptation Team to identify potential impacts of projected climate change on fish and wildlife resources and resource management of the BBWMA and develop potential adaptation strategies and monitoring needs.

Long-term

- 6.12.2 Continue to coordinate with FWC-FWRI Climate Change Adaptation Team to refine potential adaptation strategies and implement identified actions to address potential impacts of projected climate change on fish and wildlife resources and resource management of the BBWMA.
- 6.12.3 Incorporate appropriate climate change adaptation strategies into the WCPR for the BBWMA.

- 6.12.4** As appropriate, update the BBWMA Prescribed Fire Plan to incorporate new scientific information regarding projected climate change, such as increased frequency of drought, on the fire regime of BBWMA's fire-adapted natural communities.
- 6.12.5** As science, technology, and climate policy evolve, educate natural resource management partners and the public about the agency's policies, programs and efforts to study, document and address potential climate change; assess the need to incorporate public education about climate change into the update of the BBWMA Recreation Master Plan.

6.13 Research Opportunities

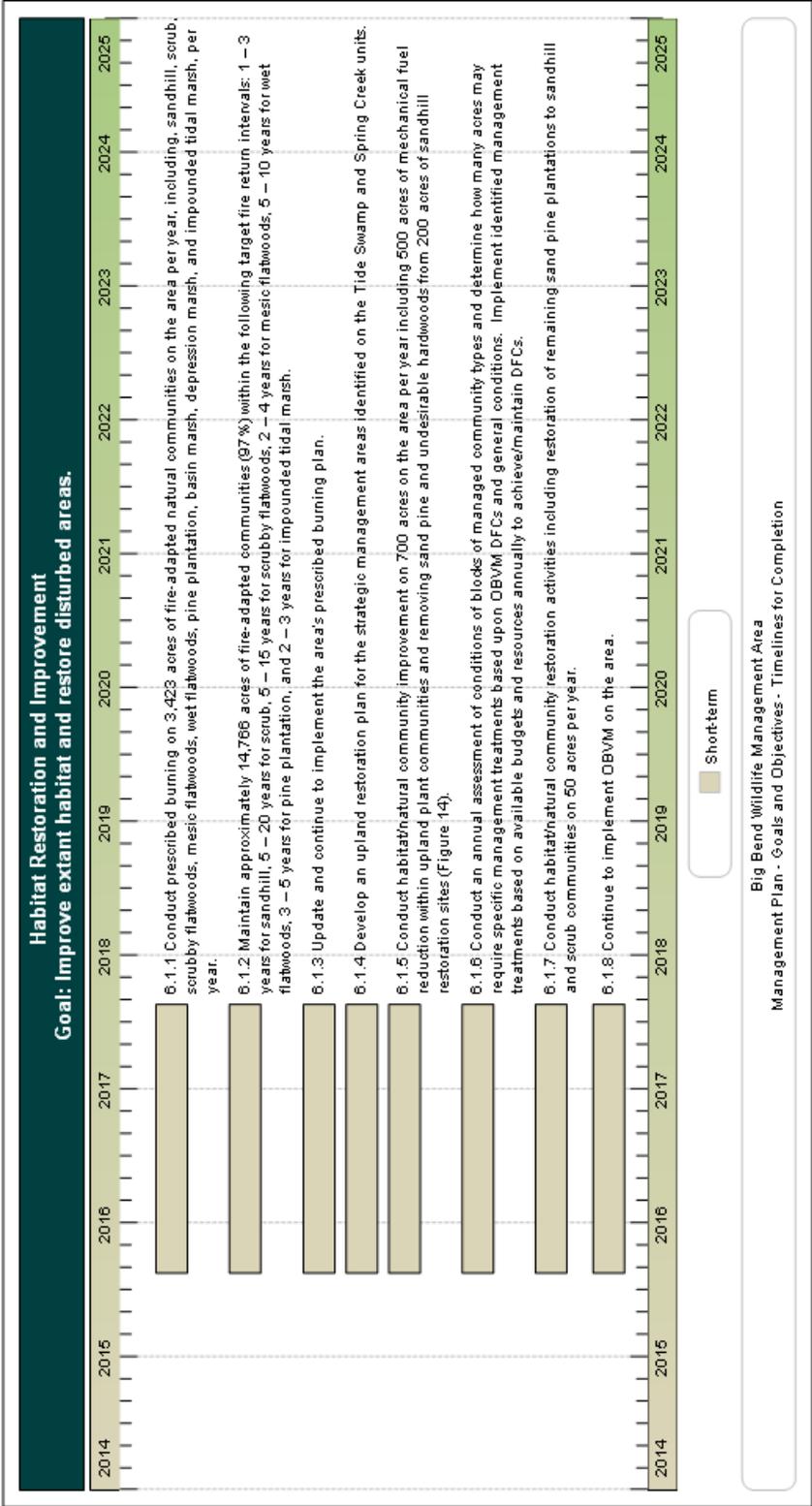
Goal: Explore and pursue cooperative research opportunities.

