Draft

Apalachicola River and Bay Surface Water Improvement and Management Plan

September 2017

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Acknowledgements

This document was developed by the Northwest Florida Water Management District under the auspices of the Surface Water Improvement and Management (SWIM) Program and in accordance with sections 373.451-459, Florida Statutes. The plan update was prepared under the supervision and oversight of Brett Cyphers, Executive Director and Carlos Herd, Director, Division of Resource Management. Funding support was provided by the National Fish and Wildlife Foundation's Gulf Environmental Benefit Fund. The assistance and support of the NFWF is gratefully acknowledged.

The authors would like to especially recognize members of the public, as well as agency reviewers and staff from the District and from the Ecology and Environment, Inc., team that contributed to the development of this plan. Among those that contributed considerable time and effort to assist in the development of this plan are the following. Their assistance and thoughtful comments were invaluable and are gratefully acknowledged.

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Executive Summary

[to be added for final]

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Abbreviations and Acronyms

ACF	Apalachicola-Chattahoochee-Flint
ACFS	ACF Stakeholders
ANERR	Apalachicola National Estuarine Research Reserve
ARPC	Apalachee Regional Planning Council
AWT	Advanced Wastewater Treatment
BMAP	Basin Management Action Plan
BMP	best management practice
cfs	cubic feet per second
CWA	Clean Water Act
DO	dissolved oxygen
EPA	U.S. Environmental Protection Agency
ERP	Florida - Environmental Resource Permitting
°F	Degree Fahrenheit (temperature)
F.A.C.	Florida Administrative Code
FDACS	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FDOH	Florida Department of Health
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Agency
FFS	Florida Forest Service
FNAI	Florida Natural Areas Inventory
F.S.	Florida Statutes
FWC	Florida Fish and Wildlife Conservation Commission
FWRI	Fish and Wildlife Research Institute
GEBF	Gulf Environmental Benefit Fund
GEMS	Gulf Ecological Management Site
GIS	Geographic Information Systems
I-10	Interstate 10
IWR	Impaired Surface Waters Rule
MFLs	minimum flows and minimum water levels
mgd	million gallons per day
MS4s	municipal separate storm sewer systems
NFWF	National Fish and Wildlife Foundation
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	nonpoint source
NRC	National Research Council
NRCS	Natural Resources Conservation
NRDA	Natural Resource Damage Assessment
NSILT	Nitrogen Source Inventory and Loading Tool
NWFWMD	Northwest Florida Water Management District
NWS	National Weather Service
OFWs	Outstanding Florida Waters
OSTDS	onsite sewage treatment and disposal systems
RESTORE	Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States (Act)
SAV	submerged aquatic vegetation
SEAS	Shellfish Environmental Assessment Section
SHCA	Strategic Habitat Conservation Area
SIMM	Seagrass Integrated Mapping and Monitoring
SMZ	special management zone
SWIM	Surface Water Improvement and Management
SWTV	Surface Water Temporal Variability
TMDL	total maximum daily load
TNC	The Nature Conservancy
UF-BEBR	University of Florida Bureau of Economic and Business Research
UF-IFAS	University of Florida Institute of Food and Agricultural Sciences
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDOC	U.S. Department of Commerce
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WBID	waterbody identification number
WMA	water management area
WWTF	wastewater treatment facility

1.0 Introduction

The Apalachicola River and Bay watershed is the lower extent of the Apalachicola-Chattahoochee-Flint (ACF) rivers basin, which covers over 20,000 square miles of Georgia, Alabama, and Florida. Within this basin, the watershed encompasses about 2,850 square miles of northwest Florida. The basin has its origins in the Appalachian mountains of northern Georgia and includes the Chattahoochee and Flint rivers. These rivers drain portions of western Georgia and southeastern Alabama before draining to Lake Seminole, the source of the Apalachicola River. The Apalachicola River then travels approximately 106 miles to the south before discharging into Apalachicola Bay and the Gulf of Mexico.

The Apalachicola River and Bay watershed provides important environmental functions and benefits for people living within the watershed. Among watershed services are regulation of discharge to surface and ground waters, water storage and flood attenuation, water quality protection, cycling of energy and nutrients, groundwater recharge, erosion control, and streambank stabilization. Among the human benefits of these are usable surface and ground waters, fish and wildlife resources, recreational opportunities, aesthetic characteristics, and associated economic benefits.

