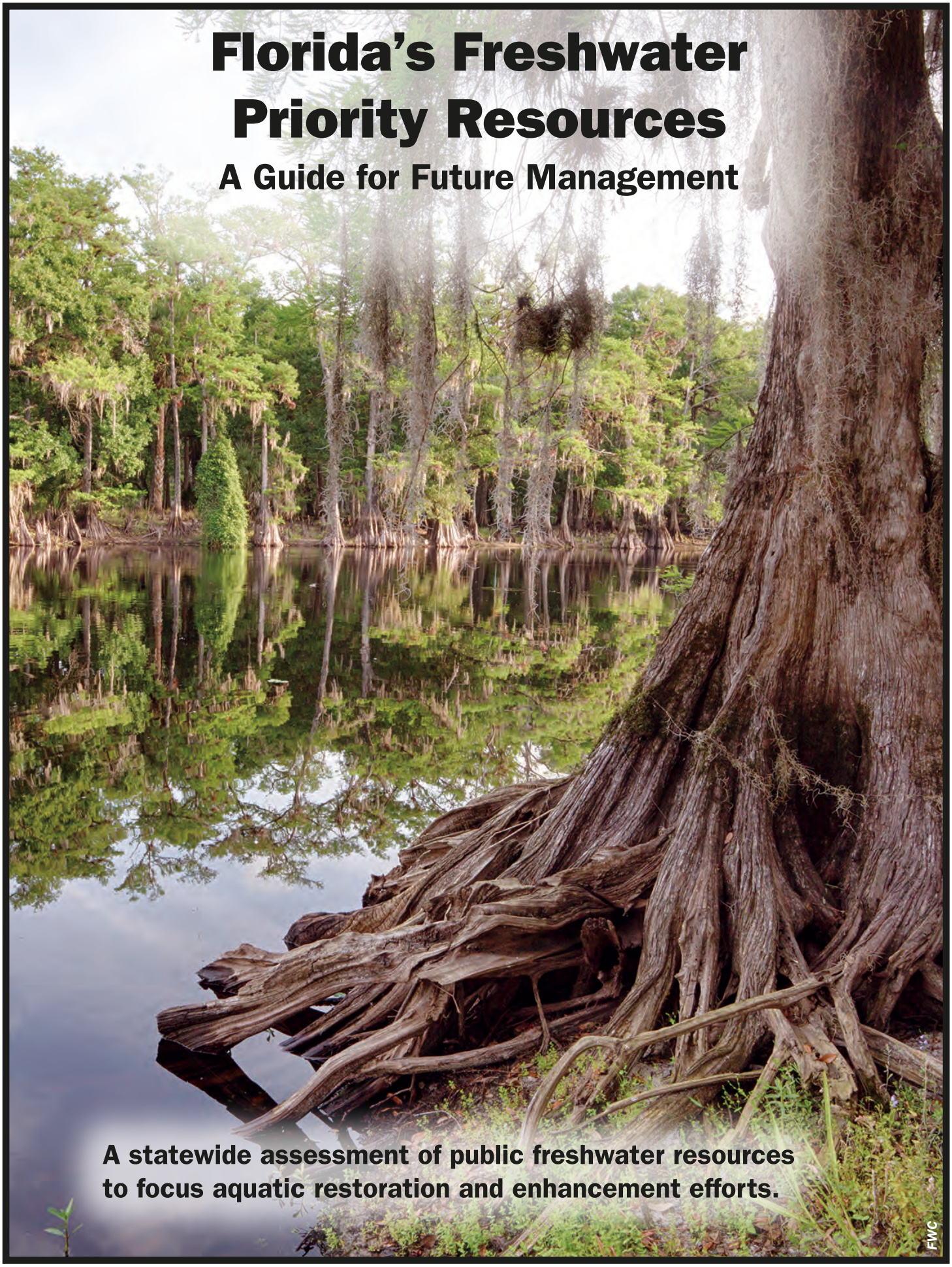
Florida's Freshwater Priority Resources

A Guide for Future Management



A statewide assessment of public freshwater resources to focus aquatic restoration and enhancement efforts.

FWC

Florida's Freshwater Priority Resources: A Guide for Future Management 2018

Florida Fish and Wildlife Conservation Commission
Aquatic Habitat Conservation and Restoration Section

Recommended Citation:

Florida Fish and Wildlife Conservation Commission (FWC). 2018. Florida's Freshwater Priority Resources: A Guide for Future Management. Tallahassee, Florida.

Table of Contents

Section I: Need for Wetland Assessment **1**

Purpose of Assessment 2

Future Considerations 2

Section II: Identification of Freshwater Resources **3**

Rivers and Streams 3

Non-forested Wetlands 6

Forested Wetlands 6

Lakes 6

Prioritization Process 10

Section III: Priority Resources **12**

Northwest Region 12

North Central Region 15

Northeast Region 18

Southwest Region 21

South Region 24

Section IV: Merging Priority Resources into Management Activities **27**

List of Figures and Tables

Figure 1. Florida's major freshwater habitat types 4

Figure 2. Florida's rivers and streams 5

Figure 3. Florida's non-forested wetlands 7

Figure 4. Florida's forested wetlands 8

Figure 5. Florida's natural and artificial lakes 9

Figure 6. High-priority aquatic resources of the Northwest Region. 13

Figure 7. High-priority aquatic resources of the North Central Region 16

Figure 8. High-priority aquatic resources of the Northeast Region 19

Figure 9. High-priority aquatic resources of the Southwest Region 22

Figure 10. High-priority aquatic resources of the South Region 25

Table 1. Summary of public aquatic resources assessed and resulting high-priority resources 11

Literature Cited **29**

SECTION I: Need for Wetland Assessment

Florida's freshwater aquatic resources are some of the most dynamic and ecologically unique habitats in the state. Habitat types include a diverse assemblage of sandhill and sinkhole lakes, bottomland hardwood forest, numerous softwater, calcareous and seepage streams, freshwater marshes and wet prairies, cypress swamps, alluvial rivers and associated floodplain marshes, spring and spring runs, and the Everglades. Ecologically, wetlands themselves serve as a critical interface between terrestrial habitats and many of the state's lakes, rivers and streams intercepting runoff and serving as natural water treatment facilities for the assimilation of phosphorous and nitrogen, heavy metals, and other toxic substances (Kautz et al. 1998). These aquatic resources provide nesting, foraging, wintering and migrating habitat for many species of fish and wildlife, including waterfowl, shorebirds, wading birds and songbirds as well as spawning grounds, nurseries, and food resources for fish, aquatic amphibians and insects. Many aquatic resources are identified as critical habitat under the provisions of the Endangered Species Act due to the high numbers of threatened and endangered plants (26%) and animals (45%) that directly or indirectly rely on wetlands and aquatic resources for survival (Niering 1988, Hammer 1992, Flynn 1996, Environmental Protection Agency [EPA] 2016a, EPA 2016b). Economically, aquatic resources contribute significantly to Florida's $38.3 billion outdoor recreation industry (Outdoor Industry Association 2011) as many recreational activities such as camping, hunting, fishing, birding, and photography take place in Florida's aquatic habitats. Accordingly, these activities support over 329,000 jobs and contribute $2.5 billion through state and local taxes.

At statehood, an estimated 20.3 million acres of wetlands existed in Florida (Dahl 1990). However, Florida was thought to have too much water and Floridians were most concerned about drainage, flood control, and navigation (Purdum 2002). As a result, wetlands were drained for farms, groves, and houses. Canals were cut to facilitate drainage and improve navigation. Floodwaters were held back with engineering works. Wastes were discharged without treatment into rivers, lakes, and coastal waters. Many water bodies became isolated from their historic flood plains, resulting in reduced and greatly altered aquatic habitat. Furthermore, water management activities have reduced the surface area of lakes, and water-level regulation schedules prevent natural fluctuations that otherwise maintain the health of these ecosystems (Kautz et al. 1998). Consequently, approximately 45% (9 million acres) of Florida's wetlands and aquatic resources have been converted, altered or destroyed, the most of any state (Dahl 2005, Estevez et al. 1984). Most of the net losses (72%) are attributed to urban and rural development with the remaining 28% resulting from agriculture activities (Dahl 2005). As of 2010, an estimated 11.3 million acres of wetlands existed in Florida, which represents approximately 31% of the area of the state, a greater percentage of the land surface than any other state in the conterminous United States (Dahl 2005, U.S. Department of Agriculture [USDA] 2015). Roughly 90% of Florida's wetlands consist of freshwater systems including approximately 32,000 lakes (U.S. Geological Survey [USGS] 2016). The remaining 10% includes marine and estuarine wetlands.

Florida's 2015 population estimate exceeded 20.2 million (U.S. Census Bureau 2015) and water managers today are concerned with water quality protection, water supply planning, water resources development, and preservation and protection of the natural environment. By 2030, Florida's population projection is expected to increase to 24.6 million, a 22% increase (University of Florida-Bureau of Economic and Business Research 2015). Conserving, protecting, and restoring natural systems, while ensuring an adequate water supply, remains one of Florida's greatest challenges (Purdum 2002). Despite Florida's storied history of wetland impacts, aquatic resources are major economic drivers contributing to quality of life for a variety of stakeholders at the local, regional and national scale. The diverse waterbodies that sustain our fish and wildlife populations are a concern for many citizens due to a rapidly changing landscape. Population growth, water withdrawals, water level stabilization in natural lakes, sedimentation, non-native species introduction and expansion, cultural eutrophication, and climate change are significant threats that will continue to have an impact on fish and wildlife populations.

FWC

Alteration of wetlands in the Florida Everglades includes created ditches and canals. Florida's wetlands have been largely altered, converted, or destroyed.

Purpose of Assessment

Floridians' commitment to the natural resources of the state through passage of the Florida Water and Land Conservation Initiative (F.S. 375.041) provides an opportunity to continue to manage existing freshwater aquatic habitats, restore and enhance altered or manipulated freshwater habitats, and to incorporate innovative, science-based techniques to improve conservation efforts.

Thus, the purpose of this document is to assimilate current geographical and geospatial information on Florida's freshwater aquatic habitats and associated fish and wildlife species that depend on these resources. Using a science-based approach, a prioritization analysis was conducted to identify and locate publicly-owned aquatic resources. This information will help guide future management considerations that will provide the greatest conservation benefit from management, restoration and enhancement. This information further strengthens the Florida Fish and Wildlife Conservation Commission's (FWC) accountability in making informed, science-based decisions when expending legislatively appropriated funds towards public trust resources, benefiting not only fish and wildlife resources, but Florida citizens as well.

Future Considerations

With Florida's increasing human population, encroachment and development continues into natural areas, stressing aquatic habitats and the fish and wildlife that depend on healthy wetlands. Furthermore, to meet human demand, large volumes of freshwater will be required to meet basic everyday consumption needs. Because sizeable acreages of freshwater habitats are privately held within Florida, preservation and protection of these resources may be crucial to maintaining quality fish and wildlife habitat. These aquatic resources are an integral component in maintaining wildlife corridors and reducing habitat fragmentation.

The FWC should evaluate opportunities to preserve and protect these privately-held aquatic resources. This can be accomplished through collaboration with other state and federal conservation agency partnerships.

SECTION II: Identification of Freshwater Resources

For the purposes of this guide, and to ensure relative consistency with the 2018 revision of Florida's State Wildlife Action Plan (SWAP), Florida's freshwater aquatic habitat types are grouped into four major categories: 1) rivers and streams, 2) non-forested wetlands, 3) forested wetlands, and 4) lakes (Figure 1).