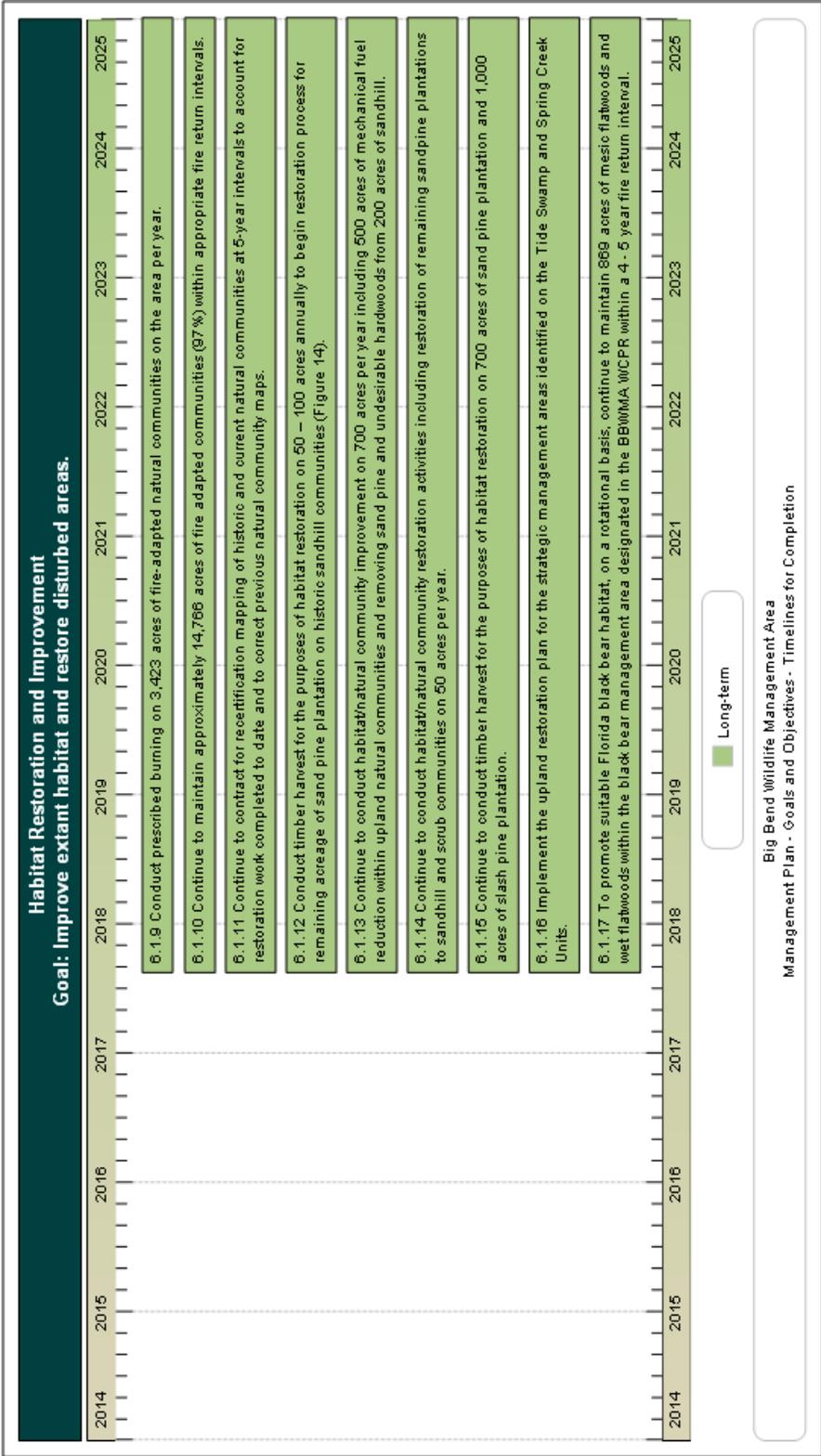
Long-term

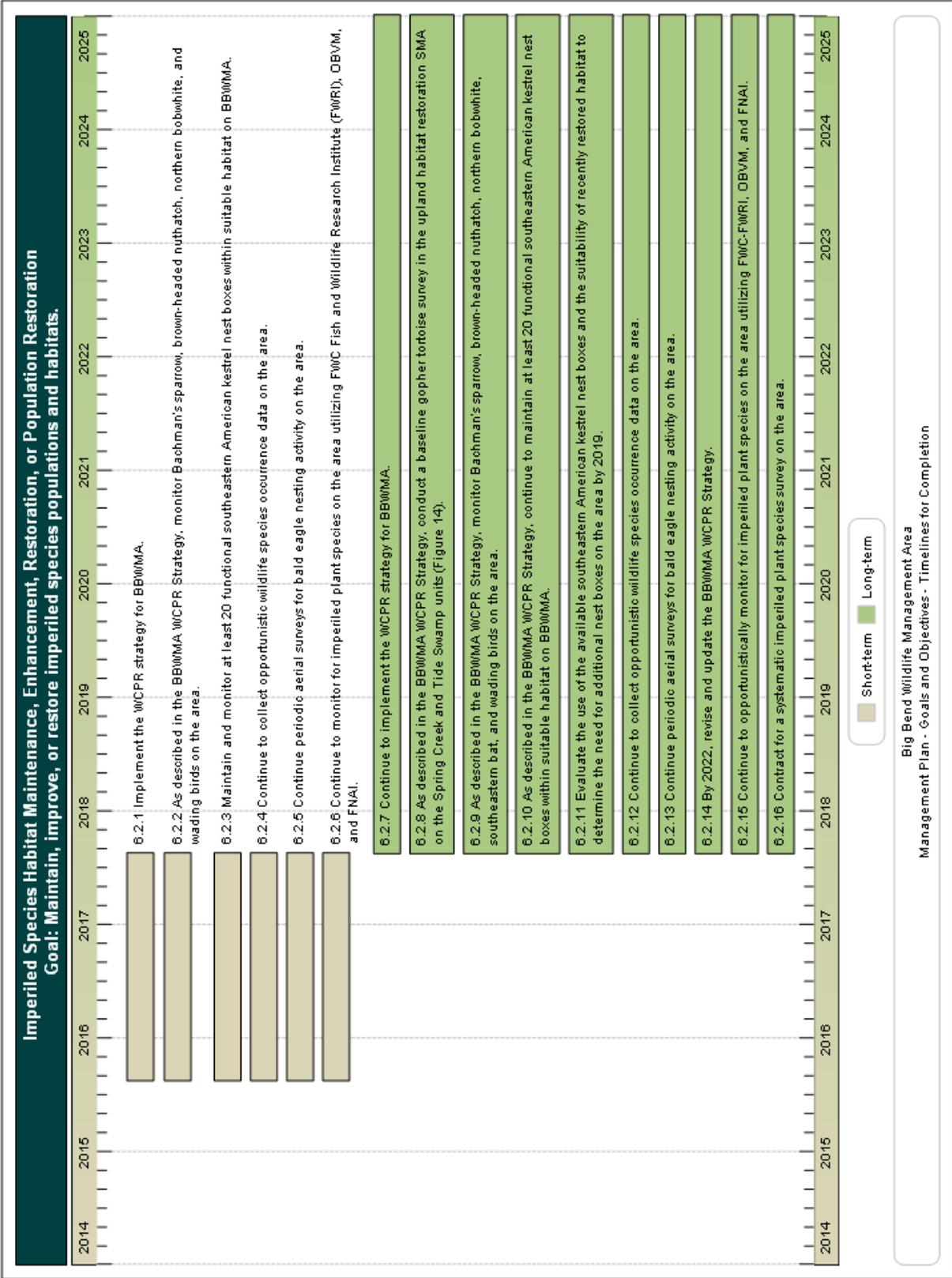
- 6.13.1** In cooperation with universities, FWRI, and others, explore and pursue cooperative research opportunities on the area, including the study of invertebrates.
- 6.13.2** Continue to cooperate with researchers, universities, and others as appropriate.
- 6.13.3** Continue to assess the need for and pursue research and environmental education partnership opportunities as appropriate.

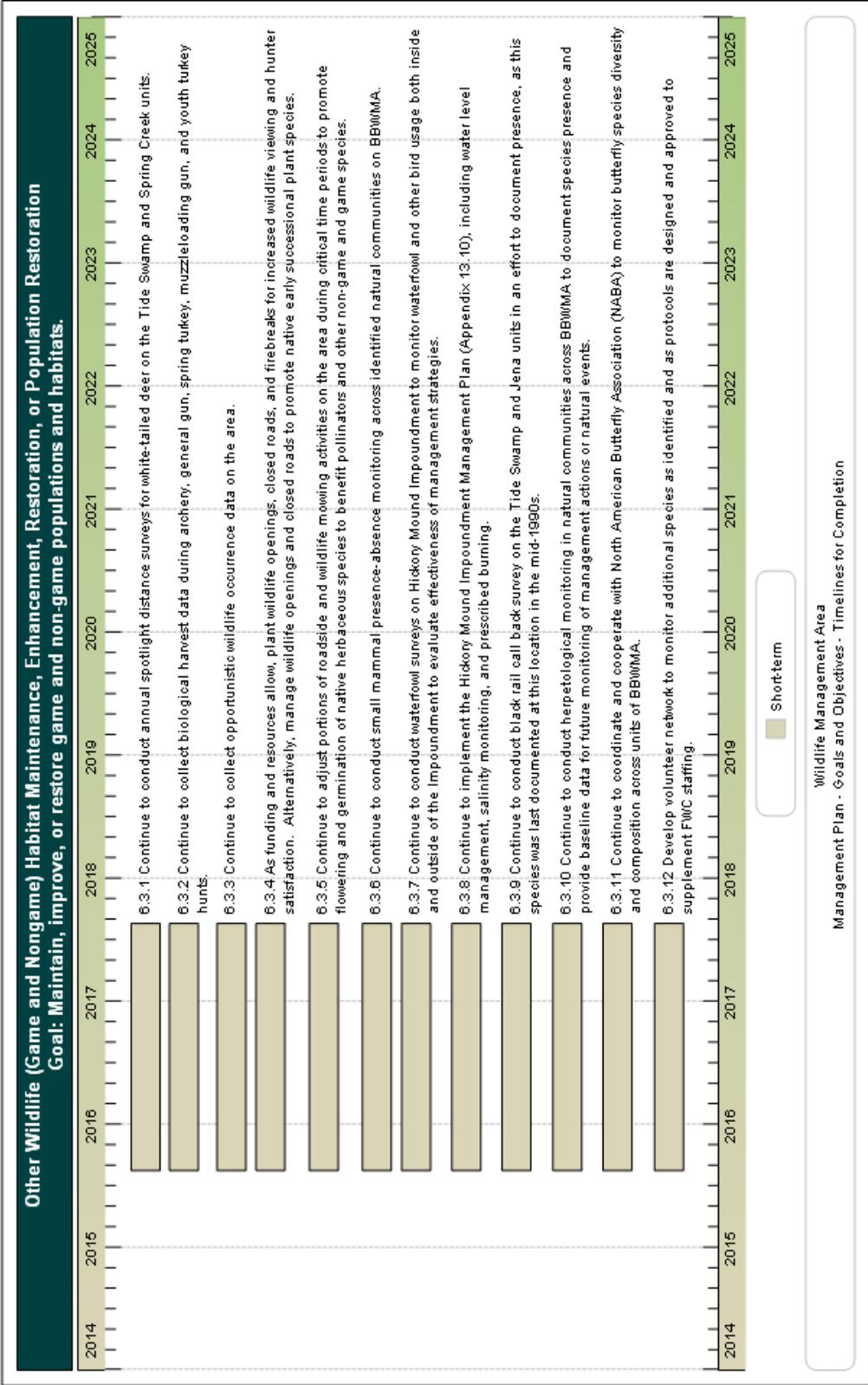
7 Schedule: Timelines for Completion of Resource Management Goals and Objectives

The following section presents the short- and long-term goals and objectives for the management of BBWMA graphically in a timeline format. These timelines directly reflect the short- and long-term goals and objectives presented above in Section 6.