In the Apalachicola River and Bay watershed, major stakeholders include:

- Northwest Florida Water Management District
- Florida Department of Environmental Protection
- Florida Fish and Wildlife Conservation Commission
- Florida Department of Agriculture and Consumer Services
- Florida Department of Economic Opportunity
- Apalachee Regional Planning Council
- U.S. Department of Agriculture
- U.S. Fish and Wildlife Service
- Apalachicola National Estuarine Research Reserve
- Riparian County Stakeholder Coalition
- Gadsden, Jackson, Liberty, Calhoun, Gulf and Franklin Counties
- Municipalities, including Marianna, Bristol, Blountstown, Wewahitchka, Apalachicola, Carrabelle, Altha, Alford, Bascom, Campbellton, Cottondale, Grand Ridge, Jacob City, Malone, Greenwood, Sneads, and Chattahoochee
- ACF Stakeholders, Inc.
- Apalachicola Bay and Riverkeeper
- Franklin County Seafood Workers Association
- The Nature Conservancy
- The National Fish and Wildlife Foundation
- Apalachee Audubon Society
- And many others

1.1 Purpose and Scope

The Apalachicola River and Bay Surface Water Improvement and Management (SWIM) plan is intended to provide a framework for resource management, protection, and restoration using a watershed approach. The 2017 Apalachicola River and Bay SWIM Plan update (hereafter the 2017 SWIM Plan) is funded by a grant from the National Fish and Wildlife Foundation's (NFWF) Gulf Environmental Benefit Fund (GEBF), with the intent to further the purpose of the GEBF to remedy harm and eliminate or reduce the risk to Gulf resources affected by the Deepwater Horizon oil spill.

The 1996 Apalachicola River and Bay Management Plan sought to implement comprehensive basin-wide management through coordination of government programs in cooperation with private interests, applying a regional approach to water quality and habitat issues. The goal of the plan was equitable management of the system to maintain and/or improve the natural resources of the Apalachicola River and Bay.

This 2017 SWIM Plan updates earlier planning efforts, while addressing new issues, ongoing challenges, and opportunities for achieving watershed protection and restoration. The 2017 SWIM Plan describes the watershed's physical characteristics and natural resources, provides an assessment of the watershed's current condition, and identifies priority challenges affecting watershed resources and functions. The plan also prescribes a set of management actions to meet those challenges and needs. Management actions are generally limited to those within the mission and scope of the NWFWMD SWIM program and the NFWF GEBF, recognizing the ongoing initiatives and needs of local communities and other agencies. Although a significant portion of the watershed is located in Georgia or Alabama, the scope of this plan, for implementation purposes, is limited to the Florida portion. The 2017 SWIM Plan supersedes the Apalachicola River and Bay Management Plan completed by the District in 1996.

1.2 SWIM Program Background, Goals, and Objectives

Surface Water Improvement and Management plans are developed pursuant to the SWIM Act, enacted by the Florida Legislature in 1987 and amended in 1989 through sections 373.451-373.459, Florida Statutes (F.S.). Through this act, the Legislature recognized threats to the quality and function of the state's surface water resources. The SWIM Act authorized the state's five water management districts to:

- Develop plans and programs to improve management of surface waters and associated resources;
- Identify current conditions and processes affecting the quality of surface waters;
- Develop strategies and management actions to restore and protect waterbodies; and
- Conduct research to improve scientific understanding of the causes and effects of the degradation of surface waters and associated natural systems.

For the purposes of SWIM, watersheds are the appropriate hydrological, ecological, and geographical units for planning and managing restoration efforts along Florida's Gulf Coast. Successful watershed management requires coordination and implementation of complementary programs and projects under the purview of all jurisdictions and agencies involved in the watershed. Among these are local, state, and federal regulatory and management agencies; conservation land acquisition and management organizations; and other interested stakeholders.

In addition to the SWIM Act of 1987, the following Florida statutes and rules support and complement the SWIM program:

- Chapter 259, F.S.: Florida Forever Act: Land Acquisitions and Capital Improvements for Conservation or Recreation
- Chapter 375, F.S.: Land Acquisition Trust Fund
- Section 403.067(7)(A)4, F.S.: Total Maximum Daily Loads (TMDLs)
- Section 373.042, F.S.: Minimum Flows and Minimum Water Levels
- Chapter 62-43, Florida Administrative Code (F.A.C.): Surface Water Improvement and Management Act
- Chapter 62-302, F.A.C.: Surface Water Quality Standards
- Chapter 62-303, F.A.C.: Identification of Impaired Surface Waters
- Chapter 62-304, F.A.C.: TMDLs

The SWIM program addresses watershed priorities by identifying management options and supporting cooperative project implementation. Projects may include stormwater retrofits for water quality improvement, wetland and aquatic habitat restoration, resource assessments, and wastewater management improvements, among others. Surface Water Improvement and Management plans integrate complementary programs and activities to protect and restore watershed resources and functions. They are also designed to address water quality and natural systems challenges to achieve the District's goal and strategic priorities outlined in the District's strategic plan (NWFWMD 2017a).