Rivers and Streams

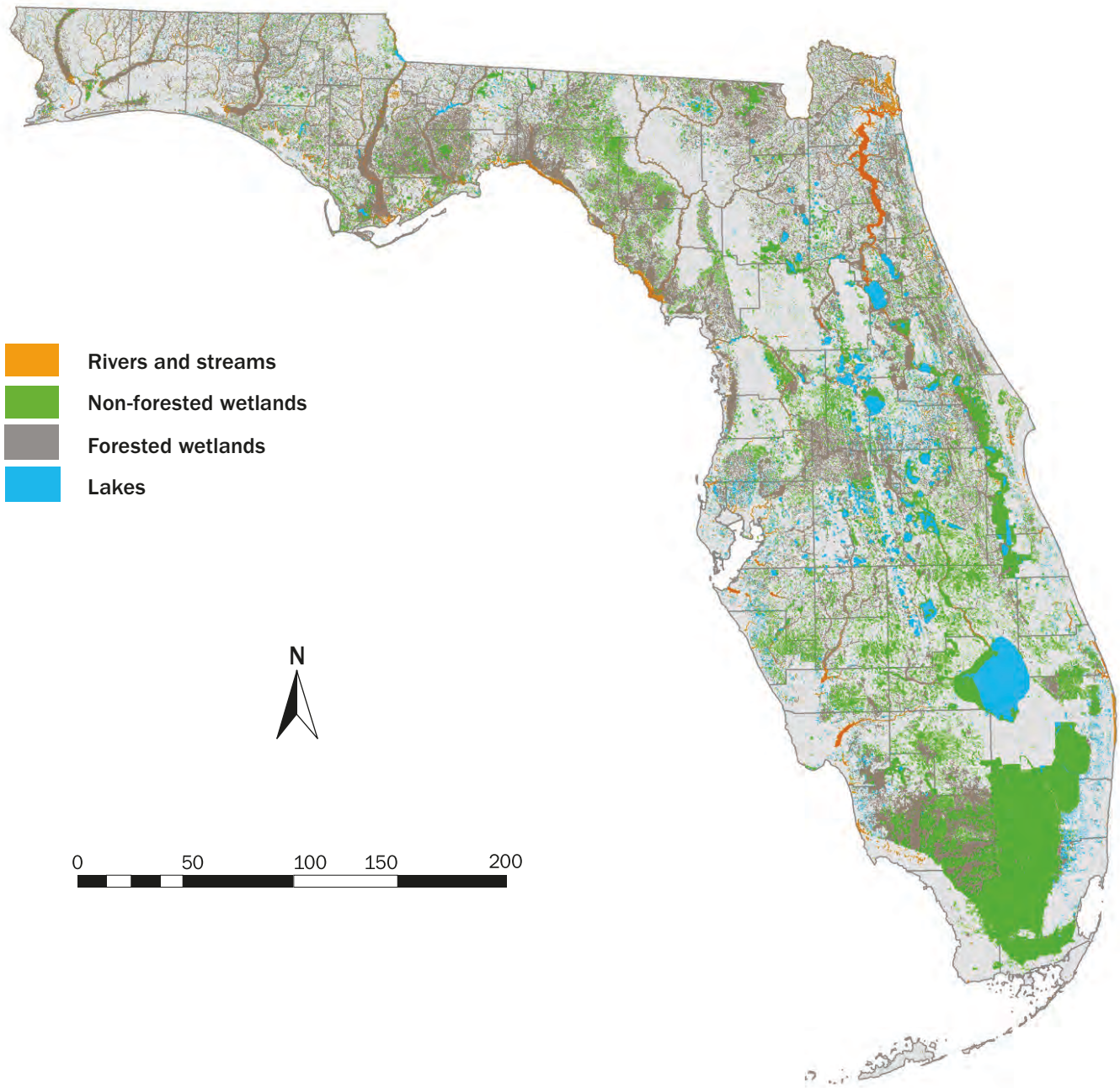
Rivers and streams are natural, flowing waters bound by channel banks that flow from a source to the downstream limits of tidal influence, or in some cases, discharge directly into the ocean (Nordlie 1990, Figure 2). Over 1,700 rivers and streams flow over Florida and are classified based on flow velocity, temperature, dissolved oxygen concentration, substratum, and water hardness (Fernald and Patton 1984, Nordlie 1990).

By flow, the four largest rivers are the Apalachicola, Suwannee, Choctawhatchee, and Escambia, all in north Florida. Stream flow varies little from month to month, but is highly variable seasonally and geographically across the state. Flow is based on several factors including the relatively low variability of average monthly rainfall, relatively high rate of evapotranspiration in summer, the large volume of slowly-released water from Florida's numerous lakes, and the large and relatively stable flow of ground water to rivers and streams from the aquifer system (Kenner 1969). Florida's rivers and streams contain a great diversity of plants, fish and wildlife. Due to the variety, fragility, and uniqueness of Florida's rivers and streams, many fish and wildlife species, including multiple endemic species, depend on these systems. Florida's rivers and streams are categorized as follows: spring run, alluvial, tidally-influenced, seepage, riverine sandbar, and blackwater (Florida Natural Areas Inventory [FNAI] 2010).

FWC

Non-forested wetland, Split Oak Forest WEA near Orlando, Florida.

Florida's Major Freshwater Habitat Types



Rivers and streams: Natural waters, bound by channel banks, that flow from a source to the downstream limits of tidal influence or discharge into the ocean.	**Non-forested wetlands:** Large alluvial floodplains or shallow depressions typically dominated by grasses, herbs, and shrubs.	**Forested wetlands:** Typically alongside rivers and streams, lakes, and seepage basins, dominated by trees adapted to aquatic environments.	**Lakes:** Standing water bodies of natural origin, with a surface area measuring one or more acres. In Florida, often inter-connected with groundwater.

Figure 1. *Florida's major freshwater habitat types: rivers and streams, non-forested wetlands, forested wetlands, and lakes.*

Florida's Rivers and Streams

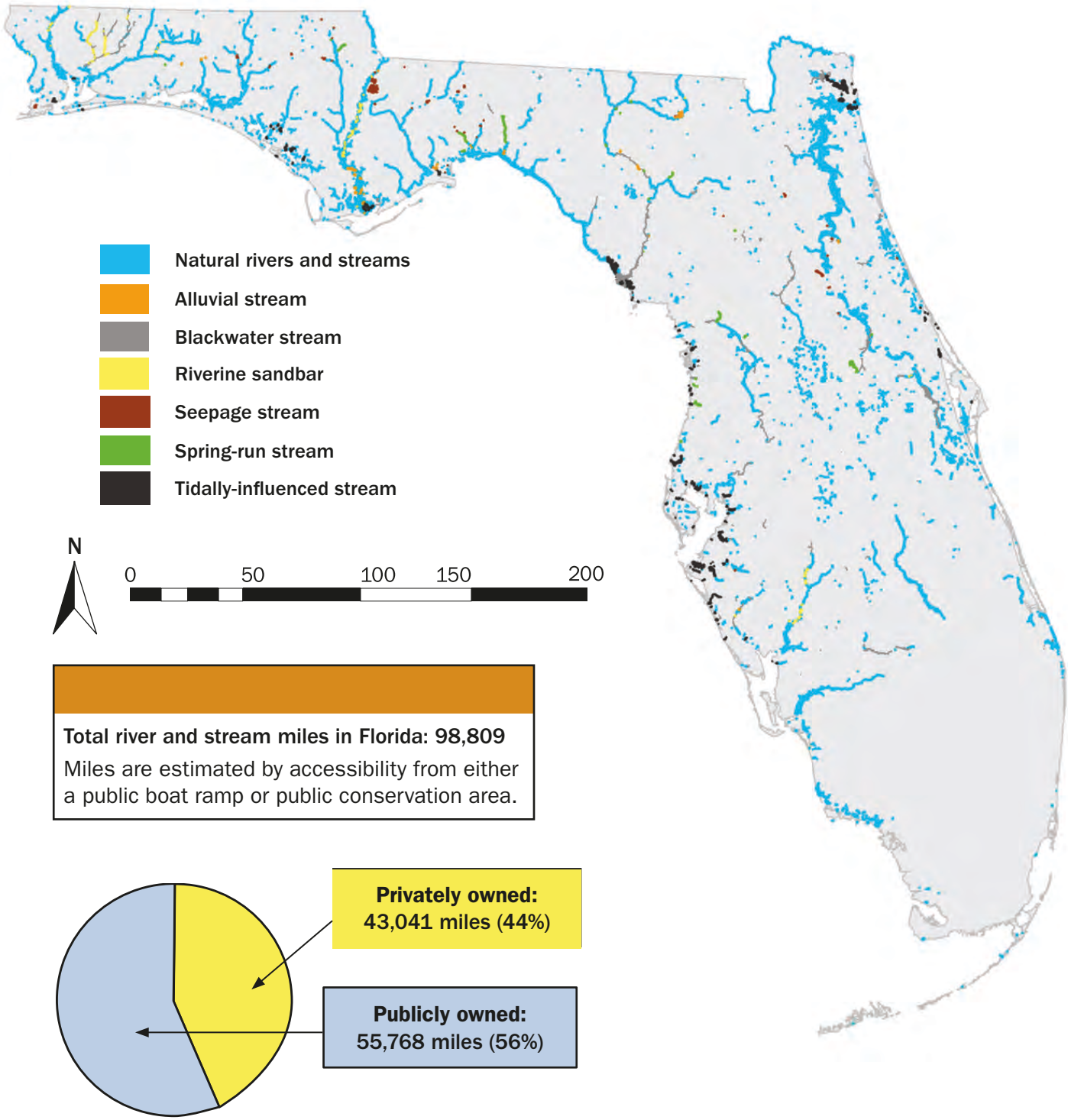


Figure 2. *Florida's rivers and streams. Rivers and streams were identified and mapped utilizing U.S. Geologic Survey National Hydrography Dataset (NHD) Plus (USGS 2016, McKay et. al. 2012) which includes the Strahler order of stream reaches. Streams not included in the NHD Plus were assumed to be a Strahler order of 1. Furthermore, rivers and streams were based at the hydrologic unit code (HUC) 12. These sources are slight deviations from the calculations used in Florida's State Wildlife Action Plan (2017).*

Non-Forested Wetlands

Non-forested wetlands are one of the most widespread and abundant wetland types in Florida and are typically associated with large alluvial floodplains, or occur in shallow depressions throughout the state (Figure 3). As the name implies, non-forested wetlands consist of early successional plant species such as grasses, herbs, and small shrubs. If a woody canopy is present, it is generally sparse and often stunted. Recurring fire and other forms of disturbance, especially during the early growing season, is crucial in maintaining an early successional, non-woody vegetative community.

The hydrologic regime, soils and disturbance frequency can define the sub-classification of non-forested wetlands. Generally, marshes are flooded seven to twelve months a year and occur in sandy, clay, marl and organic soils (Kushlan 1990). Hydroperiod and inundation depth will influence the types of plants that grow. Emergent or floodplain marshes are shallowly flooded (less than one foot deep) for shorter periods and include emergent grasses and herbaceous plants such as sedges, rushes, and cattails. Marshes containing floating-leaved plants (e.g., water-lilies, duck weed, spatterdock) or submersed plants (e.g., eel grass, coontail, pondweed) tend to be flooded year-round at depths greater than two feet. Other types of non-forested wetlands include prairies and bogs in which the soils are typically saturated during the rainy season and may or may not contain standing water. Vegetation usually consists of a mixture of wetland and herbaceous plants, some of which are facultative, or found growing in non-wetland soils.

Forested Wetlands

Forested wetlands occupy 10% of Florida's land area and occur along rivers and streams, lakes, and seepage basins (Figure 4). Forested wetlands are dominated by hydrophytic trees that are adapted to aquatic environments. Many types of forested wetland communities can be found in Florida, such as cypress swamps, bottomland hardwood forest, bay swamps, and hydric hammocks. Similar to non-forested wetlands, the hydrologic regime, soils, and inundation depth influence and determine the classification of forested wetland at a given site. For example, bottomland hardwoods typically occur in the northern latitudes of the peninsula under relatively short hydroperiods (three to six months per year), whereas cypress swamps are found throughout the state, but under a more protracted hydroperiod (more than nine months per year).

Trees typically associated with forested wetlands include water hickory, river birch, Florida elm, live oak, bald and pond cypress, water tupelo, swamp ash, and cabbage palm. Other forested wetlands are characterized by the presence of broad-leaved evergreens, such as sweetbay, loblolly bay and swamp bay intermixed with deciduous hardwoods.

Lakes

Florida has approximately 31,978 natural lakes with a surface area of one acre or more (Figure 5). This habitat category is comprised exclusively of standing water bodies of natural origin. In addition to natural lakes, the FWC currently manages numerous "artificial" impoundments and reservoirs (Commission Managed Impoundments – CMIs) for fish and wildlife benefit and recreational use. The great majority of natural lakes were formed or enlarged by dissolution of the underlying limestone by acidic surface waters. As a result, many retain an intimate connection with groundwater, and lack a natural surface outflow. Others may be connected to aquatic caves by underground fissures or bedding planes. Some are landlocked and dependent on rainfall as their only source of water, while others have surface water inlets and outlets. Many of those with surface water inlets and outlets, such as the Kissimmee chain of lakes, have been altered by the construction of water control structures and canals.

Florida's lakes are usually less than 10 feet (3 m) deep, with sand, silt, or organic bottom substrates. Depending on the water chemistry, vegetation in the lakes can vary from nonexistent, to a fringe of emergent plants at the shoreline, to a complete covering of floating plants. Introduced, non-native aquatic species are a major threat to this habitat. For more information about Florida's natural lakes, please visit FNAI's Guide to the Natural Communities of Florida, 2010 Edition.