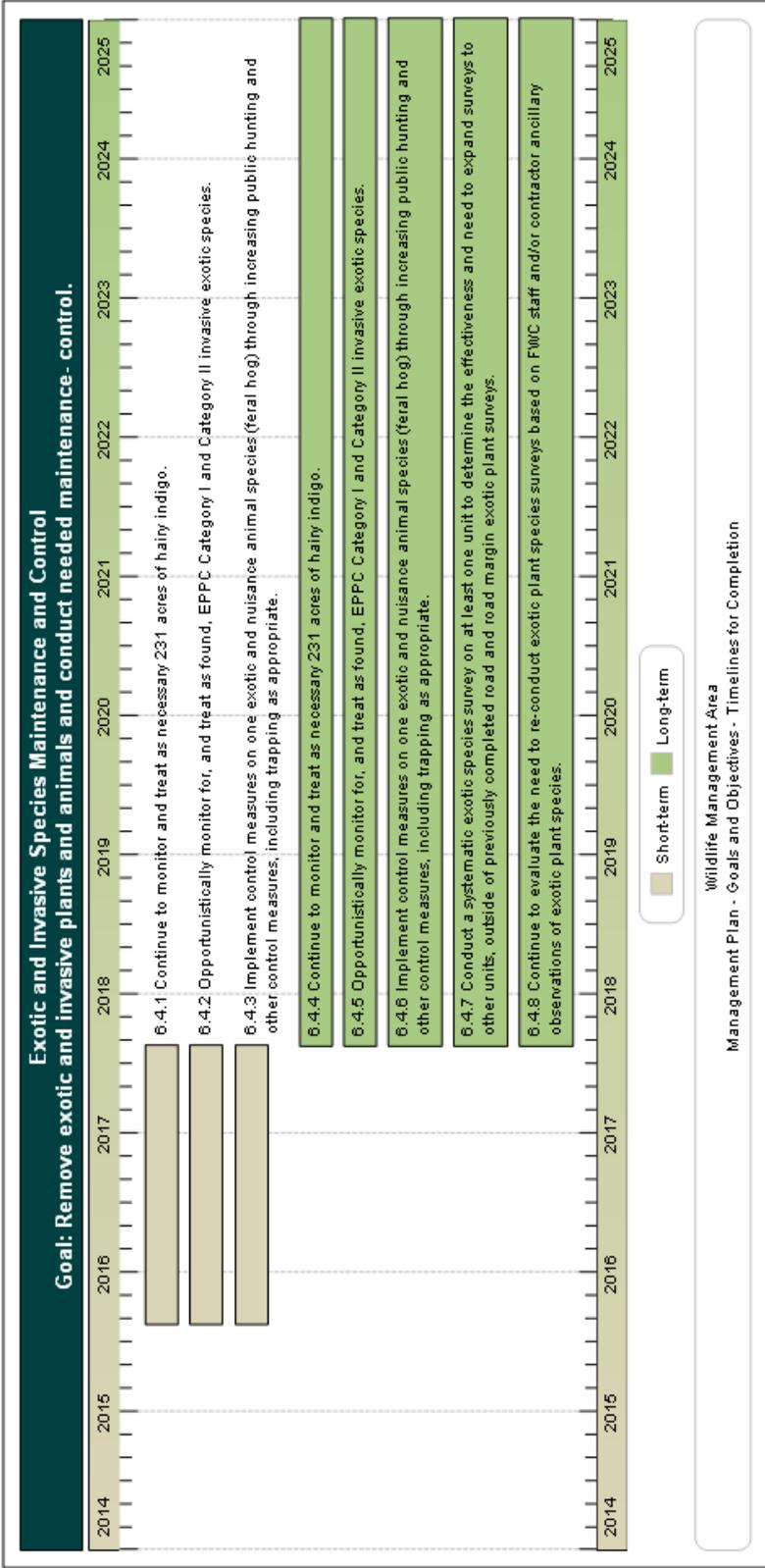


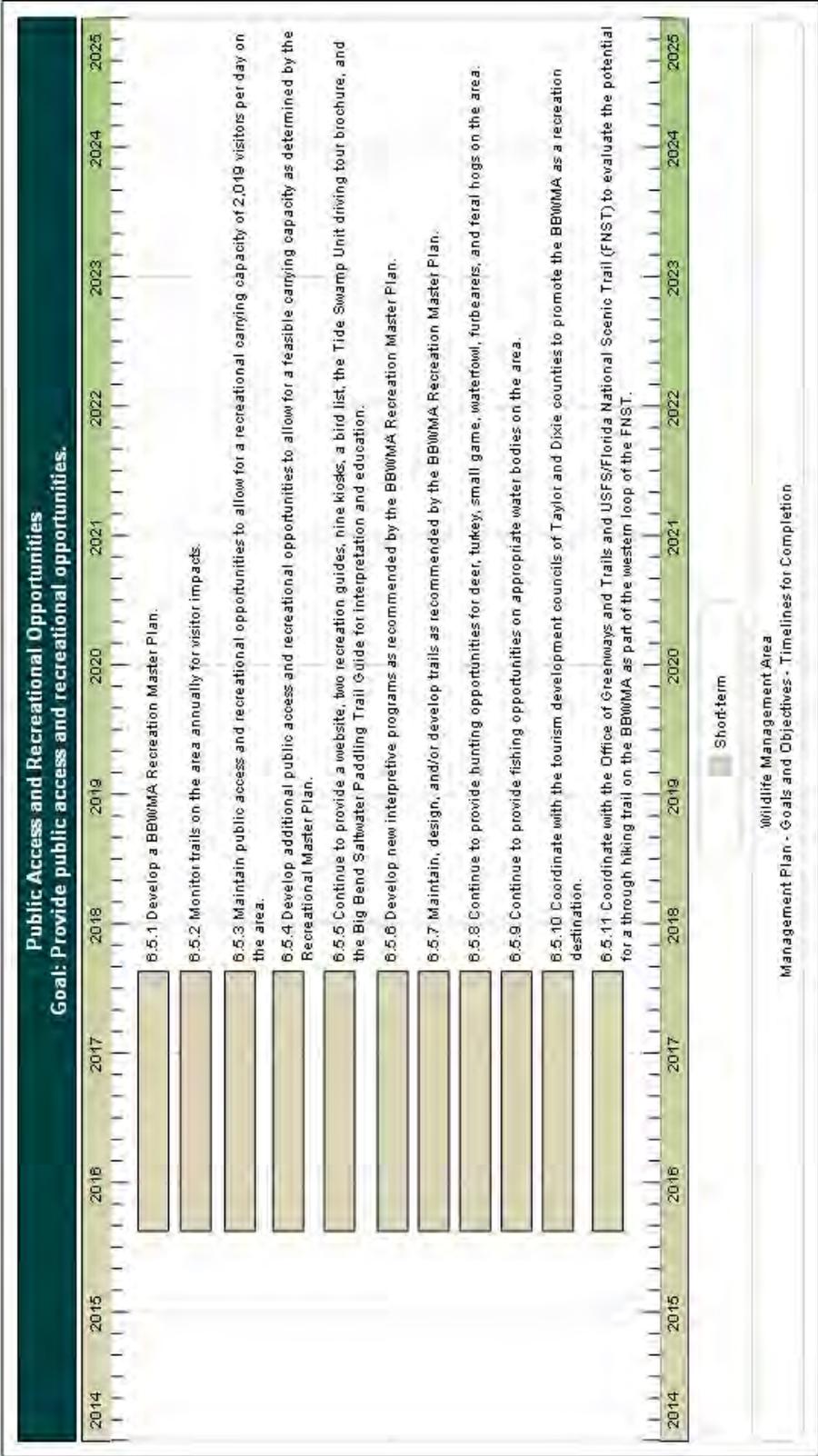




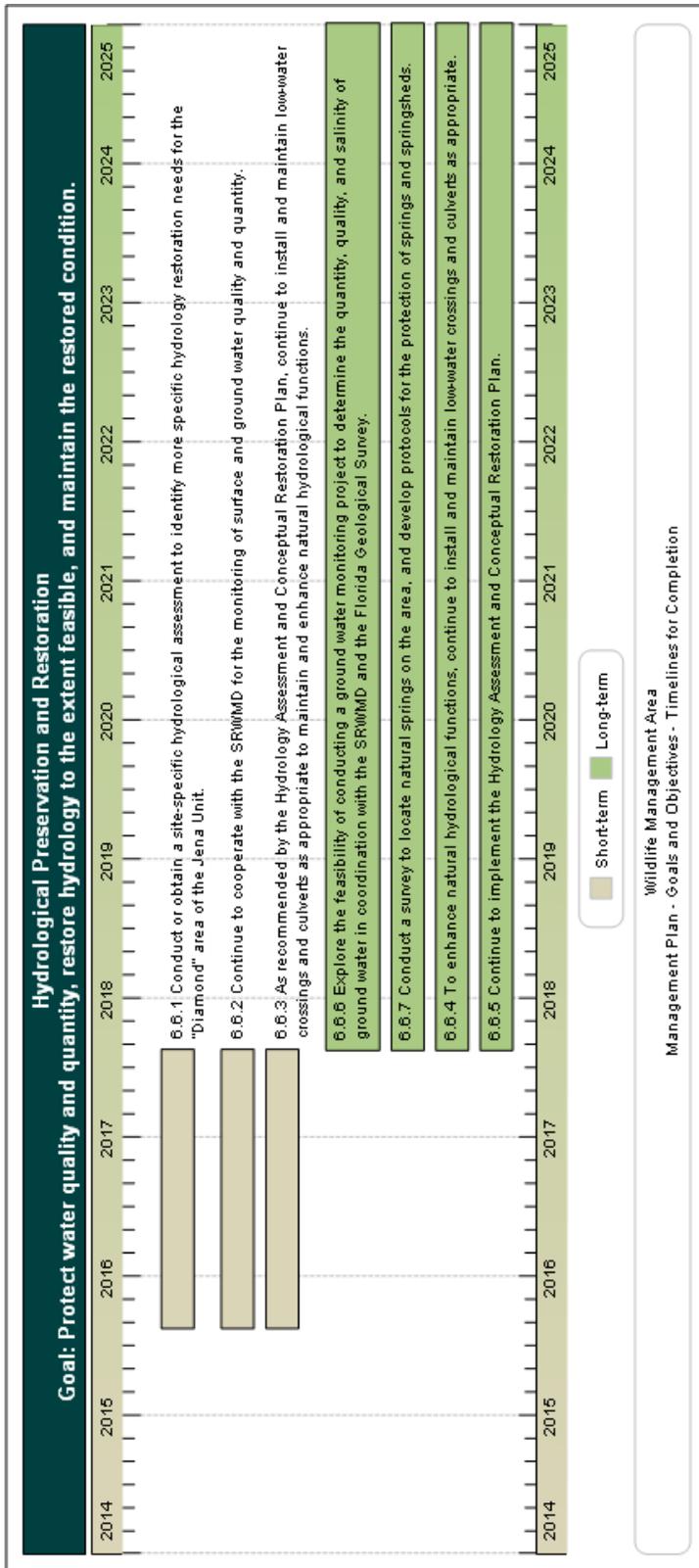


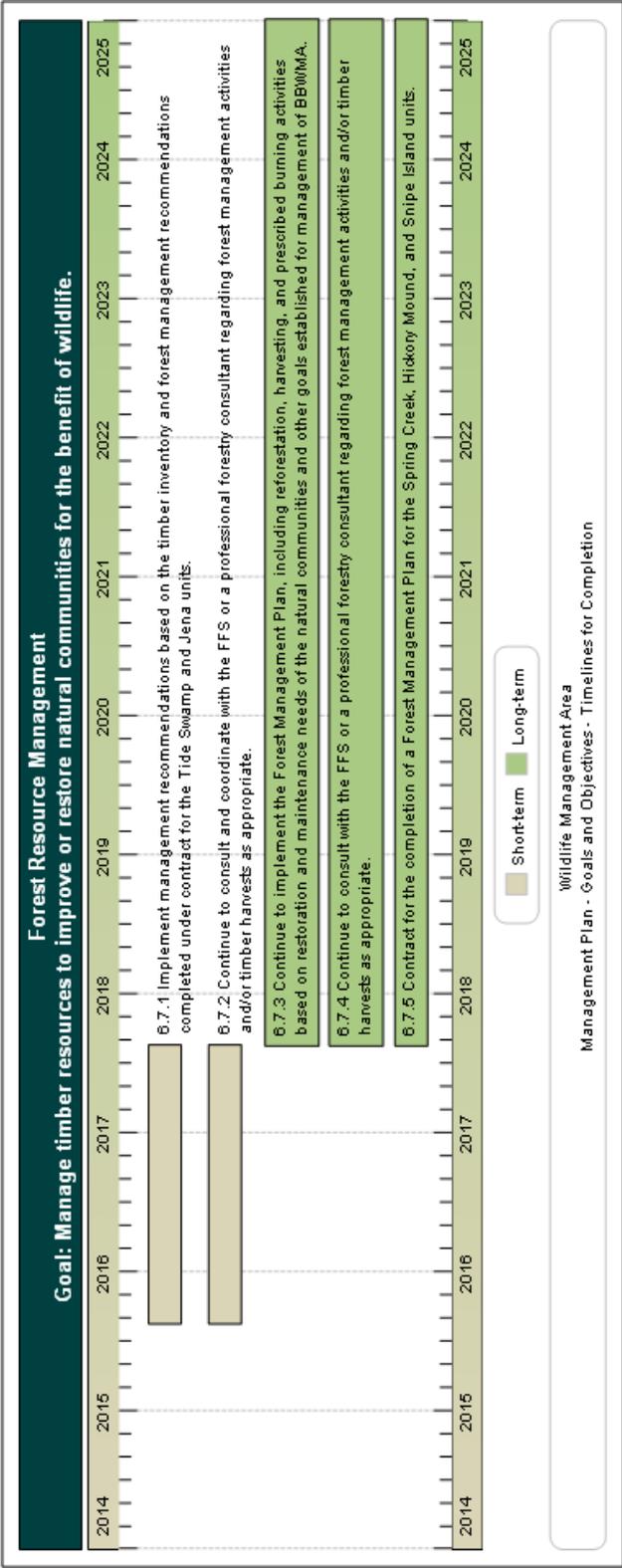


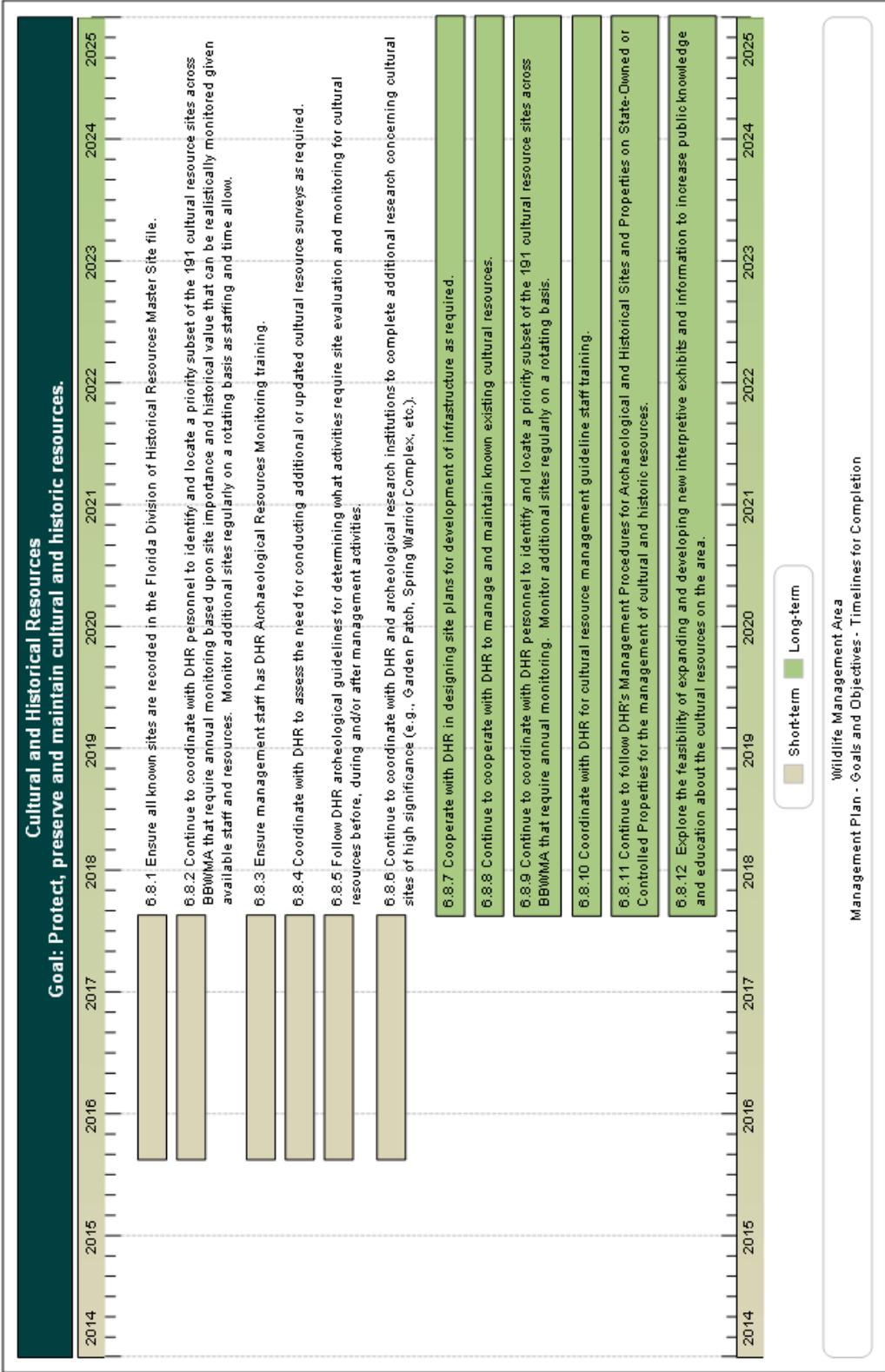


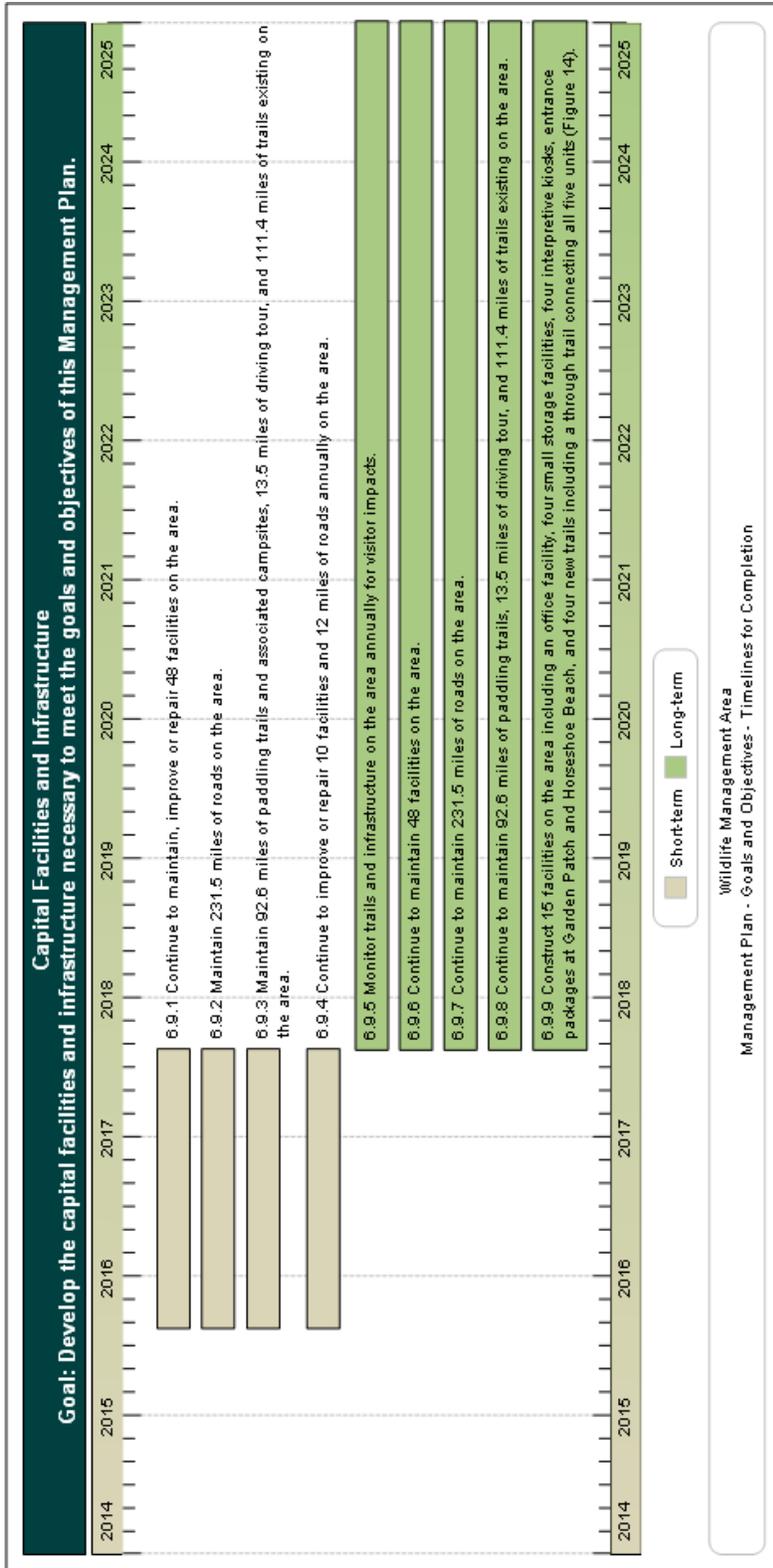


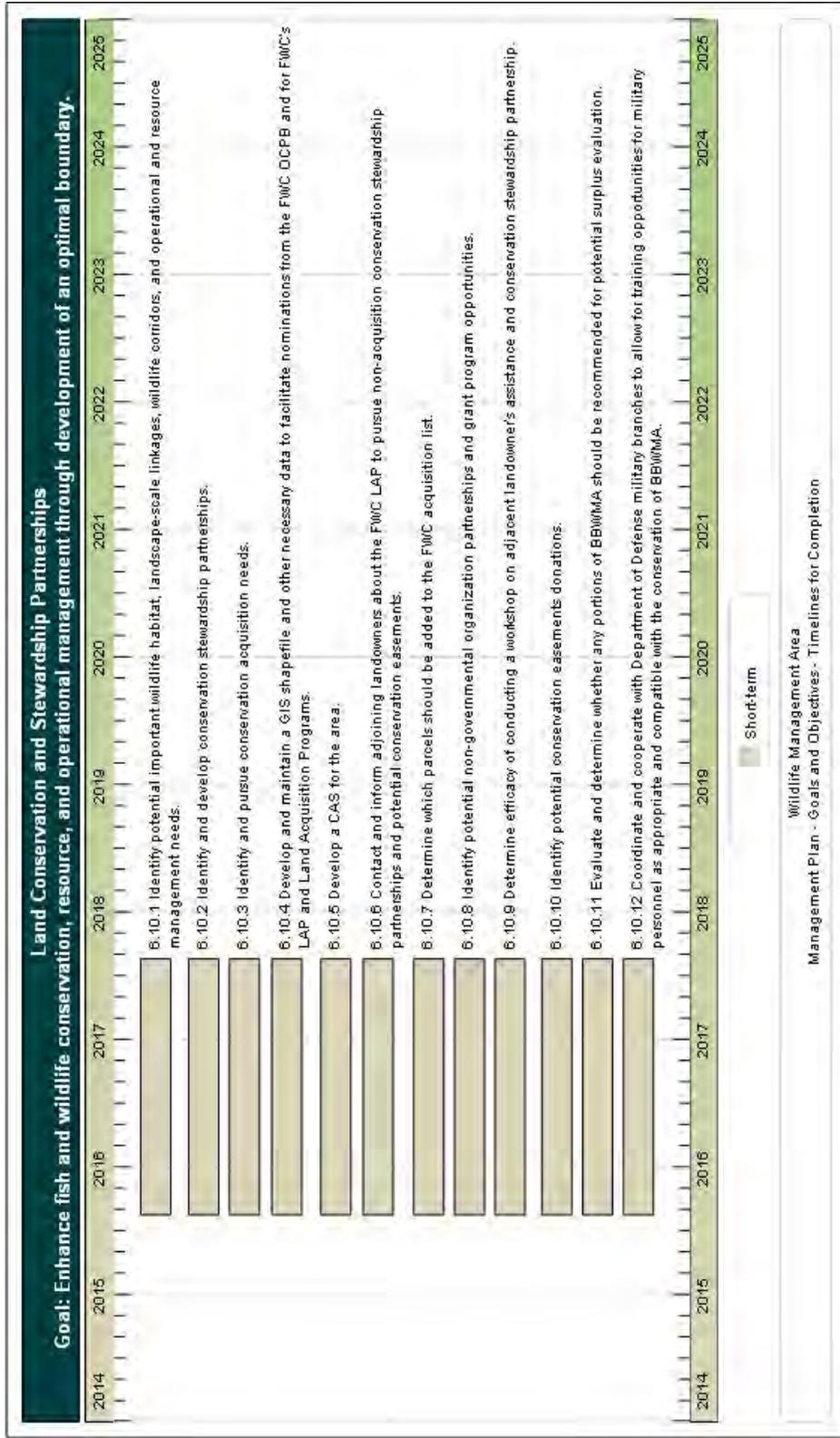


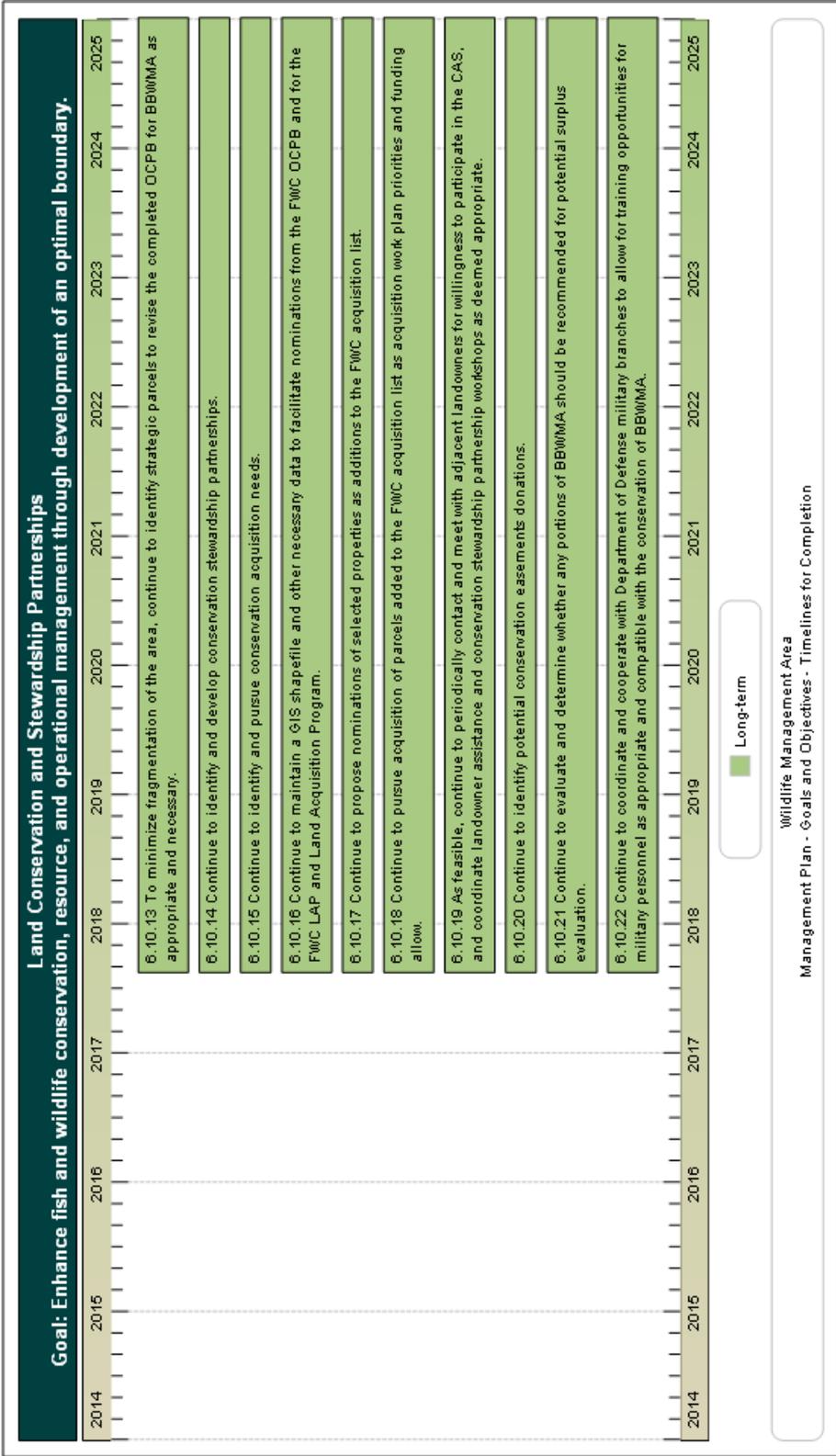


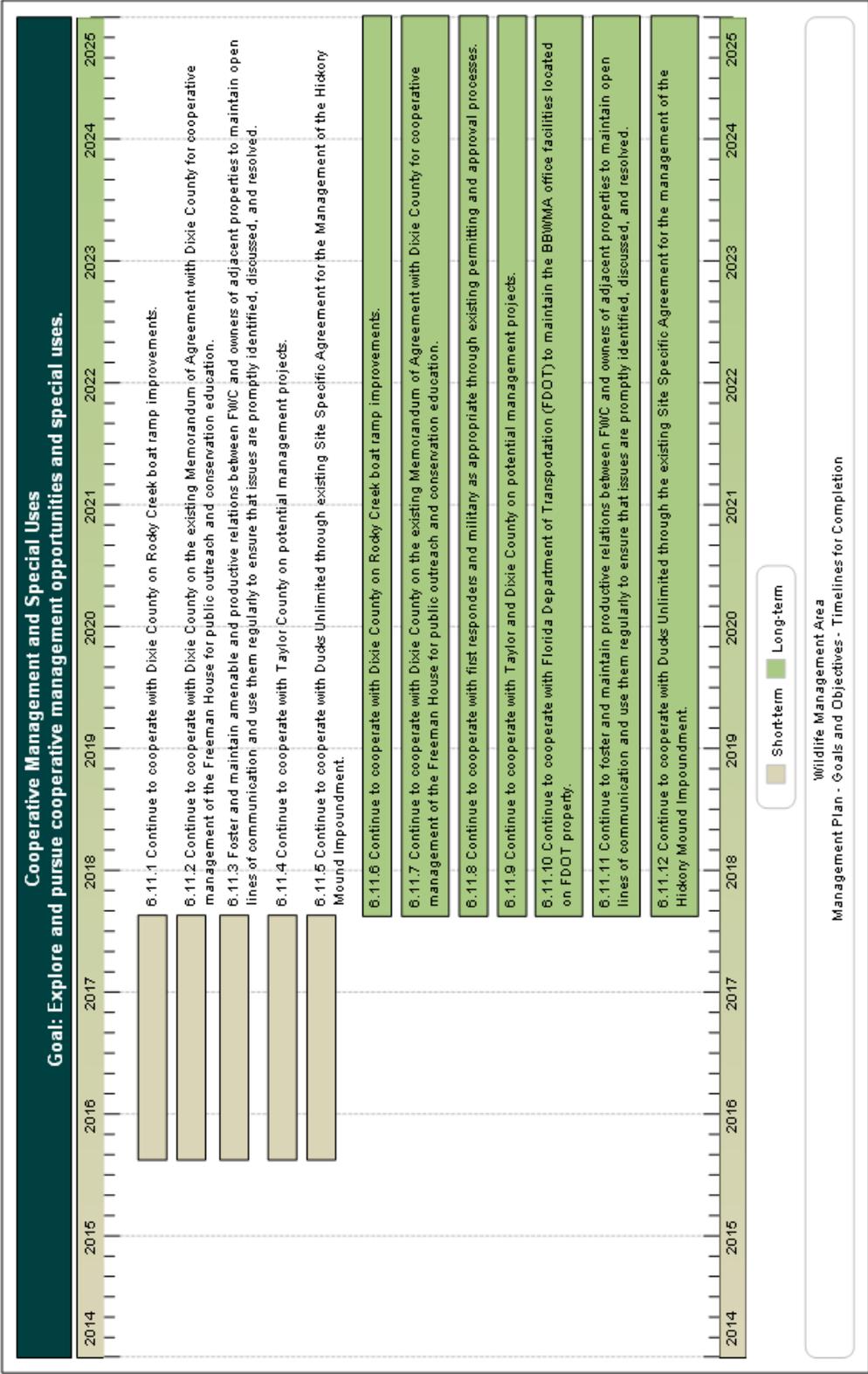


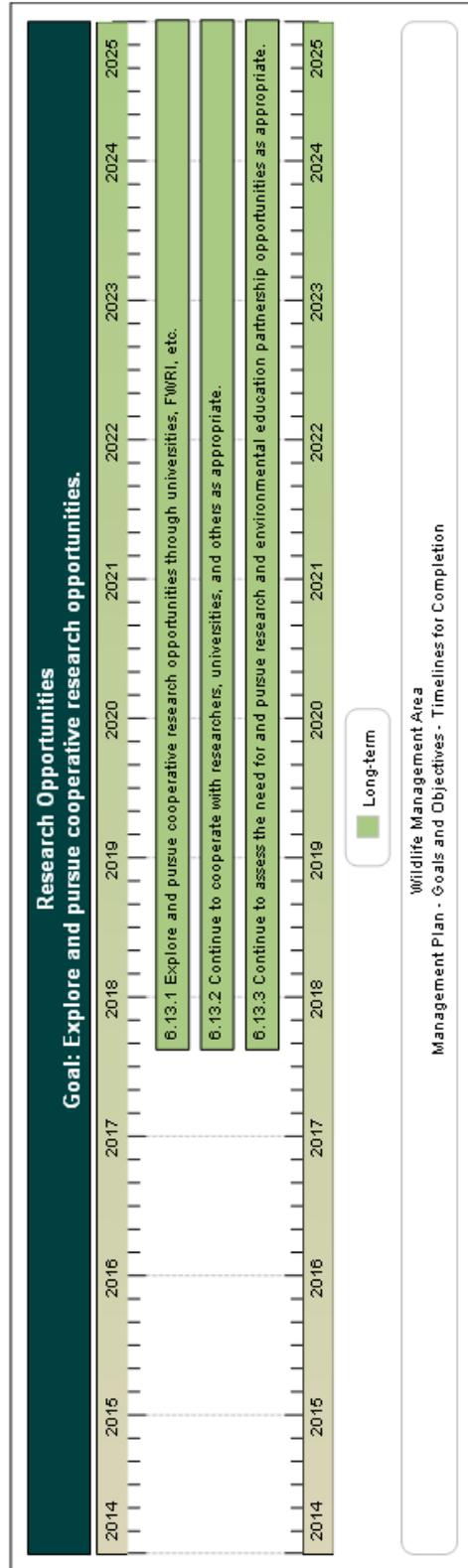