1.3 Summary of Interstate Issues

The ACF basin drains much of northern and western Georgia, as well as southeastern Alabama and the Apalachicola River and Bay watershed. Two principle rivers comprise the upper basin. The Chattahoochee River originates in the mountains of northeastern Georgia and flows south, forming a portion of the border between Georgia and Alabama before discharging into Lake Seminole. The Flint River has its origin in the metropolitan Atlanta area and flows southward to its confluence with the Chattahoochee at Lake Seminole. The U.S. Army Corps of Engineers (USACE) operates four dams on the Chattahoochee River: Buford Dam forming Lake Lanier; West Point Dam and Lake; W.F. George Dam and Lake; George W. Andrews Dam and Lake; and a fifth dam, Jim Woodruff Dam and Lake Seminole, at the headwaters of the Apalachicola River. Three of these lakes – Lanier, West Point, and W.F. George – have significant water storage capacity, with Lake Lanier holding about 62 percent of the overall capacity of the ACF basin. While no water storage facilities have been constructed on the Flint River, the river and its contributing basin provides a significant source of irrigation water for agricultural operations in southwest Georgia.

Since 1990, Florida, Georgia, Alabama, and the USACE have been involved in rounds of litigation, with interludes of negotiation, regarding the use and management ACF basin waters. In 1992, following initial litigation between the states contesting the USACE plan to reallocate storage from Lake Lanier for municipal water use, the states of Alabama, Georgia, and Florida agreed to suspend litigation and undertake a comprehensive study of the ACF basin. The states subsequently entered into an interstate compact to equitably apportion surface waters of the ACF. Congress passed and the three states ratified the compact in 1997. Despite years of negotiations and multiple extensions, the states failed to reach consensus. The compact ultimately failed and was allowed to expire in 2003.

Given the failure of the Compact to lead to an equitable allocation and lack of progress in litigation involving the USACE, the State of Florida in 2013 filed an original action with the U.S. Supreme Court seeking an equitable apportionment of the basin's waters and a cap on Georgia's water consumption. In its complaint, Florida demonstrated that increasing and unrestrained water withdrawals in Georgia have had profound adverse impacts on the ecology of the Apalachicola River and Bay system and on the important economic and cultural resources that depend on this system.

While Florida continues to pursue efforts to achieve an equitable interstate allocation of water resources within the ACF basin, it is essential that management of the watershed and its resources within Florida focus on actions that will ensure the long-term sustainability, health, and productivity of these resources. This is the scope of the 2017 SWIM plan. Additional descriptive characterization of the interstate basin may be found in Appendix C.

2.0 Watershed Description

2.1 Geographic and Geological Characteristics

The drainage basin for the interstate ACF basin, including the Apalachicola River and Bay watershed as defined herein, encompasses approximately 20,149 square miles of Florida, Alabama, and Georgia. Approximately 72 percent of the basin is within Georgia, with about 14 percent each within Florida and Alabama. The ACF Basin includes urban centers such as Atlanta, Columbus, Albany, Dothan, and their metropolitan areas. The Florida portion of the watershed encompasses about 2,850 square miles (Figure 2-1).

Apalachicola River and Bay watershed attributes:

- Largest Florida river in terms of flow
- Largest forested floodplain of all of Florida's rivers
- One of the most biologically and ecologically diverse regions in the country
- Home to important and productive natural resources, including Florida's most economically important oyster beds
- Terminus of a major interstate basin
- Only Florida riverine system with its headwaters in the Appalachian mountains
- Portions of eight Florida counties

The Apalachicola River and Bay watershed spans north-south through the eastern Florida's Panhandle. In addition to the Apalachicola River and Apalachicola Bay, the watershed includes the Chipola, New and Carrabelle rivers, Lake Wimico, Alligator Harbor, and other tributaries. The watershed also includes the first magnitude Jackson Blue Spring and ten second magnitude springs within the Chipola River basin.

The majority of the watershed in Florida is within the boundaries of the six riparian counties: Calhoun, Franklin, Gadsden, Gulf, Jackson, and Liberty (Figures 2-1 and 2-2). Minor portions of the watershed are within Bay and Washington counties. The cities of Apalachicola and Carrabelle border Apalachicola Bay, and Bristol, Blountstown, and Chattahoochee border the Apalachicola River. Other municipalities within the watershed include Altha, Alford, Bascom, Campbellton, Cottondale, Jacob City, Malone, Marianna, Sneads, and Wewahitchka.