Florida's Non-Forested Wetlands

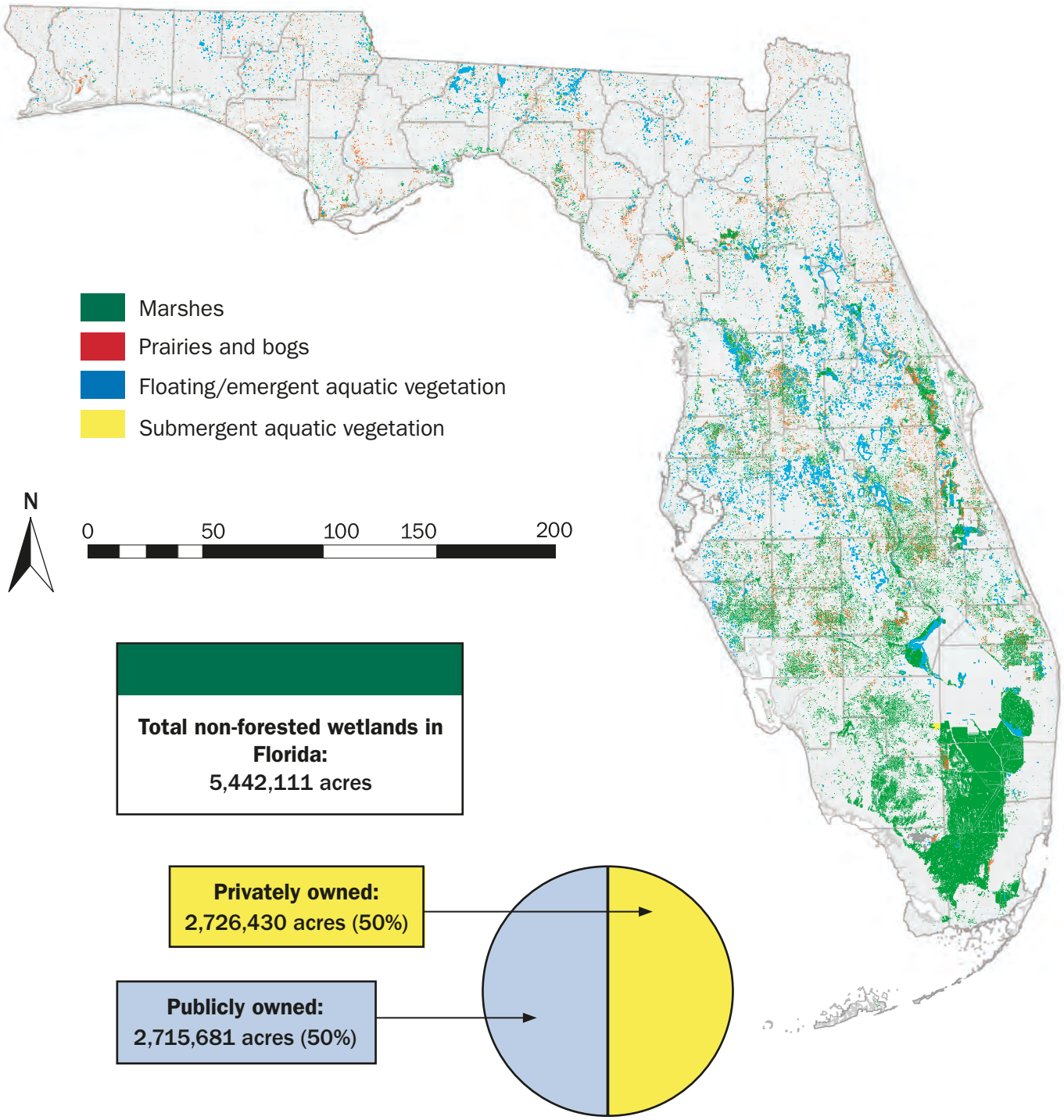


Figure 3. *Florida's non-forested wetlands. This habitat is broken into 5 classifications. Nearly 5.5 million acres of freshwater non-forested habitat exists in the state, nearly half of which is publicly managed. Data source: FNAI Cooperative Land Cover (v3.2) and FNAI 2016 Florida Managed Areas.*

Florida's Forested Wetlands

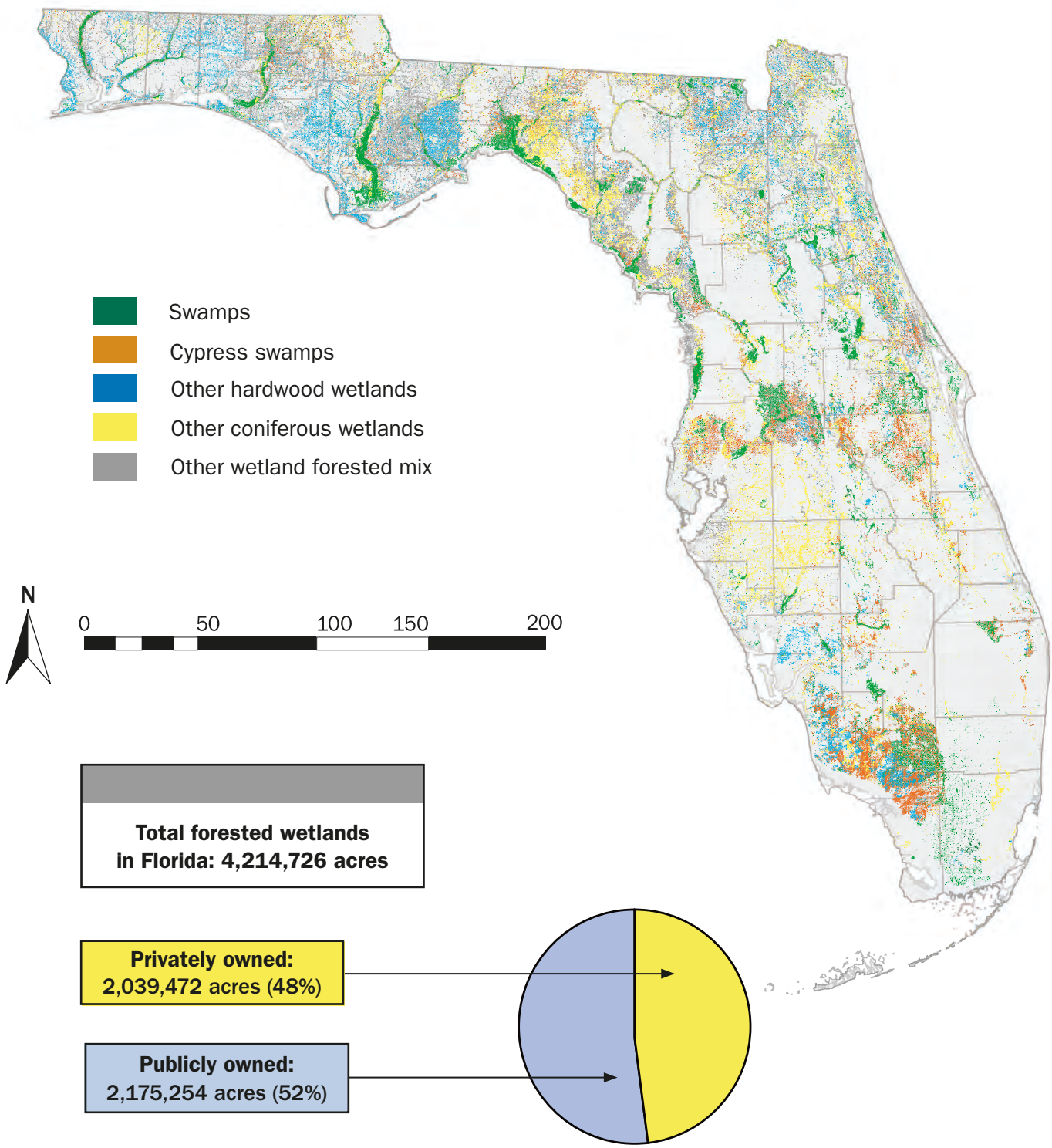


Figure 4. *Florida's forested wetlands. Slightly more than half of the 4 million acres of forested wetlands in Florida are publicly-managed. Data source: FNAI Cooperative Land Cover (3.2) and FNAI 2016 Florida Managed Areas.*

Florida's Natural and Artificial Lakes

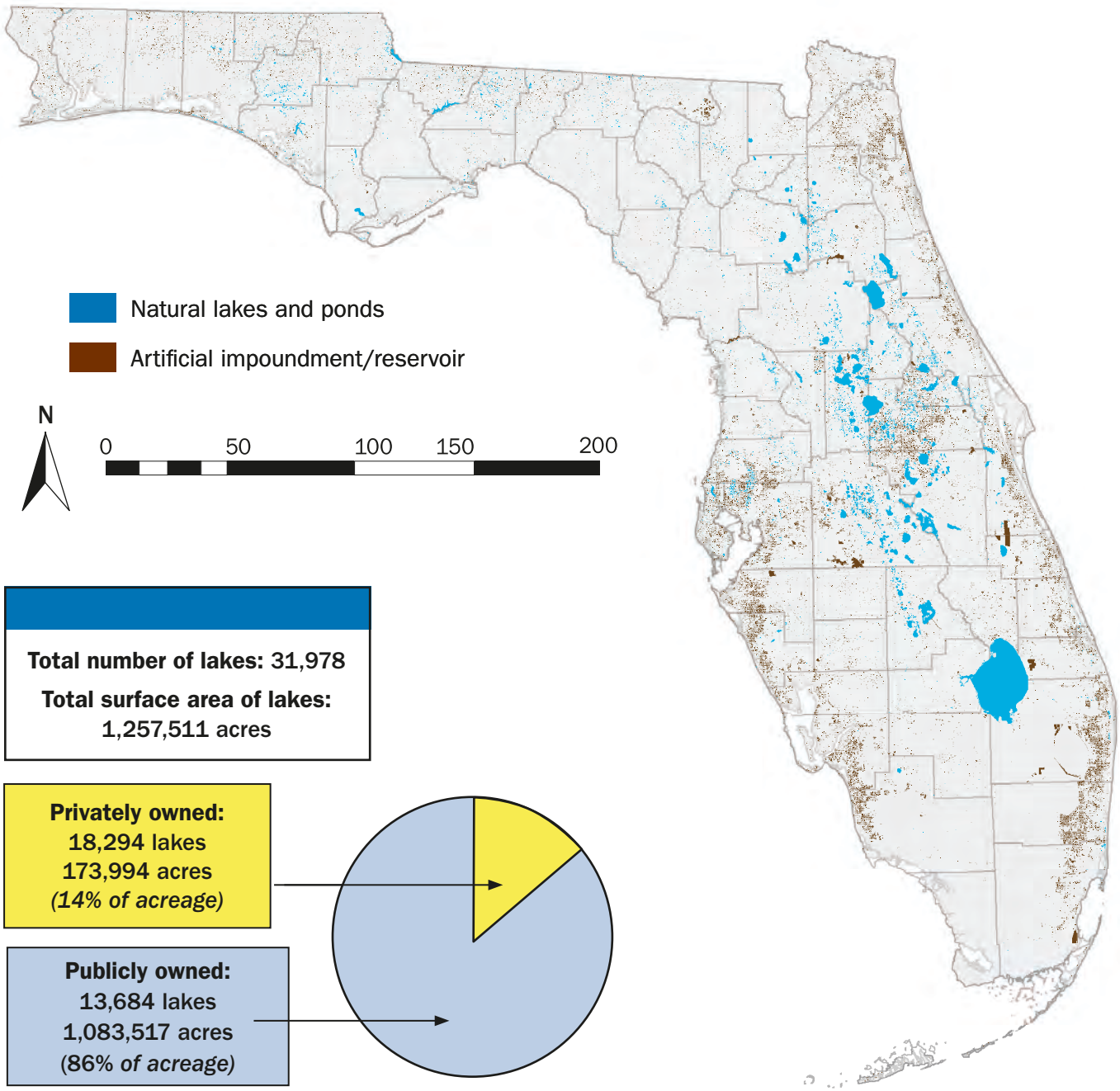


Figure 5. *Florida's natural and artificial lakes. While the number of privately-owned lakes exceeds publicly-owned lakes, the total surface area acreage of publicly-owned lakes is nearly five times more than that of privately-owned lakes. Lakes were identified and mapped utilizing U.S. Geologic Survey National Hydrography Dataset. Only public natural lakes greater than 50 acres were used in the assessment.*

Prioritization Process

The process of prioritizing the four major aquatic habitat types began by partitioning out publicly-owned lands from those held in private ownership.

Because there are tens of thousands of miles of rivers and streams in Florida, these resources were consolidated into sub-watershed boundaries (Hydrologic Unit Code-12; U.S. Fish and Wildlife Service [USFWS) 2002, USGS 2017). Sub-watersheds, which range in size from 10,000 to 40,000 acres, provide the best available resolution of priority stream locations. Using the National Hydrography Dataset stream flowlines (USGS 2016), 1,295 sub-watersheds were identified, of which 1,235 contained publicly accessible streams. Streams within each sub-watershed were weighted for analysis by Strahler order and length (the larger the stream, the higher the priority value).

Non-forested and forested wetlands were partitioned out by selecting the appropriate sub-classes for each habitat type utilizing the 2016 FNAI Cooperative Land Cover layer and clipping them from the FNAI 2016 Florida Managed Areas layer. Over 2,500 public conservation areas were identified, of which 1,835 contained either forested or non-forested wetlands. Many contained both wetland types. Public conservation areas with wetlands classified as artificial impoundments (e.g., T.M Goodwin Waterfowl Management Area) were excluded from this assessment. The FWC recognizes that many of these conservation areas provide high fish and wildlife resource values, significant water quality and quantity benefits, and numerous recreational opportunities. Although excluded from the prioritization analysis, these areas are intensely managed by FWC and cooperating agencies.

Lakes were considered public if they were accessible from a public boat ramp or public waterway, which resulted in nearly 14,000 public lakes. In order to focus FWC's efforts on those public lakes with the greatest capacity to influence habitat restoration efforts, we excluded those less than 50 acres for analysis. This process resulted in 324 public lakes greater than or equal to 50 acres for prioritization (FWC 2012b).