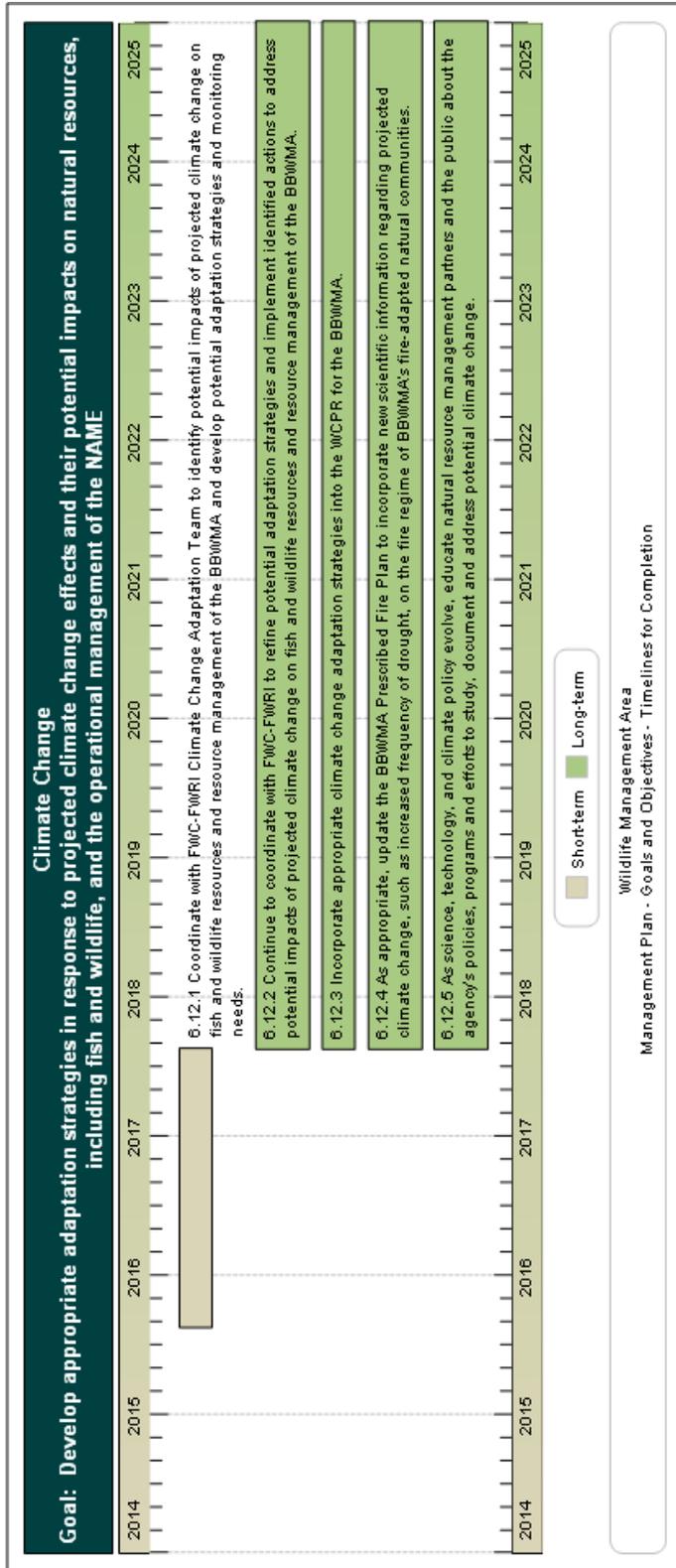












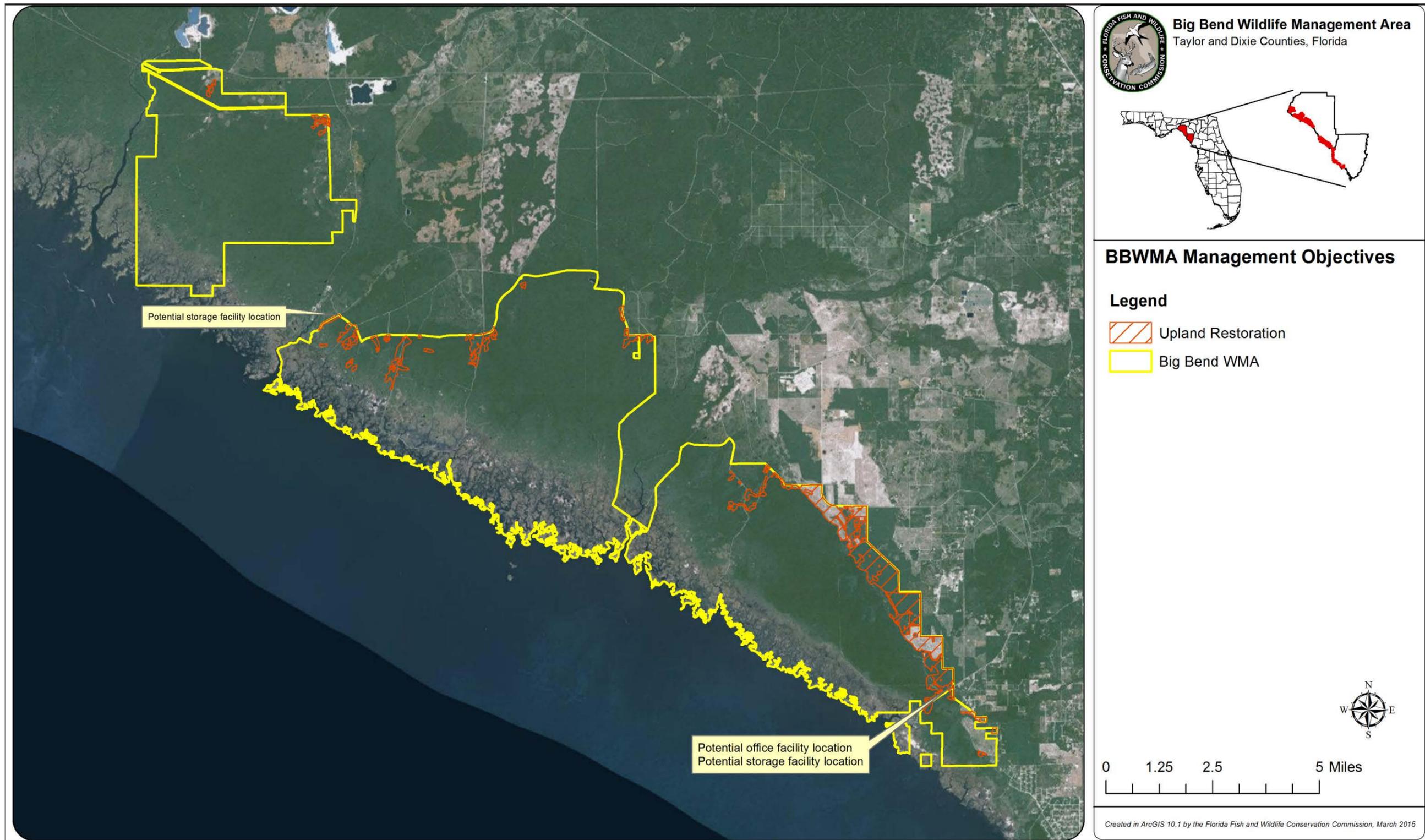


Figure 14a: BBWMA Management Objectives – Snipe Island, Hickory Mound, and Spring Creek Units



Figure 14b: BWMA Management Objectives – Tide Swamp and Jena Units

8 Resource Management Challenges and Strategies

The following section identifies and describes further management needs and challenges associated with BBWMA 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.

8.1 Challenge: A complete boundary survey of BBWMA is lacking.

8.1.1 Strategy: Explore the feasibility of contracting for a boundary survey of the area.

8.2 Challenge: Several sections of BBWMA do not currently have legal public vehicle access available and FWC does not have secured easements on other access roads limiting management and maintenance and repair that can be completed on these roads to provide reasonable and safe public access.

8.2.1 Strategy: Pursue land acquisition, negotiate easements, and develop road use agreements with private property owners to enable the public to use roads and FWC staff to maintain roads that provide legal, reliable, adequate public access to each unit of BBWMA.

8.2.2 Strategy: As a last resort and where possible, evaluate the feasibility of building new roads across state lands to access areas that are currently not accessible by roads incorporated into an easement or road use agreement.

8.3 Challenge: Degradation of sensitive natural communities is occurring due to inappropriate usage, primarily off-road vehicle use.

8.3.1 Strategy: Install gates and road barriers to prevent vehicles from leaving named and numbered roads to operate on closed roads and trams, firelines, or across country.