The Apalachicola River lies entirely within the lower Coastal Plain physiographic province and is the only Florida river system originating in the Piedmont and southern Appalachian Mountains. The basin spans two broad physiographic regions: the Gulf Atlantic Rolling Plain and the Gulf-Atlantic Coastal Flats (Leitman *et al.* 1984). Within these regions, the watershed spans portions of the Northern Highlands, Marianna Lowlands, and Gulf Coastal Lowlands (Pratt *et al.* 1996). The Northern Highlands consist of the Tallahassee Hills, New Hope Ridge, Grand Ridge, and the Apalachicola Bluff region. The Marianna Lowlands interrupts the Northern Highlands, but the continuity of the Highlands is maintained by New Hope Ridge and Grand Ridge south of the Marianna Lowlands. The Tallahassee Hills and Gulf Coastal Lowlands are separated by the Cody Scarp. The Cody Scarp is a relict escarpment of the Pleistocene epoch, when sea level was nearly 200 feet higher than today.

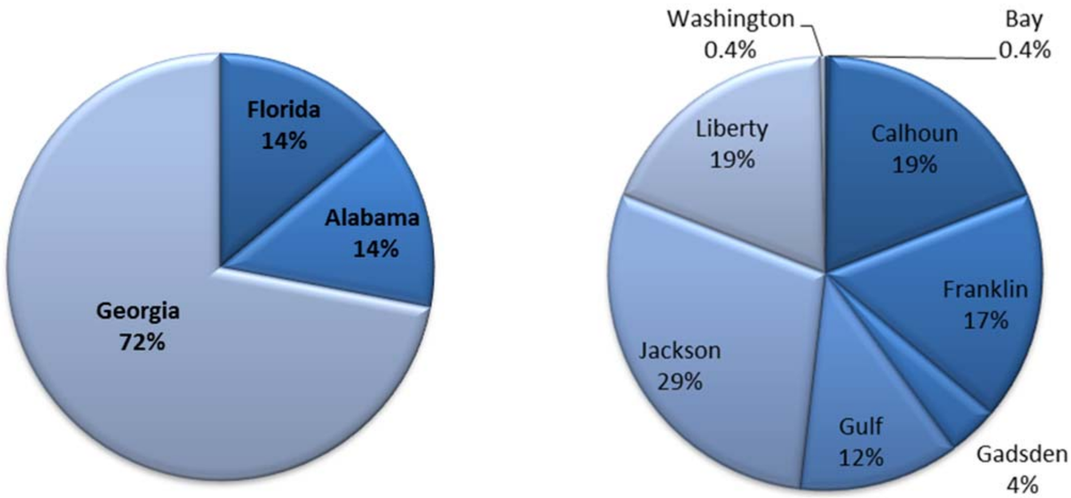


Figure 2-1 Proportion of the Apalachicola Watershed by State and Florida Counties

The watershed encompasses portions of two principle hydrogeologic settings: the Dougherty Karst region and the Apalachicola Embayment (Pratt *et al.* 1996). The Dougherty Karst includes all of Jackson County, northern Calhoun County, and northwest Gadsden County. This region has a dynamic flow system with a strong hydraulic connection between ground and surface waters, with karst features and high recharge rates. The Apalachicola Embayment region includes Gulf County, southern Calhoun County, most of Liberty and Gadsden counties, and western Franklin County. The Apalachicola Embayment is characterized by relatively poor connectivity between surface and ground waters (NWFWMD 2014). Eastern Franklin County is within the Woodville Karst Region.

The fluctuation of sea level over time has helped define regional topography within the coastal plain. With each encroachment and subsequent retreat, a number of shorelines have been formed at different elevations. These are represented by fluvial terraces in the middle and upper sections of the watershed and as coast-paralleling marine terraces in the lower section (Leitman *et al.* 1984). The Pleistocene seas are believed to have advanced no further than the Cody Scarp above Bristol (Leitman *et al.* 1984). Two marine terraces have been identified: the Wicomico shoreline of the Sanamon stage along the east-west 100-foot contours; and the Pamlico shoreline of the late Wisconsin stage which parallels the 30-foot contour (Leitman *et al.* 1984). Additional details on geographic and geological characteristics (including soils) within the watershed are found in Appendix C.

Figure 2-2 Apalachicola River and Bay Watershed

2.2 Hydrologic Characteristics

The Apalachicola River and Bay watershed includes four principal sub-basins in Florida, those of the Apalachicola, Chipola, and New rivers and the direct drainage area of Apalachicola Bay and adjoining estuarine waterbodies. Each is described further below. The overall topography and major waterbodies and tributaries within the Apalachicola River and Bay watershed are illustrated by Figure 2-3.