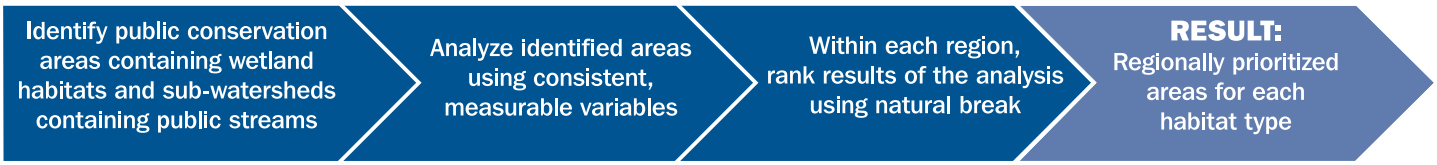
Collectively, this information was used to create four new "base" geospatial data layers, one for each of the four publicly-owned/accessible aquatic habitat types. An iterative, analytical process was then used to overlay additional physical and biological data layers (referred to as variables or parameters) on top of the four base layers to evaluate their presence (or absence) and importance to the resource. These variables, identified below, were grouped into three categories, each comprised of four geospatial parameters (seven each for lakes, FWC 2012b).

Variables evaluated over base layers to determine ranking of regional aquatic resources:

1) Socio-Economic – provide a measure of public outdoor recreational opportunities (parameters include recreational trails, population centers, hunting and fishing opportunities, and FWC management areas);

2) Fish And Wildlife Resources – designed to highlight ecological significance of each aquatic resource and how it relates to fish and wildlife function (i.e., public waterbody/wetland size, threatened, endangered, and species of greatest conservation need, avian focal areas, hydrological units); and

3) Management Emphasis – designed to measure biological significance that relate to the need and opportunity for aquatic habitat restoration and include information such as impaired waters, road density, land cover, hydrologic modification, invasive aquatic and wetland plants, and riparian/freshwater buffers.



Prioritization process for areas containing aquatic resources in FWC's five regions. The resulting priorities will help inform allocation of resources to manage and enhance aquatic habitats throughout Florida.

Identification of Freshwater Resources

Each publicly-owned aquatic resource that was partitioned out as described on the preceding page received a score ranging between zero and one for each variable evaluated. For example, the avian focal areas variable identifies important focal areas for waterfowl, wading birds, land birds, seabirds, and shorebirds. If a publicly-owned aquatic resource did not fall within any of the avian focal areas, that aquatic resource received a score of zero for that variable. However, if the aquatic resource fell within one of the five focal areas, it would receive a score of 0.20, and a score of 0.40 if it fell within two of the five areas, etc. The scores for each public aquatic resource by habitat type were then summed across all variables and grouped for each of FWC's five regions. A Jenks natural breaks optimization classification (Jenks 1967, Jenks and Caspall 1971) was used to rank (low, medium low, medium, medium high and high) each aquatic resource, by habitat type for each of the five regions.

Table 1 summarizes the number of public aquatic resources assessed by habitat type for each region, along with those identified as high priority. Aquatic resources classified as medium high, medium, medium low and low are presented, by region, in Appendix B of the online version of Florida's Freshwater Priority Resources Document.

For more detailed information on the identification of habitat types, how public lands were partitioned out, or the geo-spatial data variables utilized, please refer to Appendix A of the online version of Florida's Freshwater Priority Resources: A Guide for Future Management. The document can be located at MyFWC.com/AquaticHabitats.

Table 1. *Summary of public aquatic resources assessed and resulting high-priority resources. Resources were assessed within the four major aquatic habitat types, and within each FWC Region.*

Aquatic Habitat Type		Rivers & Streams		Non-Forested Wetlands		Forested Wetlands		Lakes	
FWC Region		Sub-Watersheds	Stream Miles	Conservation Areas	Wetland Acres	Conservation Areas	Wetland Acres	Number >50 Acres	Total Acres
Northwest	Assessed	340	16,376	201	162,117	230	708,343	35	53,819
	High-Priority	42	2,408	12	124,282	11	500,515	4	21,653
North Central	Assessed	231	8,513	247	118,058	340	438,285	30	53,625
	High-Priority	42	2,523	28	70,612	35	238,776	5	35,475
Northeast	Assessed	259	9,949	380	353,258	407	486,371	137	330,940
	High-Priority	39	2,824	26	221,732	30	265,518	11	116,867
Southwest	Assessed	270	10,514	361	148,090	414	246,212	117	113,894
	High-Priority	29	1,739	43	77,035	65	134,618	1	27,262
South	Assessed	136	9,592	242	2,082,248	243	542,255	4	450,277
	High-Priority	16	2,443	29	1,875,738	20	416,009	1	448,000

SECTION III: Priority Resources

This section includes high-priority aquatic resources identified within each FWC region. Priority rivers and streams are referenced by the sub-watershed in which they occur, rather than the individual stream name. In many cases, the given name of the sub-watershed may include "Lake," as in Lake Munson, a high-priority sub-watershed in the Northwest Region. Readers are reminded that these are not priority lakes, but refer to the names of sub-watersheds containing priority rivers and streams.

Northwest Region

High-priority aquatic resources are clustered around Apalachicola, west of Tallahassee, and east of Pensacola (Figure 6). Sub-watersheds such as Tate's Hell Swamp-Cash Creek, Cat Creek, Carters Mill Branch and Lake Jackson are noted for their high socio-economic importance, management emphasis, and fish and wildlife values. Other high-ranking sub-watersheds include Blounts Bay Frontal and East River-Apalachicola River Frontal. This region contains numerous seepage/steephead and softwater streams (Tonsmeire et al. 1996), important for recreational value and high species diversity (Florida Department of Environmental Protection [DEP] 2005).

Priority conservation areas containing non-forested and forested wetlands include Apalachicola National Forest, Apalachicola River Wildlife and Environmental Area (WEA), Tate's Hell State Forest, and Tate's Hell Wildlife Management Area (WMA). Tate's Hell State Forest, a 202,437-acre conservation area comprised of 27,506 acres of non-forested and 45,813 acres of forested wetlands was the only conservation area in the region to rank high in all three categories (socio-economic importance, management emphasis, and fish and wildlife values). The hydrology within many of the conservation areas was substantially altered in the 1960's with the construction of roads and associated ditches and the establishment of slash pine plantations. These impacts degraded wetlands through drainage and altered freshwater flows into the Apalachicola Bay. Restoration efforts are now underway to reconnect wetlands to restore fresh water flow to the Bay. FWC staff also actively work to restore ephemeral wetlands, benefitting threatened and endangered species such as the Florida bog frog and frosted flatwoods salamander.

Lake Talquin in the Tallahassee area, one of the four high-priority lakes in the region, is an 8,088-acre reservoir in Gadsden County formed in the 1920s by damming the Ochlocknee River. Lake Talquin is nationally known for its high-quality black crappie fishery and supports at least 10 public boat ramps, seven public fishing piers, and six fish camps. Enhancement activities include drawdowns, re-establishment of native vegetation through transplanting efforts, and stocking of largemouth bass.

Multiple public and private partners within the region such as DEP, the Northwest Florida Water Management District, the USFWS, the U.S. Forest Service (USFS), The Nature Conservancy, and Apalachicola Riverkeeper provide opportunities to leverage funds for aquatic restoration and enhancement. The FWC's Aquatic Habitat Restoration and Enhancement Sub-Section (AHRE) maintains staff near Tallahassee and Crestview for riverine restoration and management of multiple water-bodies and wetlands throughout the region.

FWC

Lake Munson near Tallahassee is a popular urban waterbody within a high-priority sub-watershed for the Apalachee Bay-St. Marks sub-basin.

Northwest Region

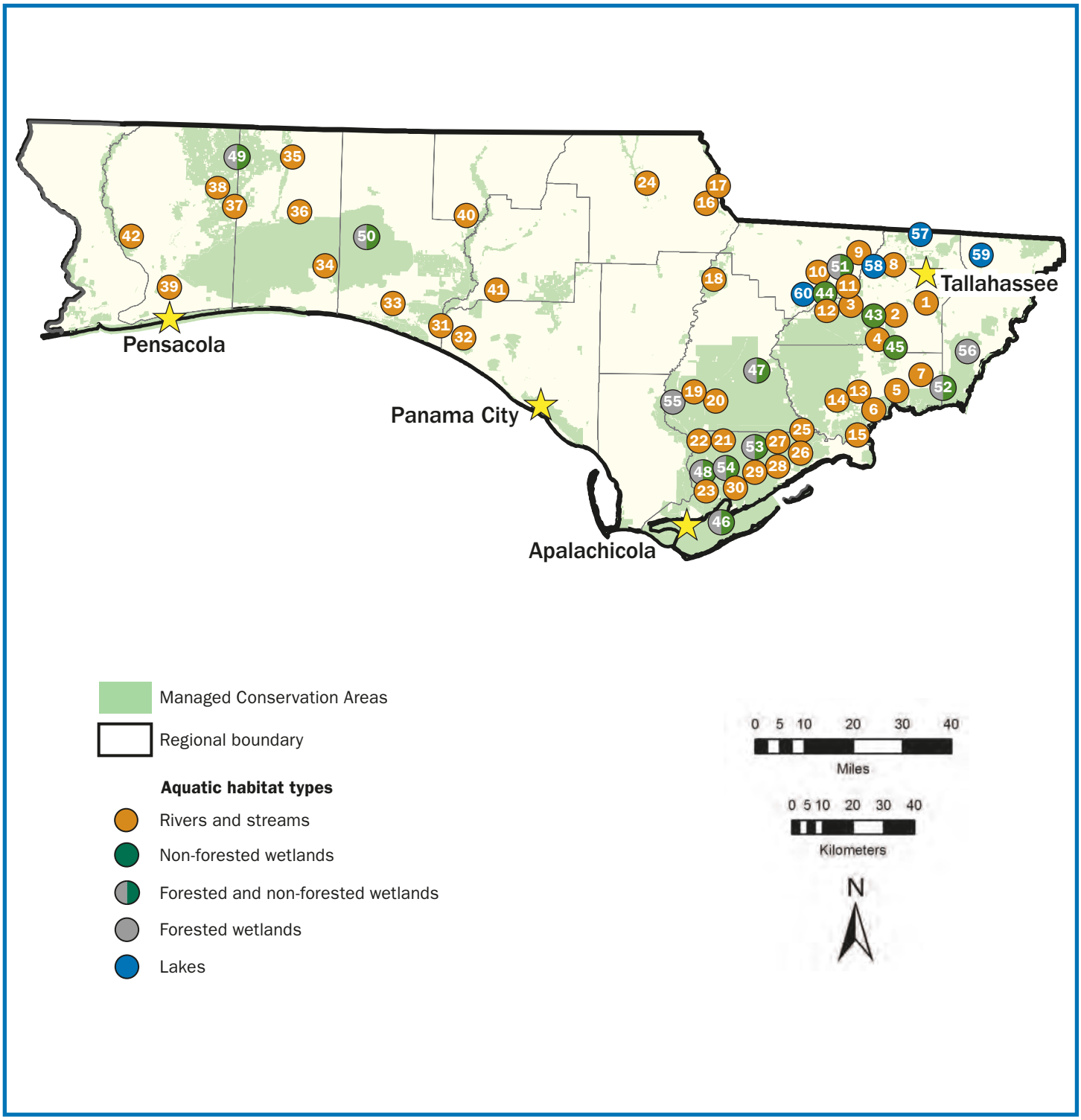


Figure 6. *High-priority aquatic resources of the Northwest Region*

Northwest Region Legend

1 Lake Lafayette
2 Lake Munson
3 Fisher Lake
4 Wakulla Springs
5 Goose Creek-Walker Creek Frontal
6 Old Creek-Skipper Creek Frontal
7 Lower St. Marks River
8 Lake Jackson
9 Reed Swamp
10 Lower Little River-Lake Talquin
11 East Lake Talquin
12 Central Lake Talquin
13 Buckhorn Creek-Sopchoppy River
14 Lower Sopchoppy River
15 Ochlocknee Bay
16 Race Pond
17 West Lake Seminole
18 Kelly Branch
19 Kennedy Creek
20 Little Owl Creek
21 Juniper Cove Swamp
22 Brothers River
23 East River-Apalachicola River Frontal
24 Carter's Mill Branch
25 Thousand Yard Bay
26 Lower Crooked River
27 Cat Creek
28 Carabelle River
29 Tate's Hell Swamp-Cash Creek
30 Blounts Bay Frontal
31 Peach Creek
32 Eastern Lake-Phillips Inlet Frontal
33 McQuage Bayou-Mack Bayou Frontal
34 Boggy Bayou-Choctawatchee Bay
35 Deadfall Creek-Yellow River
36 Turkey Hen Creek-Shoal River
37 Ninemile Creek-Blackwater River
38 Lower Big Juniper Creek
39 Pensacola Bay
40 Lower Sandy Creek
41 Pine Log Creek
42 White River
43 Gil Waters Preserve at Lake Munson
44 Lake Talquin State Park
45 Wakulla State Forest
46 Apalachicola National Estuarine Research Reserve
47 Apalachicola National Forest
48 Apalachicola River WEA
49 Blackwater River State Forest
50 Eglin Air Force Base
51 Lake Talquin State Forest
52 St. Marks National Wildlife Refuge
53 Tate's Hell State Forest
54 Tate's Hell WMA
55 Apalachicola River WMA
56 Aucilla WMA
57 Lake Iamonia
58 Lake Jackson
59 Lake Miccosukee
60 Lake Talquin/JT Budd Pond

Note: Numerical values are for identification purposes only and do not represent ranking order

North Central Region

The North Central region contains unique wetlands supporting diverse wildlife. High-priority aquatic resources identified in this region are centered close to Jacksonville, Gainesville, Inverness and Chiefland (Figure 7). The highest scoring sub-watersheds include the Homosassa River near Inverness and Lochloosa Lake south of Gainesville, both of which ranked high for their management emphasis, socio-economic importance, and fish and wildlife values. Other high ranking sub-watersheds include: Lower Pablo Creek and Governors Creek near Jacksonville; Newnans Lake, Hogtown Creek, and Hatchet Creek near Gainesville; and Crystal River, West Lake Rousseau-Cross Florida Barge Canal, and Barnett Creek-Black Point Swamp Frontal near Inverness/ Chiefland.