8.3.2 Strategy: Evaluate the potential of further restricting or prohibiting the use of ATVs on those units where they are routinely being used off-road illegally and causing damage to sensitive habitats.

8.3.3 Strategy: Improve compliance with designated road regulations through directed law enforcement patrols of problem areas.

8.3.4 Strategy: Work to educate the public about the negative effects of vehicle damage to sensitive habitats and the resultant negative effects on wildlife.

8.4 Challenge: Ensure that recreational opportunities on each unit of BBWMA are most suited and compatible with the existing infrastructure and system of roads and based on user demand.

- 8.4.1 Strategy: Collect and evaluate data regarding the various types of recreational activities that are engaged in by members of the public entering each unit of BBWMA and correlate with management problems or challenges that result from each type of use.
- 8.4.2 Strategy: Based on BBWMA user demand, evaluate the need to modify recreational uses offered to allow other compatible uses or address identified recreational issues and conflicts.
- 8.5 Challenge: Currently the existing level of staffing and resources is inadequate to accomplish optimal management and address the management challenges across all five units of BBWMA.**
- 8.5.1 Strategy: Continue to seek funding and resources to meet the needs of staffing and resources within the BBWMA Management Plan optimal management cost estimate (Section 9).
- 8.6 Challenge: Approximately 500 acres of historical scrub community planted in off-site sand pines have been clear-cut and require restoration, but there is a lack of a clear protocol to implement restoration activities on this natural community and a question about the specific species composition of plants that are historically found on these sites.**
- 8.6.1 Strategy: Work with FNAI, FWRI, universities and other natural community experts and sources to develop protocol for restoring coastal scrub communities across BBWMA. Develop species composition and structural objectives for the restoration of coastal scrub communities across BBWMA.
- 8.7 Challenge: The units of BBWMA are disjunct, not well connected internally and are far apart resulting in higher management costs and continuing resource management challenges.**
- 8.7.1 Strategy: Advocate for increased acquisition of parcels within the FWC Florida Forever Additions and Inholdings acquisition list to provide increased connectivity, manageability, and improved public access.
- 8.7.2 Strategy: Implement the OCPB and CAS; cooperate and coordinate with private landowners, Taylor and Dixie counties, as well as other partners.
- 8.8 Challenge: Currently the number of public entrances at BBWMA Jena Unit creates potential management issues.**
- 8.8.1 Strategy: Explore the feasibility of eliminating and/or relocating select entrances.

8.8.2 Strategy: Pursue land acquisitions to decrease the number of entrances required to effectively access the Jena Unit.

8.9 Challenge: Facility and equipment vandalism, and littering have negative impacts on sensitive plant communities and water quality, degrade aesthetic qualities of the area, damage wildlife species or their habitats, and increase management costs.

8.9.1 Strategy: Through news media outlets, postings at entrance kiosks, and signage, inform public about these activities and their detrimental effects on the area.

8.9.2 Strategy: Improve compliance with designated road regulations, litter laws, and protection of facilities and equipment through directed law enforcement patrols of problem areas.

8.10 Challenge: Currently, the BBWMA lease agreement from the BOT includes submerged lands landward of the Juncus line that are not delineated sufficiently to allow a calculation of the total acreage within the BBWMA boundary.

8.10.1 Strategy: Coordinate with DSL to update the acreage included in the management funding formula for the area and add the additional acreage to the establishment boundary total.

9 Cost Estimates and Funding Sources

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

The cost estimate below, although exceeding what FWC typically receives through the appropriations process, is estimated to be what is necessary for optimal management, and is consistent with the current and planned resource management and operation of BBWMA. Cost estimate categories are those currently recognized by FWC and the Land Management Uniform Accounting Council. More information on these categories, as well as the Fiscal Year 2014-2015 operational plan showing detailed cost estimates by activity and categories of expenditures, may be found in Appendix 13.13.

Table 15: Big Bend WMA Management Plan Cost Estimate

Maximum expected one year expenditure

<u>Resource Management</u>	<u>Expenditure</u>	<u>Priority</u>
Exotic Species Control	\$100,354	(1)
Prescribed Burning	\$374,672	(1)
Cultural Resource Management	\$9,020	(1)
Timber Management	\$139,497	(1)
Hydrological Management	\$296,666	(1)
Other (Restoration, Enhancement, Surveys, Monitoring, etc.)	\$720,506	(1)
Subtotal	\$1,640,716	
<u>Administration</u>		
General administration	\$127,813	(1)
<u>Support</u>		
Land Management Planning	\$196,713	(1)
Land Management Reviews	\$62,779	(3)
Training/Staff Development	\$82,599	(1)
Vehicle Purchase	\$898,833	(2)
Vehicle Operation and Maintenance	\$17,558	(1)
Other (Technical Reports, Data Management, etc.)	\$48,873	(1)
Subtotal	\$1,307,354	
<u>Capital Improvements</u>		
New Facility Construction	\$54,734	(2)
Facility Maintenance	\$858,987	(1)
Subtotal	\$913,722	
<u>Visitor Services/Recreation</u>		
Info./Education/Operations	\$130,177	(1)
<u>Law Enforcement</u>		
Resource protection	\$63,123	(1)
<u>Total</u>	\$4,182,905	*

*Based on the characteristics and requirements of this area, 14 FTE positions would be optimal to fully manage this area. All land management funding is dependent upon annual legislative appropriations.

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

Table 16: Big Bend WMA Management Plan Cost Estimate

Ten-year projection

Resource Management	Expenditure	Priority	Priority schedule:
Exotic Species Control	\$881,724	(1)	(1) Immediate (annual)
Prescribed Burning	\$3,291,906	(1)	(2) Intermediate (3-4 years)
Cultural Resource Management	\$79,252	(1)	(3) Other (5+ years)
Timber Management	\$1,225,640	(1)	
Hydrological Management	\$2,606,540	(1)	
Other (Restoration, Enhancement, Surveys, Monitoring, etc.)	\$6,330,444	(1)	
Subtotal	\$14,415,505		
Administration			
General administration	\$1,122,983	(1)	
Support			
Land Management Planning	\$1,728,340	(1)	
<i>Land Management Reviews</i>	\$179,711	(3)	
Training/Staff Development	\$725,728	(1)	
Vehicle Purchase	\$3,163,030	(2)	
Vehicle Operation and Maintenance	\$154,265	(1)	
Other (Technical Reports, Data Management, etc.)	\$429,402	(1)	
Subtotal	\$6,380,476		
Capital Improvements			
New Facility Construction	\$158,100	(2)	
Facility Maintenance	\$7,547,156	(1)	
Subtotal	\$7,705,256		
Visitor Services/Recreation			
Info./Education/Operations	\$1,143,752	(1)	
Law Enforcement			
Resource protection	\$554,604	(1)	
Total	\$31,322,576	*	

*Based on the characteristics and requirements of this area, 14 FTE positions would be optimal to fully manage this area. All land management funding is dependent upon annual legislative appropriations.

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

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

Approved Conditional Rejected

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

11 Compliance with Federal, State, and Local Governmental Requirements

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

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

where the law allows reasonable exceptions (e.g., where handicap access is structurally impractical or where providing such access would change the fundamental character of the facility being provided).

Uses planned for BBWMA are in compliance with the Conceptual State Lands Management Plan and its requirement for “balanced public utilization,” and are in compliance with the mission of FWC as described in its Agency Strategic Plan (Appendix 13.7). 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 372, 253, 259, 327, 370, 403, 870, 375, 378, 379, 487, and 597 FS.

The FWC has developed and utilizes an Arthropod Management Plan for BBWMA in compliance with Chapter 388.4111 F.S. (Appendix 13.14). This plan was developed in cooperation with the local BBWMA County arthropod control agency. The BBWMA Management Plan is also in conformance with the Local Government Comprehensive Plan as approved and adopted for Taylor and Dixie Counties, Florida, (Appendix 13.15).

12 Endnotes

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- ¹⁰ Stevenson, J. C., M. S. Kearney, and E. W. Koch. 2002. Impacts of sea level rise on tidal wetlands and shallow water habitats: A case study from Chesapeake Bay. *American Fisheries Society Symposium* 32:23-36.
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- ¹⁵ Mann, M.E. and K.A. Emanuel. 2006. Atlantic Hurricane Trends Linked to Climate Change. *Eos Trans. AGU* 87: 233-244.
- ¹⁶ Stanton, E.A. and F. Ackerman. 2007. *Florida and Climate Change: The Costs of Inaction*. Tufts University Global Development and Environment Institute and Stockholm Environment Institute–US Center, Tufts University, Medford, MA.
- ¹⁷ Clough, J.S. 2008. Application of the Sea-Level Affecting Marshes Model (SLAMM 5.0) to Crystal River NWR. Warren Pinnacle Consulting, Inc. for U.S. Fish and Wildlife Service. 46 pp.

13 Appendices

The appendices are located in Volume II of this Management Plan.