2.2.1 Apalachicola River

The headwaters of the Apalachicola River are at the Jim Woodruff Lock and Dam on Lake Seminole. Despite its large size, Lake Seminole is essentially a run-of-the-river impoundment, dependent upon inflow from by the upstream Chattahoochee River impoundments and the Flint River to maintain flows in the Apalachicola River downstream. Jim Woodruff Dam was constructed by the U.S. Army Corps of Engineers and was the first of the major structures within the ACF system (Leitman *et al.* 1984). Construction was begun in 1947 and the dam and lock were opened to navigation in 1954. The reservoir was considered full in 1957, at which time generation of electric power began. The reservoir has a volume of 367,318 acre-feet (USACE 2015). At normal operating pool elevation of 76.5 feet, North American Vertical Datum of 1988 (NAVD 88), the lake covers an area of approximately 37,500 acres.

The Apalachicola River is a large alluvial river. As such, it has a broad floodplain and is subject to variable seasonal flow, sustained annual flooding and a heavy sediment load. The continual scouring action of water and depositional processes causes the stream channel to be in a constant state of change. The deposition and erosion of material in the river creates meanders, which widen the river valley, decrease slope, slow water velocity, and allow more sediments to be deposited thereby continuing the movement of the river channel within the floodplain (Edmiston and Tuck 1987).

The Apalachicola River is the dominant source of freshwater inflow to Apalachicola Bay and the largest river in Florida in terms of flow. From 1978-2016, the river had an average annual discharge, as reported by the USGS, of 22,648 cubic feet per second (cfs) at Sumatra. In addition to the Chipola River, tributaries of the Apalachicola River within Florida include the Brothers and Jackson rivers and Flat, Big Gully, Black, Owl, and Whiskey George creeks, among many others. Lake Wimico is a large lake that drains toward the Apalachicola River through the Jackson River in the lower watershed.