The highest-ranking conservation areas for non-forested and forested wetlands include the Palatka-to-Lake Butler State Trail east of Gainesville, and Timucuan Ecological and Historic Preserve in Jacksonville. In the Inverness/Chiefland area, the Cedar Key Scrub State Reserve, Crystal River Preserve State Park and Withlacoochee Gulf Preserve (Yankeetown Conservation Area) all ranked high. Restoration and enhancement activities conducted by AHRE staff in this region have largely focused on streams. Activities include the installation of hardened low-water crossings and bank stabilization practices to minimize siltation and the transportation of sediments.

High-priority lakes are centered near Gainesville and Inverness. Gainesville-area lakes include Orange, Lochloosa, and Newnans, which are noted for their high fish and wildlife values and their socio-economic importance. In particular, Orange and Lochloosa lakes are designated as “Outstanding Florida Waters,” a special protection due to their natural attributes. In 2016, FWC developed the Orange Lake Management Plan, incorporating the input from stakeholders to help guide restoration and enhancement activities (FWC 2016). Lakes Rousseau and Tsala Apopka, near Inverness, include expansive marshes and numerous boat ramps and public piers. Many commercial businesses exist along the highly residential shores of these water bodies. Though not highly productive fisheries, these lakes are important habitat for many other wildlife species and for recreation. Restoration and enhancement of these lakes are guided by a detailed study conducted on sediments and vegetation characteristics of the Tsala Apopka Chain of Lakes (FWC 2008).

Management responsibilities of these priority resources falls mainly to FWC’s Wildlife and Habitat Management Section (WHM), the water management districts, DEP, the USFWS and the USFS. The diversity of public partners within close proximity of high-priority aquatic resources, provide multiple opportunities for restoration and enhancement. AHRE staff is actively involved with the restoration, enhancement and management of multiple aquatic resources and has project management staff located in Ocala, Eustis, and the Gainesville area. Enhancement activities employed on these systems in the past include organic sediment scrapping, tussock harvesting and shredding, herbicide plant management, sediment removal from springs and construction of low-water crossings on streams.

FWC

Manatee Springs and its associated spring run provide critical habitat for Florida manatees.

North Central Region

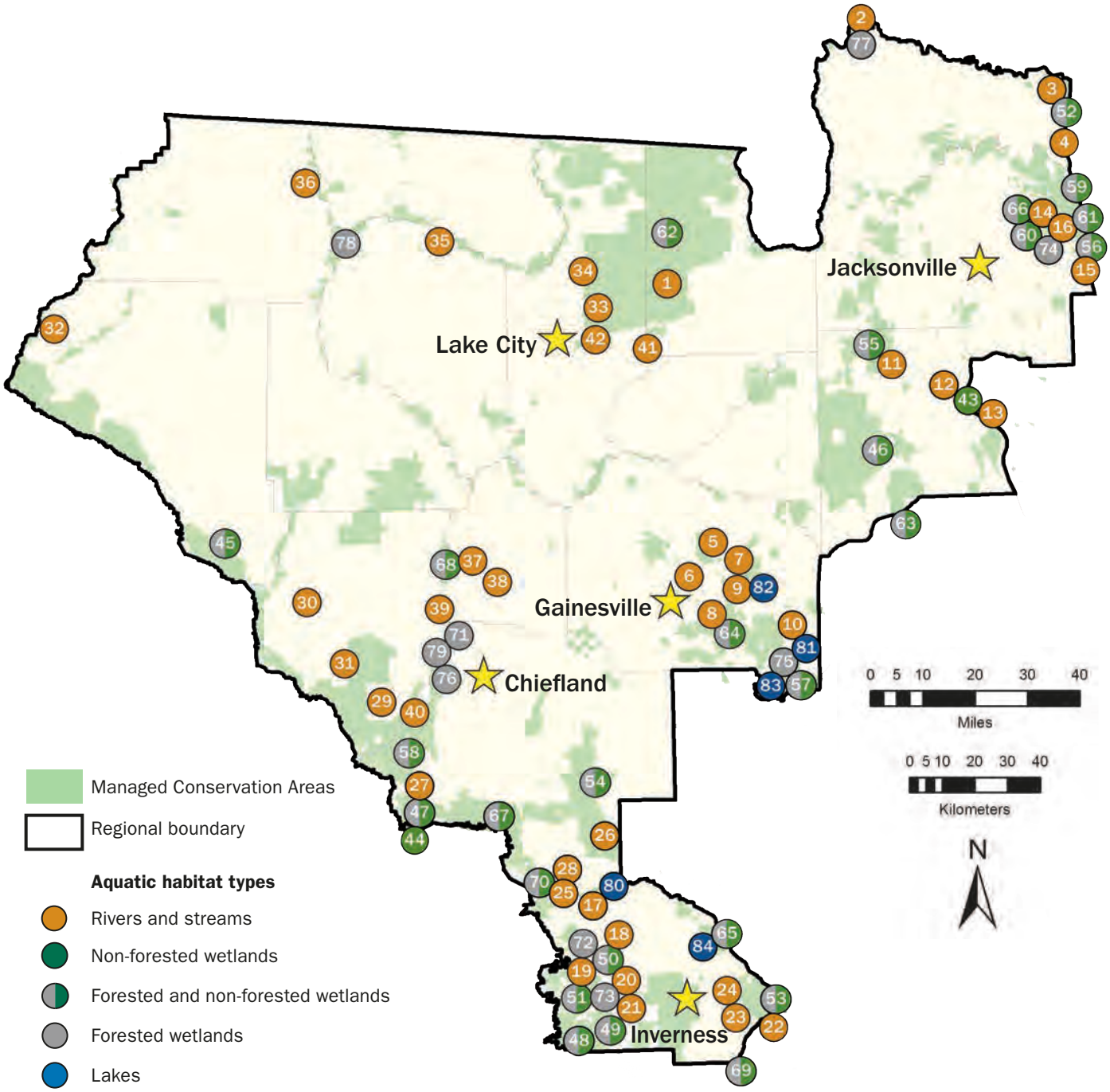


Figure 7. *High-priority aquatic resources of the North Central Region.*

North Central Region Legend

1 Ocean Pond
2 Hampton Lake
3 Amelia River
4 Nassau Sound-Fort George Inlet
5 Hatchet Creek
6 Hogtown Creek
7 Gum Root Slough
8 Paynes Prairie
9 Newnans Lake
10 Lochloosa Lake
11 Lower North Fork of Black Creek
12 Black Creek-St. Johns River
13 Governor's Creek
14 Clapboard Creek
15 Lower Pablo Creek
16 Chicopit Bay
17 Little Rocky and Cedar Creeks
18 Crystal River
19 Salt River
20 Homosassa River
21 Mason Creek-Seven Cabbage Cutoff
22 Juniper and Withlacoochee Rivers
23 Bradley Lake
24 Moccasin Slough
25 Rousseau-Cross-Florida Barge Canal
26 Tenmile and Lower Cow Creeks
27 Barnett and Black Point Creeks
28 Thousandmile and Helverson Creeks
29 Bumblebee Creek
30 Howard and Shired Creeks
31 Butler and Shired Creeks
32 Aucilla River-Apalachee Bay
33 Falling Creek
34 Robinson Creek
35 Sugar Creek
36 Lower Withlacoochee River
37 Sun Springs
38 North Old Town Hammock
39 Bell Springs
40 Suwannee River
41 Upper Olustee Creek
42 Alligator Lake-Ichetucknee River
43 Camp Chowenwow Park
44 Cedar Keys National Wildlife Refuge
45 Big Bend WMA
46 Camp Blanding Military Reservation
47 Cedar Key Scrub State Reserve
48 Chassahowitzka National Wildlife Refuge
49 Chassahowitzka River and Coastal Swamp
50 Crystal River Preserve National Wildlife Refuge
51 Crystal River Preserve State Park
52 Egans Creek Greenway
53 Flying Eagle Preserve
54 Gothe State Forest
55 Jennings State Forest
56 Kathryn Abbey Hanna State Park
57 Lochloosa Wildlife Conservation Area
58 Lower Suwannee National Wildlife Refuge
59 Machaba Balu Preserve
60 Marine Corps Support Facility-Blount Island
61 Mayport Naval Station
62 Osceola National Forest
63 Palatka-to-Lake Butler Trail
64 Paynes Prairie Preserve State Park
65 Potts Preserve
66 Timucuan Ecological and Historic Preserve
67 Waccasassa Bay Preserve State Park
68 Wannee Conservation Area
69 Withlacoochee State Trail
70 Withlacoochee Gulf Preserve
71 Andrews WMA
72 Crystal River Archeological State Park
73 Ellie Schiller Homosassa Springs Wildlife State Park
74 Fort Caroline National Memorial
75 M.K. Rawlings Park
76 Manatee Springs State Park
77 Ralph E. Simmons State Forest
78 Twin Rivers State Forest
79 Yellow Jacket Conservation Area
80 Lake Rousseau
81 Lochloosa Lake
82 Newnans Lake
83 Orange Lake
84 Tsala Apopka Chain of Lakes

Note: Numerical values are for identification purposes only and do not represent ranking order

Northeast Region

The Northeast region is notable for the high acreage of lakes and non-forested wetlands, second only to the South Region. The majority of high-priority sites are between Palatka and Titusville, with a small cluster occurring south of Kissimmee (Figure 8). Although high-priority sub-watersheds are spread throughout the region, most are located west of Titusville. These include Ruth Lake, the Lower Econolockhatchee River, and the Indian River Lagoon. Others located in and around Eustis and Palatka include Lake Monroe, Pellicer Creek-Big Mulberry Branch Frontal, and Lower Tolomata River. These sub-watersheds score high for their management emphasis, and either high or medium-high for socio-economic importance and fish and wildlife resources values.

Priority conservation areas containing non-forested and forested wetlands include the Little Big Econ State Forest, Seminole Ranch Conservation Area, and Tosohatchee Wildlife Management Area. Other high-ranking conservation areas include the Ocala National Forest east of Ocala, and Withlacoochee

FWC

Emeralda Marsh Conservation Area, a restored agricultural area in central Florida.

State Forest west of Kissimmee. In particular, the Ocala National Forest is a 383,689-acre conservation area comprised of 12,186 acres of non-forested and 45,061 acres of forested wetlands. This critical conservation area contains more than 600 lakes, rivers, pothole marshes, and sinkhole lakes, including three first-magnitude springs. Hydrologic issues exist along numerous USFS roads due to both recreational use and timber management. AHRE staff is currently working with the USFS on hydrologic restoration and enhancement of numerous aquatic resources within the Ocala National Forest.

High-priority lakes in the region include the Kissimmee Chain of Lakes (KCOL) (Lakes Kissimmee, Tohopekaliga, East Lake Tohopekaliga, Hatchineha, Jackson and Marian). Lake Jackson and Lake Marian are components of Three Lakes Wildlife Management Area, which also contains priority non-forested and forested wetlands. These aquatic resources are located within 30 minutes of Kissimmee, one of Florida's most popular tourist destinations. The KCOL is a world-renowned largemouth bass fishery that hosts hundreds of fishing tournaments annually and is vital to Osceola and Polk counties' economies. The KCOL also provides important habitat for the endangered Everglade snail kite. Furthermore, the KCOL lakes are classified as Fish Management Areas by FWC and Osceola County and provide extensive recreational opportunities, including waterfowl hunting, alligator hunting, and ecotourism. Unfortunately, stabilized water levels on the KCOL cause accelerated lake succession resulting in undesirable dense vegetation and organic sediment accumulation. AHRE and FWC Invasive Plant Management (IPM) staff routinely treat nuisance and invasive aquatic plants throughout the lakes with herbicides to maintain desirable plant communities for fish and wildlife habitat. Additionally, littoral habitat is managed through selective mechanical removal of dense nuisance plant communities and organic sediment using floating equipment under inundated conditions or earth-moving equipment under drawdown conditions.

Wetland habitats in the Northeast Region are highly valued for recreational opportunities and diversity. However, the proximity of many wetlands and streams to urbanized and developed lands, water supply needs, and flood protection has resulted in the degradation of many of these aquatic resources (DEP 2006a). Partnerships exist for restoration and enhancement within the region including Friends of Turkey Creek, Volusia County Land Conservation Program, DEP's Watershed Restoration Program, and the St. Johns River Water Management District (SJRWMD). In this region, FWC shares management and conservation responsibility of these resources with DEP's Central District, and the SJRWMD. AHRE teams are located in Eustis and Kissimmee, and several project management staff are located near Vero Beach.