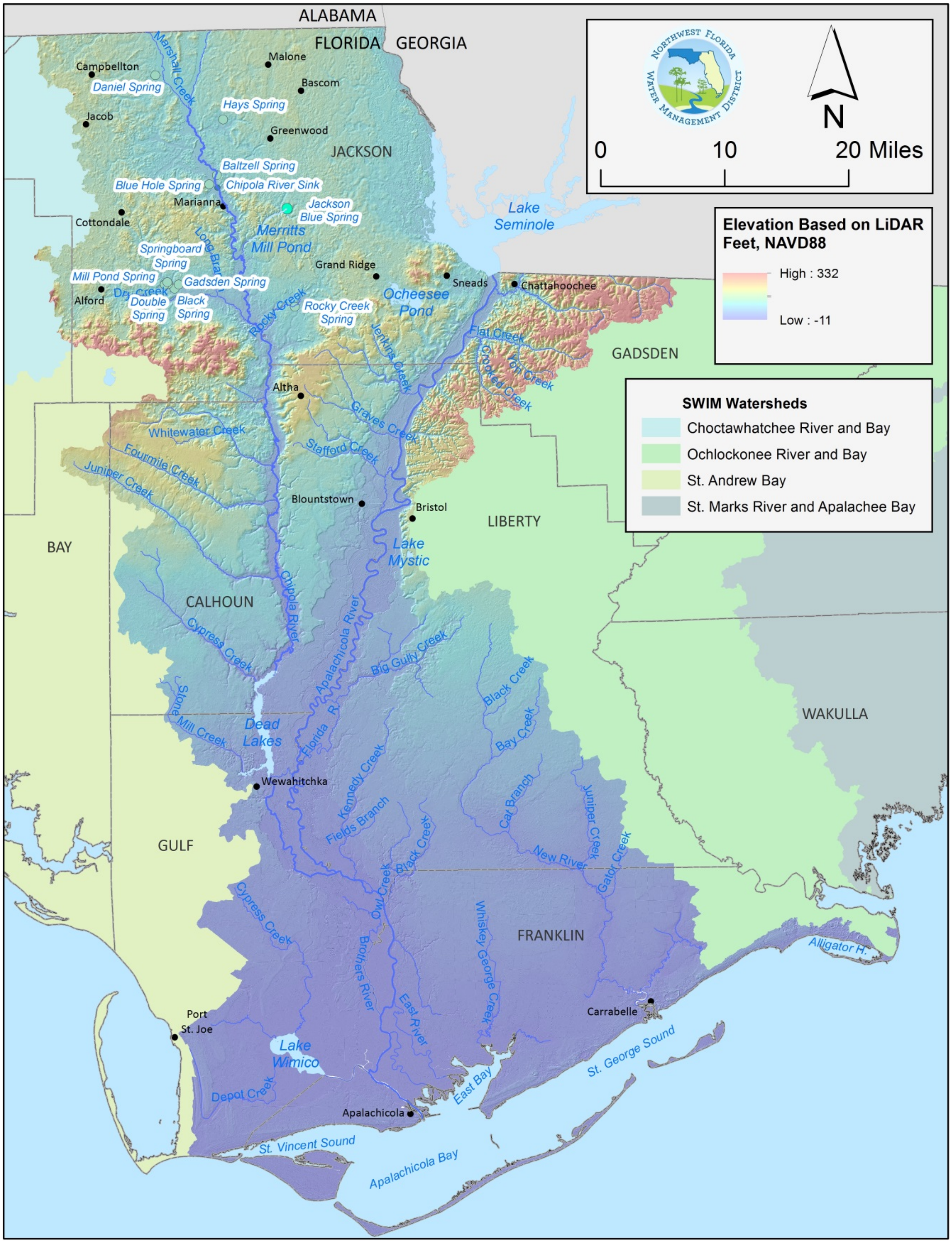


Figure 2-3 Topography and Major Waterbodies

2.2.2 Major Tributaries and Springs

The Apalachicola River's major tributary in Florida, the Chipola River, begins at the confluence of Marshall and Cowarts creeks in Jackson County. The river goes underground near Marianna and reemerges a short distance downstream. The overall watershed of the Chipola River encompasses approximately 1,277 square miles, extending from Houston County, Alabama, to just south of the Dead Lakes in Gulf County. At the Chipola Cutoff, about 25 percent of the Apalachicola River's flow diverts through a natural cutoff to join the Chipola River, from which point it constitutes the bulk of the Chipola River flow (Leitman *et al.* 1983). The water rejoins the Apalachicola River about 15 miles downstream at the confluence of the two rivers near the City of Wewahitchka (USGS 2016b).

The Chipola River flows through the Dougherty Karst Plain and is substantially spring fed. The river has a relatively narrow floodplain, carries a normally small sediment load, and has relatively consistent flow. The major spring within the basin is Jackson Blue Spring, a first magnitude spring (defined as flows over 100 cfs) with median annual flow of 105 cfs. It and seven other named springs contribute to the 270-acre Merritts Mill pond that, prior to 1860, was the upper reach of a free-flowing spring run (Spring Creek) (FDEP 2013). The water level in Merritts Mill Pond is managed by a water control structure located at the southern end of the pond along US 90/SR 71. Outflow from Merritts Mill Pond provides the majority of the flow in Spring Creek, which flows into the Chipola River (FDEP 2013).

An inventory conducted in 2004 identified a total of 63 separate springs within the Chipola river basin (Barrios and Chelette 2004). In addition to Jackson Blue Spring, the Chipola River basin has ten second magnitude (flows from 10 to 100 cfs) and numerous smaller springs (Figure 2-4). The second magnitude springs in the watershed are:

- Baltzel Springs Group – three spring vents north of Florida Caverns State Park
- Black Spring – discharges to Dry Creek
- Blue Hole Spring – within Florida Caverns State Park
- Daniel Springs Group – seven spring vents that flow to Spring Branch and Marshall Creek
- Double Spring – flows to Spring Lake
- Gadsden Spring – flows to Spring Lake
- Hays Springs Group – three vents north that flow to a spring run and the Chipola River
- Mill Pond Spring – discharges to Spring Lake
- Rocky Creek Spring – headwaters of Rocky Creek
- Spring Board Spring – discharges to Dry Creek

The Dead Lakes are within the lower reach of the Chipola River. These lakes were once floodplain that became inundated when sediment from the Apalachicola River disconnected the Chipola north of Wewahitchka. This area had water levels controlled by an artificial weir from 1960 until the late 1980’s when it was removed to restore the natural system while enhancing fishing opportunities (ANERR 2008).

The New River is a tributary of Apalachicola Bay that begins in Liberty County. The New River basin occupies 516 square miles in Liberty and Franklin counties before draining into St. George Sound through the Carrabelle River. The Carrabelle River is formed at the confluence of the New and Crooked rivers. The Crooked River forms the boundary of St. James Island and joins the Apalachicola Bay drainage basin with that of Ochlockonee Bay to the east.

Within the bluffs and ravines area along the northern Apalachicola River are steephead ravines. Steepheads are ravine features that form when erosion associated with seepage streams result in erosion upward from the valley floors (FNAI 2010).

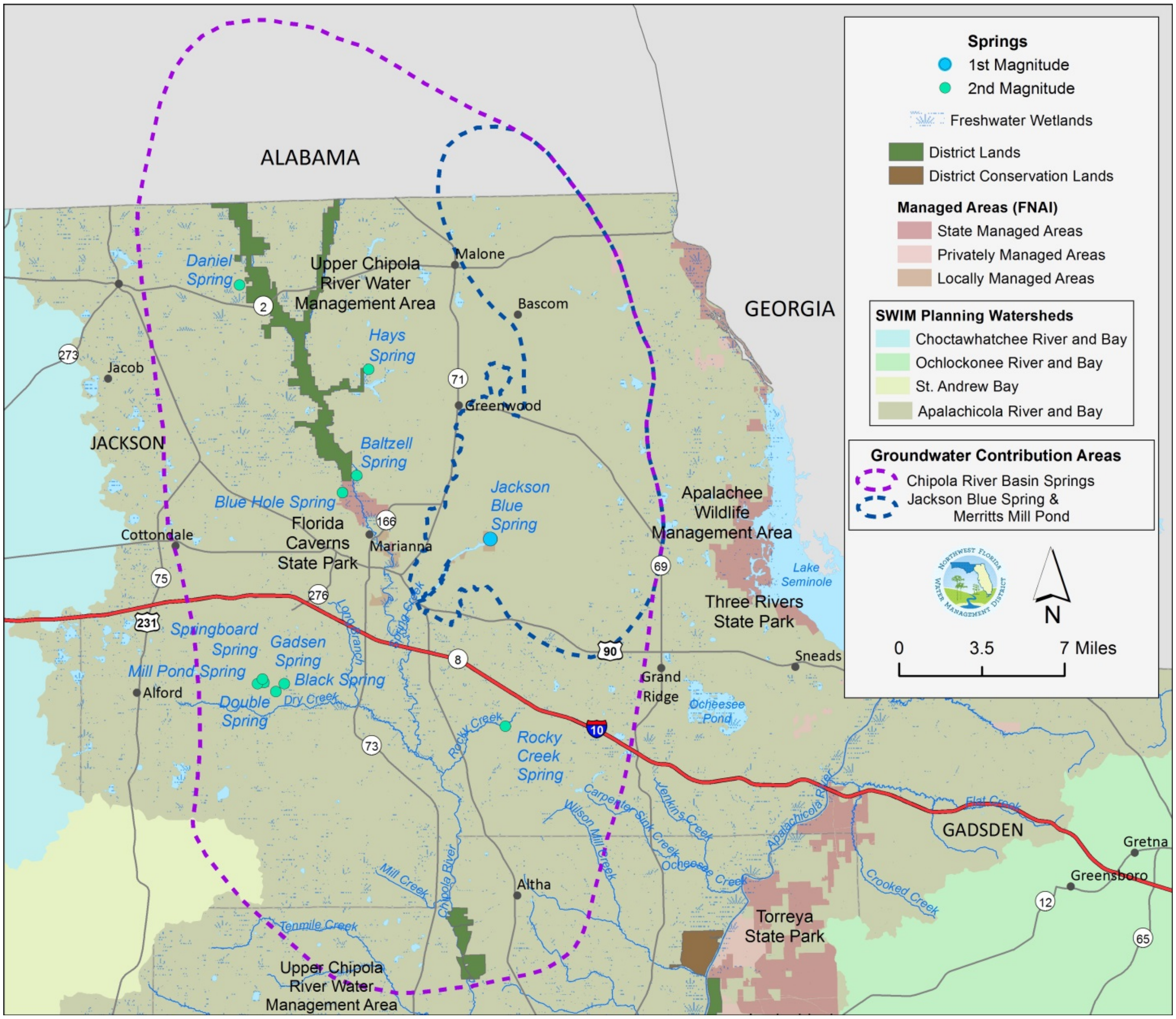


Figure 2-4 Upper Chipola River Basin

2.2.3 Floodplains and Wetlands

As illustrated by Figure 2-5, the Apalachicola River has an extensive floodplain – the largest forested floodplain in the state – along its entire length, with the widest expanses in the lower reaches. Approximately 1,139,655 acres (about 63 percent of the Florida watershed area) are delineated as Special Flood Hazard Area, which includes areas subject to inundation by the one-percent-annual-chance flood event. These are primarily forested wetlands, composed of bottomland hardwood and cypress/tupelo swamps, with the habitat grading to a tidal marsh at the river delta. The floodplain is much narrower along the Chipola River, but expansive throughout the wetlands that dominate coastal portions of the watershed.