Northeast Region

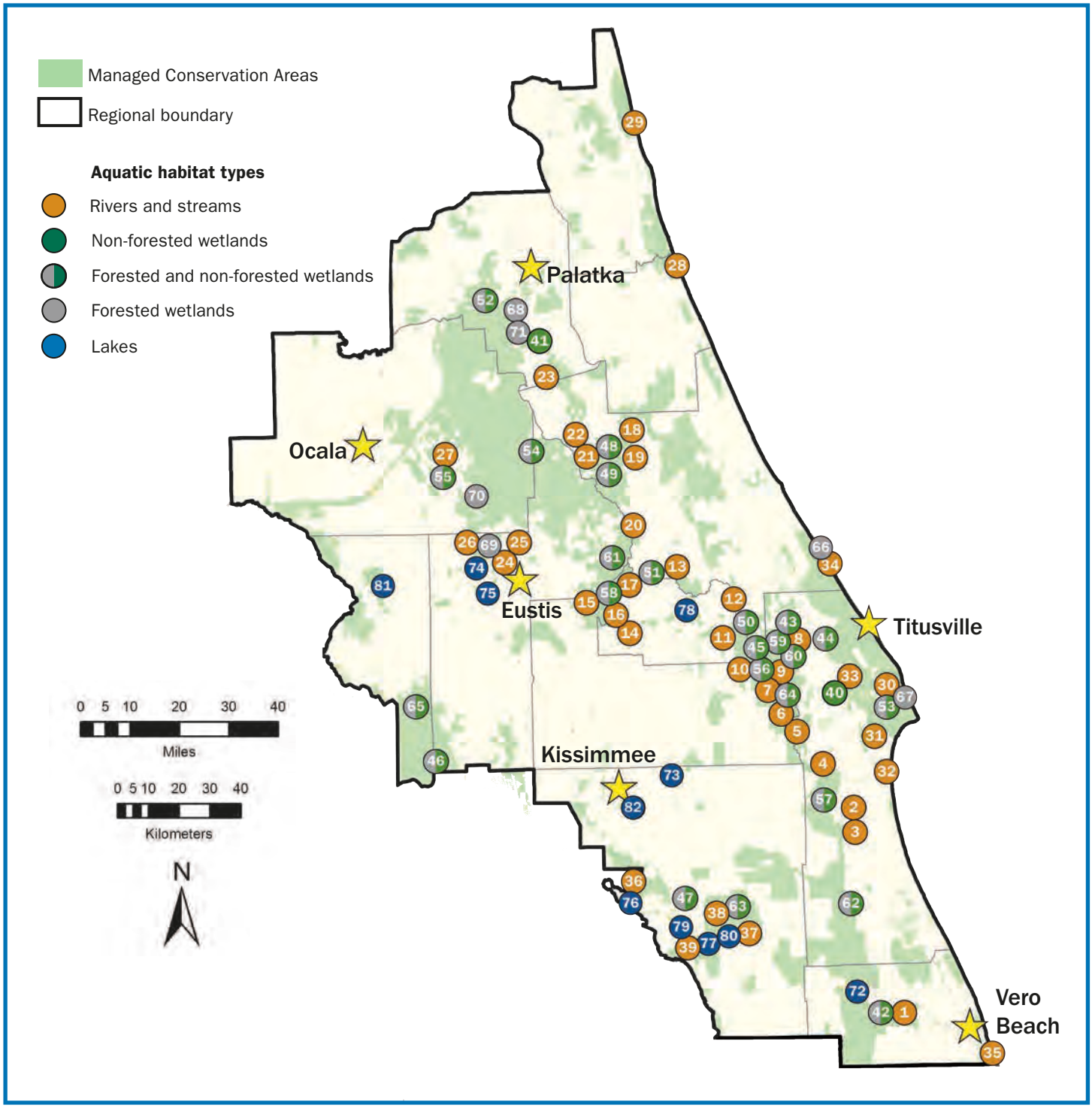


Figure 8. High-priority aquatic resources of the Northeast Region

Northeast Region Legend

1 North St. John's Marsh
2 North Marsh of Lake Washington
3 Lake Washington
4 Lake Poinsett
5 Halfway Lake
6 Lower Jim Creek
7 Tootoosahatchee Creek
8 Clark Lake
9 Ruth Lake
10 Puzzle Lake
11 Lower Econolockhatchee River
12 Lake Harvey
13 Lake Monroe
14 Little Wekiva River
15 Rock Springs Run
16 Wekiva Springs
17 Wekiva River
18 Spring Garden Creek
19 Lake Woodruff
20 Lake Beresford
21 Lake Dexter
22 Hitchens Creek
23 Lake George
24 Lake Eustis
25 Lake Yale
26 Lake Griffin
27 Mud Prairie Swamp
28 Pellicer Creek- Big Mulberry Branch Frontal
29 Lower Tolomato River
30 North Banana River
31 Newfound Harbor
32 South Banana River
33 Indian River Lagoon
34 Mosquito Lagoon
35 Fort Pierce Inlet-Indian River
36 Lake Hatchineha
37 Lake Marian
38 Fodderstack Slough
39 Lake Kissimmee
40 Enchanted Forest Sanctuary
41 Welaka National Fish Hatchery
42 Blue Cypress Conservation Area
43 Buck Lake Conservation Area
44 Chain of Lakes Park
45 Charles H. Bronson State Forest
46 Green Swamp Wilderness Preserve
47 Kissimmee Chain of Lakes Area
48 Lake George State Forest
49 Lake Woodruff Natonal Wildlife Refuge
50 Little Big Econ State Forest
51 Lower Wekiva River Preserve State Park
52 Marjorie Harris Carr Cross Florida Greenway
53 Merritt Island National Wildlife Refuge
54 Ocala National Forest
55 Ocklawaha Prairie Restoration Area
56 Orlando Wetlands Park
57 River Lakes Conservation Area
58 Rock Springs Run State Reserve
59 Salt Lake WMA
60 Seminole Ranch Conservation Area
61 Seminole State Forest
62 Three Forks Conservation Area
63 Three Lakes WMA
64 Tosohatchee WMA
65 Withlacoochee State Forest
66 Canaveral National Seashore
67 Cape Canaveral Air Station
68 Caravelle Ranch WMA
69 Emeralda Marsh Conservation Area
70 Sunnyhill Restoration Area
71 Welaka State Forest
72 Blue Cypress Lake
73 East Lake Tohopekailga
74 Lake Griffin
75 Lake Harris
76 Lake Hatchineha
77 Lake Jackson
78 Lake Jesup
79 Lake Kissimmee
80 Lake Marian
81 Lake Panasoffkee
82 Lake Tohopekailga

Note: Numerical values are for identification purposes only and do not represent ranking order

Southwest Region

High-priority aquatic resources are distributed along the west coast south of Brooksville to Fort Myers (Figure 9). Most priority sub-watersheds are located between Sarasota and the Fort Myers area near mouths of the Myakka River and Peace Rivers. Others are located between Tampa and Lakeland.

The highest-ranked sub-watersheds include: Yellow Fever Creek-Fourmile Cove serving the Caloosahatchee River; Tippecanoe Bay and Rock Creek-Oyster Creek Frontal in Port Charlotte at the confluence of the Myakka River and Peace River; and Cow House Creek, Spillway 20, and Palm River northeast of Tampa. All these sub-watersheds received high values for their management emphasis, socio-economic importance, and fish and wildlife values. Yellow Fever Creek-Fourmile Cove and Tippecanoe Bay also contained the greatest number of weighted stream-miles.

Babcock Ranch Preserve, the region's highest-ranking conservation area, contains 7,397 acres of non-forested wetlands and 15,554 acres of forested wetlands. The preserve anchors a conservation corridor of public and private land that stretches from Lake Okeechobee to the Gulf of Mexico and spans a diverse mosaic of pinelands, including both wet and mesic pine flatwoods, dry prairie ecosystems interspersed with cypress domes, and cypress swamps. Other high-ranked conservation areas include Ann Dever Memorial Regional Park, Oscar Scherer State Park, South Venice Lemon Bay Preserve in Port Charlotte, and Circle B Bar Reserve in Lakeland. The two conservation areas with the greatest acreages of high-priority forested and non-forested wetlands include Avon Park Air Force Base and Fred C. Babcock-Cecil M. Webb Wildlife Management Area (a sister conservation area to Babcock Ranch Preserve). Both conservation areas rank high for their socio-economic and fish and wildlife values, but rank medium in their management emphasis because of high preservation value.

Although the Southwest Region is home to 116 public lakes greater than 50 acres, Lake Istokpoga, a 27,692-acre natural lake south of Sebring, is the only high-priority lake in the region. Recreation on Lake Istokpoga is important to the local and regional economies. The recreational fishery alone generates 3 to 6 million dollars for the local economy, which supports numerous fishing guides, six fish camps and other local businesses (Bell and Bonn 2004). Lake Istokpoga has been identified by the USFWS as a priority management area for the Everglade snail kite. Management, restoration and enhancement of the lake's nearly 5,000-acre littoral marsh is an important component in kite population recovery. The lake also serves as a flood-control outlet for its watershed and a downstream water-supply source for agriculture (Bell and Bonn 2004, SFWMD 2005). Stabilized water levels and reversal of the natural fluctuation cycle within Istokpoga have fostered an undesirable expansion of invasive and nuisance plant species that displace more diverse aquatic vegetation communities. Management on Lake Istokpoga is based on an integrated habitat management approach and is broken into four primary activities: herbicide management, mechanical removal of nuisance plants and organic sediments, revegetation with native aquatic species, and prescribed fire.

With nearly 100 high-priority aquatic resources spread throughout the region, multiple opportunities exist for restoration and enhancement. Partners in restoration and conservation efforts include the Charlotte Harbor National Estuary Program, DEP, the Southwest Florida Water Management District (SWFWMD), USFWS, U.S Department of Defense, the National Park Service, and multiple cities, counties, and non-governmental organizations (NGO) (FWC 2012a). FWC shares primary management responsibilities of many of the region's conservation areas and water resources with DEP's Southwest and South Districts. AHRE habitat management activities includes hydrologic restoration to restore natural flows; vegetation community enhancement through herbicide treatment of nuisance plants; introduction of prescribed fire; removal of organic sediment from lake bottoms; transplanting of herbaceous emergent plants; and installation of desirable native woody species on tree islands, lake shorelines, and river and stream banks. AHRE staff includes project managers in the Port Charlotte and Sebring areas.

Southwest Region

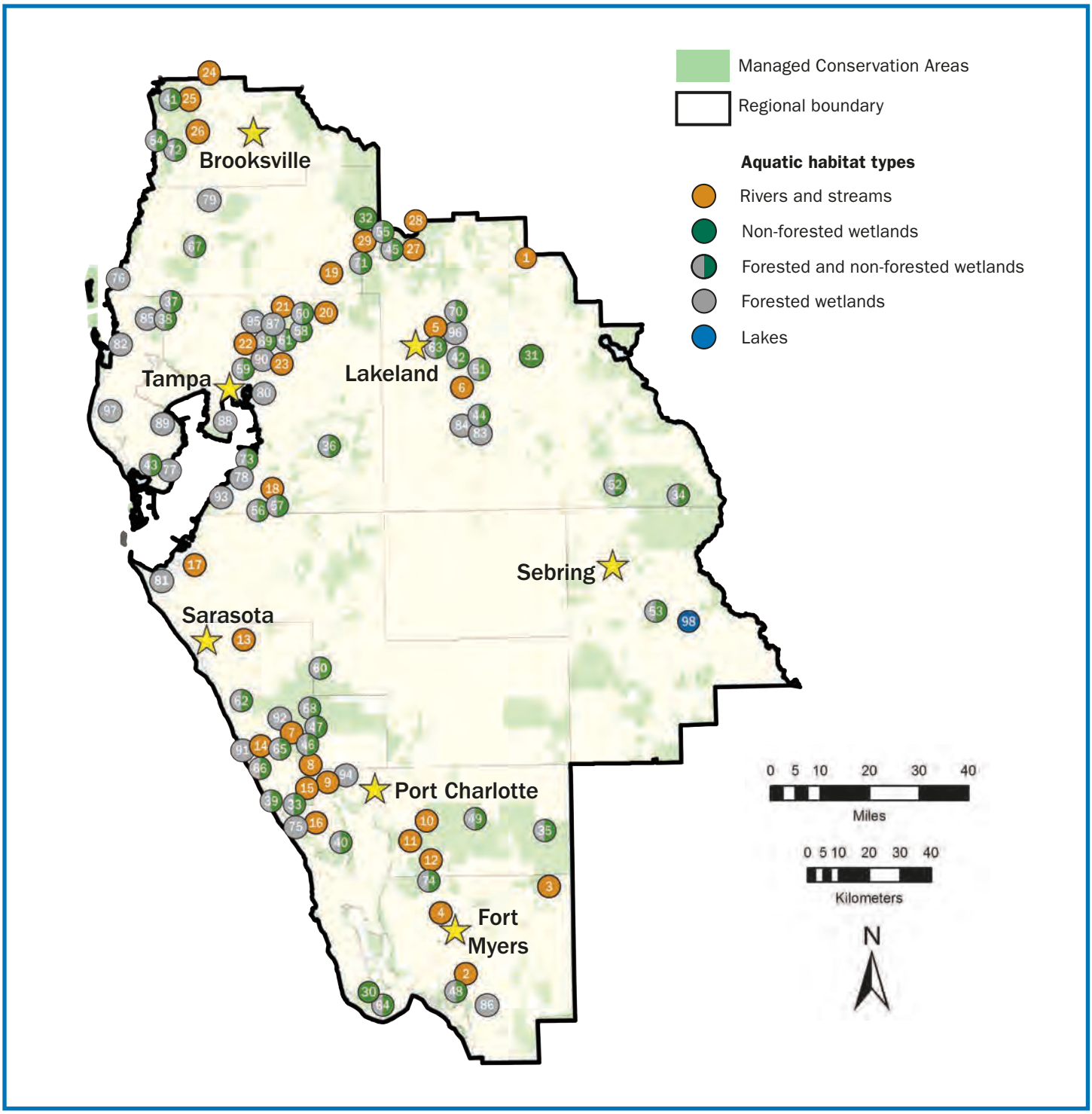


Figure 9. High-priority aquatic resources of the Southwest Region

Southwest Region Legend

1 Big Creek Palatlakaha River
2 Hendry/Cow Creek
3 Lower Caloosahatchee River
4 Yellow Fever Creek-Fourmile Cove
5 Lake Parker
6 Lake Hancock
7 Curry Creek
8 Lower Myakka River
9 Tippecanoe Bay
10 Upper Alligator Creek
11 Lower Alligator Creek
12 Yucca Pen Creek
13 Philippee Creek
14 Alligator Creek
15 Rock/Oyster Creeks
16 Buck/Coral Creeks
17 Manatee River-Warner Bayou
18 Cypress Creek-Little Manatee River
19 Indian Creek-Hillsborough River
20 Upper Hillsborough River
21 Cow House Creek
22 Spillway 20-Middle Hillsborough River
23 Palm River
24 Chassohowitzka River
25 Mud/Higginbotham Creeks
26 Weeki Watchee River
27 Gator Creek
28 Lower Withlacoochee Swamp
29 Ashley Bay
30 J. N. Ding Darling National Wildlife Refuge
31 Street Sanctuary
32 Withlacoochee River Park
33 Ann Dever Memorial Regional Park
34 Avon Park Air Force Range
35 Babcock Ranch Preserve
36 Balm-Boyette Scrub Nature Preserve
37 Brooker Creek Buffer Preserve
38 Brooker Creek Preserve
39 Cedar Point Environmental Park
40 Charlotte Harbor Preserve State Park
41 Chassahowitzka WMA
42 Circle B Bar Reserve
43 Clam Bayou Nature Preserve
44 Clear Springs Preserve
45 Colt Creek State Park
46 Charlotte Harbor Preserve State Park
47 Deer Prairie Creek/ Churchill and Jordyn Parcels
48 Estero Bay Preserve State Park
49 Babcock/Webb WMA
50 Hillsborough River State Park
51 Lake Hancock Conservation Area
52 Lake Wales Ridge State Forest
53 Lake Wales Ridge WEA
54 Linda Pederson Preserve/ Jenkins Creek Preserve
55 Little Gator Creek WEA
56 Little Manatee River State Conservation Area
57 Little Manatee River State Park
58 Lower Hillsborough Flood Detention Area
59 McKay Bay Greenway
60 Myakka River State Park
61 North Tampa Mitigation Bank
62 Oscar Scherer State Park
63 Saddle Creek County Park
64 Sanibel-Captiva Conservation Lands
65 Sleeping Turtles Preserve South
66 South Venice Lemon Bay Preserve
67 Starkey Wilderness Preserve
68 T. Mabry Carlton, Jr. Memorial Reserve
69 Temple Terrace Riverfront Park
70 Tenoroc Fish Management Area
71 Upper Hillsborough Conservation Area
72 Weekiwatchee Preserve
73 Wolf Branch Creek Nature Preserve
74 Yucca Pens Unit/ Babcock-Webb WMA
75 Amberjack Environmental Park
76 Anclote Gulf Park
77 Boyd Hill Nature Preserve
78 Cockroach Bay Preserve State Park
79 Crews Lake Wilderness Park
80 Delaney Creek Area
81 Florida Institute for Saltwater Heritage Preserve
82 Hammock Park
83 Homeland Heritage Park
84 IMC Peace River Park
85 John Chesnut Senior Park
86 Koreshan State Historic Park
87 Lettuce Lake Regional Park
88 MacDill Air Force Base
89 Sawgrass Lake Park
90 Scout Park
91 Shamrock Park and Nature Center
92 Sleeping Turtles Preserve
93 Tampa Bay Estuarine Ecosystem-Teco Tract
94 Tippecanoe Environmental Park
95 South Florida Ecological Research Area
96 Upper Saddle Creek/ Schaller Tract
97 Walsingham Park
98 Lake Istokpaga

Note: Numerical values are for identification purposes only and do not represent ranking order

South Region

Although high-priority aquatic resources are distributed throughout the region, a cluster exists between Okeechobee and West Palm Beach (Figure 10). High-priority sub-watersheds include the North and South Forks of the St. Lucie River, Corbett Wildlife Management Area, Lower West Palm Beach Canal, Tamiami Canal and Boca Raton Inlet-Port Everglades outside of Miami. This area supports a population of approximately 6.3 million people (U.S. Census Bureau 2015) resulting in major impacts to these sub-watersheds. Many natural rivers and streams have been channelized to serve as water conveyance systems for agriculture, flood control and numerous water treatment and water supply reservoirs (DEP 2004, 2006b and 2006c).

High-priority non-forested and forested wetlands include conservation areas such as the Arthur R. Marshall Loxahatchee National Wildlife Refuge, Loxahatchee Slough Natural Area, and J.W. Corbett Wildlife Management Area, all within a 15-minute drive of West Palm Beach. Others, such as Everglades National Park, Big Cypress National Preserve, and Holey Land and Rotenberger Wildlife Management Areas, are in the heart of the historic Everglades south of Lake Okeechobee. The Big Cypress National Preserve and Everglades National Park received high socio-economic importance and fish and wildlife values, but only medium values for management emphasis indicating that these conservation areas may benefit as much from preservation of their existing resources as from restoration or enhancement efforts. Although these high-priority conservation areas provide critical habitat for endangered species such as the Florida panther, Everglade snail kite and Cape Sable seaside sparrow (USFWS 1999), many have been impacted due to water management strategies for flood control and water supply.

Lake Okeechobee, the only high-priority lake identified in the region, is a multiple-use resource that supports economically valuable commercial and recreational sport fisheries, provides flood control, and serves as a water-supply reservoir for agriculture and urban areas (Bell 1987, SFWMD-FDACS-DEP 2011). Two marsh areas totaling 28,610 acres in Lake Okeechobee are designated as Audubon sanctuaries (Anderson 2000). Lake Okeechobee is used by waterfowl, shorebirds, and wading birds for nesting and foraging and is specified as critical habitat for the Everglades snail kite (David 1994a, Smith et al. 1995, Gray et al. 2009, USFWS 1999). Excessive high-water levels and nutrient enrichment continue to detrimentally impact vegetation communities, ecological processes, and fish and wildlife resources on Lake Okeechobee (David 1994b, Aumen 1995, Havens and James 2005, Johnson et al. 2007).

Within the South Region, numerous conservation efforts are being conducted by federal, state, county, private, tribal, and non-profit agencies. The Comprehensive Everglades Restoration Plan (CERP), a multi-billion-dollar joint effort between the U.S. Army Corps of Engineers (USACE) and State of Florida, is a long-term integrated plan to restore, preserve, and protect the Everglades and the South Florida ecosystem while providing for other water-related needs of the region, including water supply and flood protection (USACE and SFWMD 1999). CERP includes most of the high-priority rivers and streams, non-forested and forested wetlands, and lakes in the region. AHRE staff in the region includes a management team in Okeechobee and project management staff located in the West Palm Beach Regional office.

High-priority aquatic resources of the South Region are clustered in an area supporting 6.3 million people.

AHRE habitat management activities in the region include removal of man-made barriers, and the installation of culverts and hardened low water crossings. Vegetation management activities include: the use of herbicides to remove dense stands of nuisance plants followed by prescribed fire to restore and stimulate natural vegetative communities; harvesting and disposal of vegetated tussock material impacting marshes; removal of organic sediment from lake bottoms; transplanting of herbaceous emergent plants; and planting desirable native woody species on tree islands, lake shorelines, and river and stream banks.

South Region

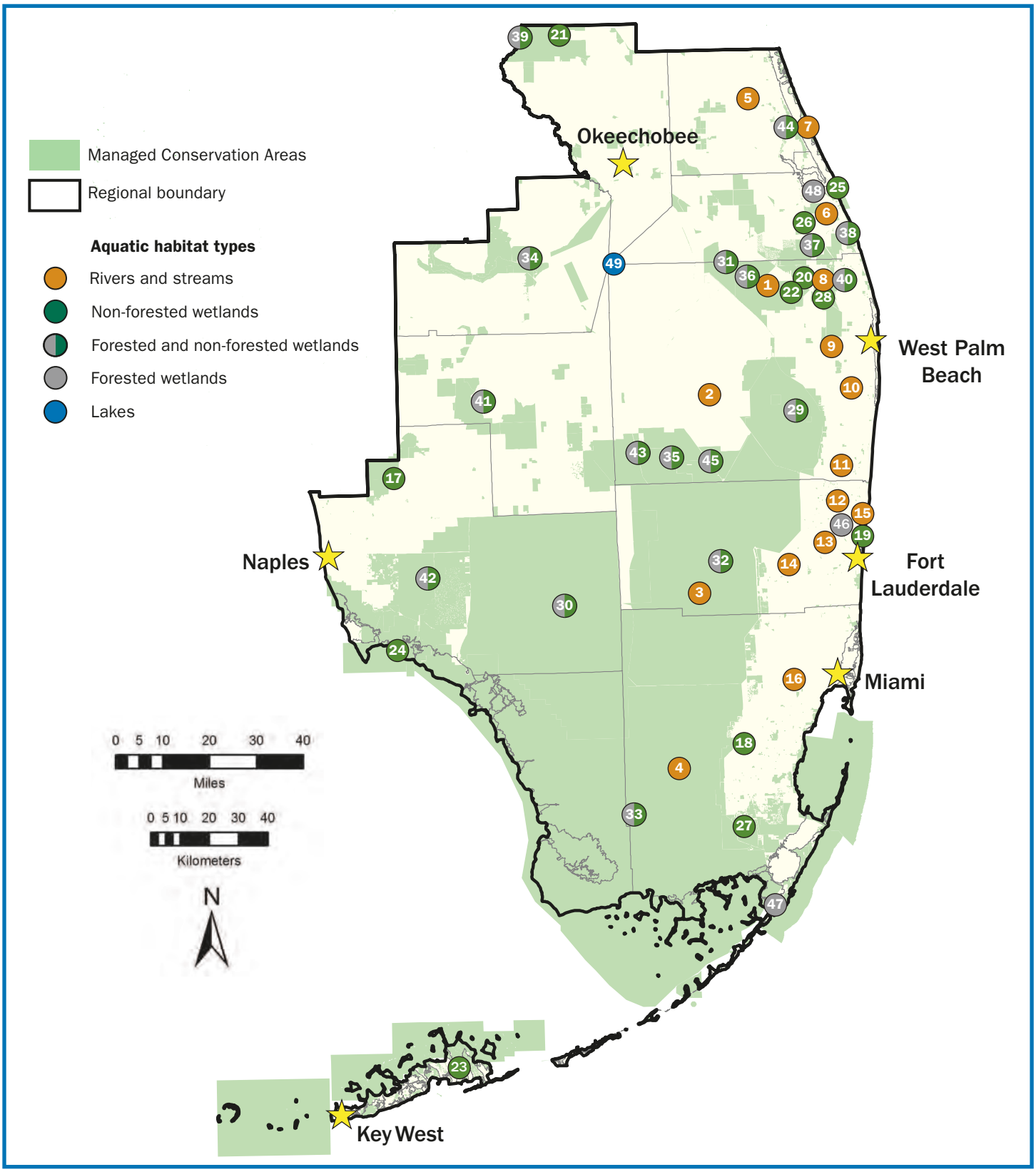


Figure 10. High-priority aquatic resources of the South Region

South Region Legend

1. Corbett WMA
2. East Bolles Canal
3. Water Conservation Area 3A
4. Everglades National Park
5. North Fork of St. Lucie River
6. South Fork of St. Lucie River
7. Indian River-St. Lucie Inlet
8. Upper Loxahatchee Slough
9. Lower West Palm Beach Canal
10. Lake Osborne
11. Hillsborough Canal
12. Cypress Creek Canal
13. North Fork of New River Canal
14. South New River Canal-West
15. Boca Raton Inlet-Port Everglades
16. Tamiami Canal
17. Corkscrew Regional Ecosystem Watershed
18. L-31 N Transition Lands Regional Conservation Area
19. Hugh Taylor Birch State Park
20. Hungryland Slough Natural Area
21. Kissimmee Prairie Preserve State Park
22. Loxahatchee River Watershed Restoration Project
23. Monroe County Managed Areas
24. Rookery Bay National Estuarine Research Reserve
25. Seabranch Preserve State Park
26. South Fork Addition/Halpatiokee Regional Park
27. Southern Glades WEA
28. Sweetbay Natural Area
29. Arthur R, Marshall Loxahatchee Natural Wildlife Refuge
30. Big Cypress National Reserve
31. Dupuis Reserve
32. Everglades & Francis S. Taylor WMA
33. Everglades National Park
34. Fisheating Creek WMA
35. Holey Land WMA
36. J.W. Corbett WMA
37. John C. & Mariana Jones/Hungryland WEA
38. Jonathan Dickinson State Park
39. Kissimmee River Public Use Area
40. Loxahatchee Slough Natural Area
41. Okaloacoochee Slough State Forest
42. Picayune Strand State Forest
43. Rotenberger WMA
44. Savannas Preserve State Park
45. Stormwater Treatment Area
46. Easterlin State Park
47. Florida Keys Overseas Heritage State Trail
48. Oxbow Eco-Center
49. Lake Okeechobee

Note: Numerical values are for identification purposes only and do not represent ranking order

SECTION IV: Merging Priority Resources into Management Activities

The prioritization of aquatic resources within each FWC region provides a science-based decision framework for identifying those resources that will likely produce the greatest ecological benefits. This process will further refine the methodology AHRE staff currently uses in developing project proposals.

The AHRE Standing Team, comprised of various FWC statewide subject matter experts, was initiated in 2005 to review and prioritize project proposals submitted for funding. The Standing Team developed a comprehensive application which staff must complete each year when submitting project proposals. The Standing Team members discuss all submitted projects at an annual team meeting and independently score each proposal. Scores are then compiled to develop a ranking list, which is used to generate a project workplan for the upcoming funding year. This process has been effective in ensuring project proposals are thoroughly evaluated for their ecological benefits, resource values, and impacts to fish and wildlife populations. Furthermore, this process provides a measure of fiscal accountability to ensure appropriate use of state allocated funds.

FWC

Fisheating Creek WMA, in the South Region, is identified as a high-priority area because of its valuable non-forested and forested wetlands.

In 2009, the project proposal application was revised to incorporate the Aquatic Restoration Prioritization and Evaluation Tool (ARPET) as an objective, quantifiable reference in project evaluation. The ARPET synthesizes existing socio-economic, ecological, and environmental data in a GIS platform for the purposes of identifying and prioritizing public lakes for potential restoration. This analysis represents an important component of executing a more expedient and cost-effective framework for aquatic restoration and further strengthens our proposal selection process and fiscal responsibility.

Through the development of ARPET and this assessment of priority resources, an increased focus will be placed on those aquatic resources with the greatest conservation, restoration and enhancement needs within each FWC Region. Regional Teams will be established to aid in the development and submittal of project proposals. Regional Teams will consist of FWC staff from various Offices, Divisions, and the Institute who are familiar with and have local knowledge pertinent to the priority aquatic resources within the region. Many of the priority aquatic resources are owned and managed by governmental entities other than the FWC, thus representatives from appropriate external governmental partners and conservation organizations will be asked to participate on Regional Teams. Coordinating with internal and external partners will build stronger synergistic relationships with our stakeholders, increase our scientific and technical knowledge of these resources, and provide opportunities to leverage or cost-share restoration and enhancement funds.

Regional Teams will be provided detailed maps and access to digital tools and resources utilized in the analysis of aquatic resources and identified during the development of this guide. This tool will allow Regional Team members to query the databases and various GIS layers to further investigate and aid in the development of project proposals for submittal for funding consideration. Regional Teams will be directed to give greater consideration and emphasis

FWC

Fishing on the Wacissa River in the Northwest Region.

in developing project proposals that address high-priority aquatic resources within their respective FWC Region, with the goal of increasing comprehensive management of these aquatic resources. All project proposals generated by the five Regional Teams will be submitted for review by the AHRE Standing Team. The AHRE Standing Team will have the responsibility to score and rank Regional Team high-priority proposals and develop a recommended slate of statewide prioritized projects for funding consideration.

In summary, the process of building upon previous effective conservation measures and applying new, innovative science-based techniques represents a continued evolution to improve and refine methodologies to restore, enhance and manage Florida's aquatic resources in a comprehensive manner. Support for these measures is paramount and FWC will continue to engage directly with our stakeholders, expand participation with our partners, and communicate our actions and decisions with those connected to the public trust resources managed by FWC.

Literature Cited

Anderson, J.M. 2000. Wildlife sanctuaries and the Audubon Society: places to hide and seek. University of Texas Press. Austin.

Aumen, N.G. 1995. The history of human impacts, lake management, and limnological research on Lake Okeechobee, Florida (USA). Archive for Hydrobiology, Advances in Limnology 45:1-16.

Bell, F.W. 1987. The economic impact and valuation of the recreational and commercial fishing industries of Lake Okeechobee, Florida. Florida Game and Fresh Water Fish Commission, Tallahassee Florida.

Bell, F.W. and M.A. Bonn. 2004. Economic sectors at risk from invasive aquatic weeds at Lake Istokpoga, Florida. Florida Department of Environmental Protection, Tallahassee Florida.

Dahl, T.E. 1990. Wetlands losses in the United States 1780's to 1980's. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C.

Dahl, T.E. 2005. Florida's wetlands: an update on status and trends 1985 to 1996. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C.

David, P.G. 1994a. Wading bird nesting at Lake Okeechobee, Florida: an historic perspective. Colonial Waterbirds 17(1):69-77.

David, P.G. 1994b. Wading bird use of Lake Okeechobee relative to fluctuating water levels. Wilson Bulletin 106(4):719-732.

Environmental Protection Agency (EPA). 2016a. The EPA watershed academy. <https://www.epa.gov/sites/production/files/2016-02/documents/wetlandfunctionsvalues.pdf>. Accessed 10 March 2017.

EPA. 2016b. Why are Wetlands Important. *<https://www.epa.gov/wetlands/why-are-wetlands-important Environmental Protection Agency>*. Accessed 10 March 2017.

Estevez, E.D., B.J. Hartman, R. Kautz, and E. D. Purdum. 1984. "Ecosystems of surface waters" In E.A. Fernald and D.J. Patton. 1984. Water resources atlas of Florida. Institute of Science and Public Affairs, Florida State University, Tallahassee, Florida.

Fernald, E.A., and D.J. Patton. 1984. Water resources atlas of Florida. Institute of Science and Public Affairs, Florida State University, Tallahassee, Florida.

Florida Department of Environmental Protection (FDEP). 2004. Water quality assessment report: St. Lucie and Loxahatchee. Division of Water Resource Management, Bureau of Watershed Management, Tallahassee, Florida, USA.

FDEP. 2005. Water quality assessment report: Apalachicola-Chipola. Division of Water Resource Management, Tallahassee, Florida.

FDEP. 2006a. Water quality assessment report: Upper St. Johns. Division of Water Resource Management, Tallahassee, Florida.

FDEP. 2006b. Water quality assessment report: Biscayne Bay-Southeast Coast. Division of Water Resource Management, Tallahassee, Florida.

FDEP. 2006c. Water quality assessment report: Lake Worth Lagoon-Palm Beach Coast. Division of Water Resource Management, Tallahassee, Florida.

Florida Fish and Wildlife Conservation Commission (FWC). 2008. Diagnostic survey of sediment and vegetation on the Tsala Apopka Chain of Lakes. Prepared by PB Americas, Orlando, Florida.

FWC. 2012a. Florida's wildlife legacy initiative: Florida's state wildlife action plan. Tallahassee, Florida, USA.

FWC. 2012b. Aquatic restoration prioritization and evaluation tool (ARPET). Tallahassee, Florida.

FWC. 2016. Orange Lake habitat management plan. Prepared by Normandeau Associates, Inc., Gainesville, Florida.

Florida Natural Areas Inventory. 2010. Guide to the natural communities of Florida: 2010 edition. Florida Natural Areas Inventory, Tallahassee, Florida.

Flynn, Kathryn. 1996. Understanding wetlands and endangered species; definitions and relationships. Alabama Cooperative Extension System, ANR-979. Auburn University, Alabama.

Gray, P.N., B. Pranty, G.R. Schrott and J.W. Tucker. 2009. Shorebird and larid use of mudflats at Lake Okeechobee, Florida, during drought conditions. Florida Field Naturalists 37(2):33-44.

Hammer, D.A. 1992. Creating freshwater wetlands. Lewis Publishers, Inc. Chelsea, Minnesota.

Havens, K.E. and R.T. James. 2005. The phosphorous mass balance of Lake Okeechobee Florida: Implications for eutrophication management. Lake and Reservoir Management 21(2):139-148.

Jenks, G.F. 1967. The Data Model Concept in Statistical Mapping, International Yearbook of Cartography 7:186–190.

Jenks, G.F. and F.C. Caspall. 1971. Error on choroplethic maps: definition, measurement, reduction. Annals of the Associations of American Geographers, 61(2):217-244.

Johnson, K.G., M.A. Allen, and K.E. Havens. 2007. A review of littoral vegetation, fisheries, and wildlife responses to hydrologic variation at Lake Okeechobee. Wetlands 1:110-126.

Kautz, R.S., K. Haddad, T.S. Hoehn, T. Rogers, E. Estevez, and T. Atkeson. 1998. Natural systems in E.A. Fernald and E.D. Purdum, eds. Water resources atlas of Florida. Tallahassee: Institute of Science and Public Affairs, Florida State University. Tallahassee, Florida.

Kenner, W.E. 1969. Seasonal variation of streamflow in Florida. Prepared by United States Geological Survey in cooperation with the Bureau of Geology, Florida Department of Natural Resources, Tallahassee, Florida.

Kushlan, J.A. 1990. Freshwater marshes. Pp. 324-363 in R.L. Myers and J.J. Ewel, eds. Ecosystems of Florida. University of Central Florida Press, Orlando, Florida.

McKay S.K., I. Linkov, J.C. Fischenich, S.J. Miller, and J. Valverde. 2012. Ecosystem restoration objectives and metrics. EBA Technical Notes Collection. ERDC TN-EMRRP-EBA-12-16.Vicksburg, MS: U.S. Army Engineer Research and Development Center. *http://cw-environment.usace.army.mil/eba/*

Niering, W.A. 1988. Endangered, threatened and rare wetland plants and animals of the continental United States, in Hook, D.D., McKee, W.H., Jr., Smith, H.K., and others, The ecology and management of wetlands–Volume I–The ecology of wetlands: Portland, Oregon. Timber Press.

Nordlie, F. 1990. Rivers and springs. Pages 392-425 in R.L. Myers and J.J. Ewel, eds. Ecosystems of Florida. University of Central Florida Press, Orlando, Florida.

Outdoor Industry Association. 2011. The outdoor recreation economy. Outdoor Industry Association, Boulder, Colorado.

Purdum, E.D. 2002. Florida waters: a water resources manual from Florida's water management districts. St. Johns River Water Management District, Palatka, Florida.

Literature Cited

Smith, J.P., J.R. Richardson, and M.W. Collopy. 1995. Foraging habitat selection among wading birds *(Ciconiiformes)* at Lake Okeechobee, Florida (USA) in relation to hydrology and vegetative cover. Archive for Hydrobiologie, Advances in Limnology 45:247-285.

South Florida Water Management District (SFWMD). 2005. Minimum flows and levels for Lake Istokpoga. South Florida Water Management District, West Palm Beach, Florida.

SFWMD, Florida Department of Agricultural and Consumer Services (FDACS), and FDEP. 2011. Lake Okeechobee protection plan: 2011 update. SFWMD, West Palm Beach, Florida.

Tonsmeire, D., D.J. Cairns, E. Hemmert, and P.L. Ryan. 1996. Apalachicola River and Bay management plan. Northwest Florida Water Management District, Havana, Florida.

University of Florida-Bureau of Economic and Business Research. 2015. Florida population studies: Bulletin 171, April 2015.

U.S. Army Corps of Engineers (USACE) and SFWMD. 1999. Central and Southern Florida project comprehensive review study, final integrated feasibility report and programmatic environmental impact statement. USACE, Jacksonville District, Jacksonville, FL, and SFWMD, West Palm Beach, Florida.

U.S. Department of Agriculture. 2015. Summary report: 2012 natural resources inventory. Natural Resources Conservation Service, Washington DC and Center for Survey Statistics and Methodology, Iowa State University. Ames, Iowa.

U.S. Census Bureau. 2015. Annual estimates of the resident population: April 1, 2010 to July 1, 2015.

U.S. Fish and Wildlife Service (USFWS). 1999. South Florida multi-species recovery plan. Fish and Wildlife Service; Atlanta, Georgia.

USFWS. 2002. Hydrologic unit codes. <*https://www.fws.gov/r5gomp/me/nrcs/HUCprimer.pdf*>. Accessed 10 March 2017.

U.S. Geologic Survey (USGS). 2016. Hydrography. <*www.https://nhd.usgs.gov.*> Accessed 17 March 2017.

USGS. 2017. Water resources of the United States, hydrologic unit maps. <*https://water.usgs.gov/GIS/huc.html*>. Accessed 22 March 2017.

Visit MyFWC.com/AquaticHabitats
for an interactive story map of Florida's
Freshwater Priority Resources:
A Guide for Future Management
FWC

Florida Fish and Wildlife
Conservation Commission

MyFWC.com