Other major wetland systems include Tates Hell Swamp, throughout much of coastal Franklin County, and extensive palustrine wetlands in Gulf County west of the Apalachicola River. Large tidal marshes are within East Bay, and much of the estuarine littoral zone supports emergent tidal marsh.

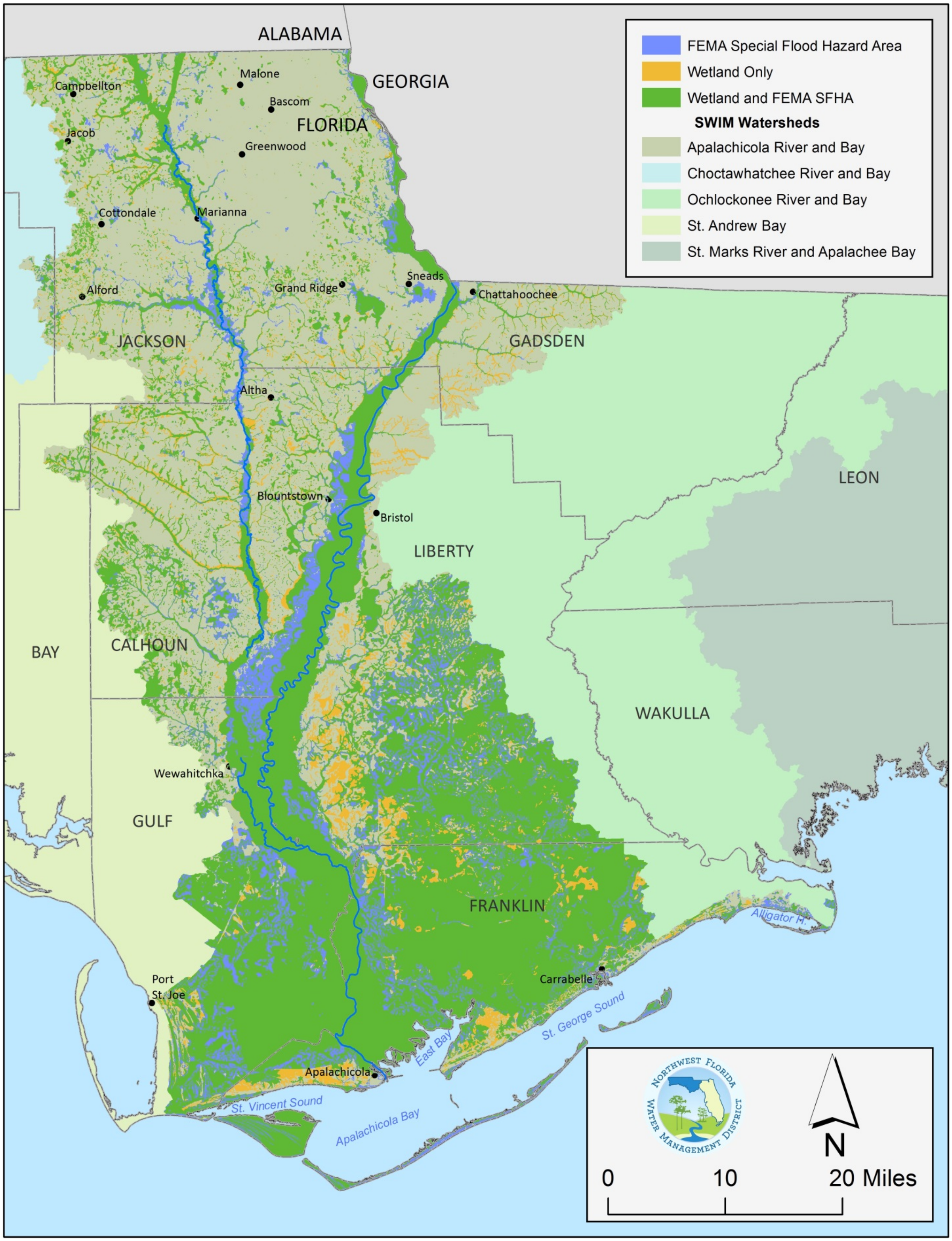


Figure 2-5 Floodplains and Wetlands

2.2.4 Apalachicola Bay

The Apalachicola Bay estuary covers about 212 square miles and serves as the interface between the river system and the Gulf of Mexico. Four barrier islands bound the bay: St. Vincent Island, St. George Island, Little St. George Island, and Dog Island. For planning purposes, the estuary is defined as including Apalachicola Bay, East Bay, St. George Sound, St. Vincent Sound, Indian Lagoon, and Alligator Harbor (Figure 2-6). Money Bayou is also included within the watershed planning area.

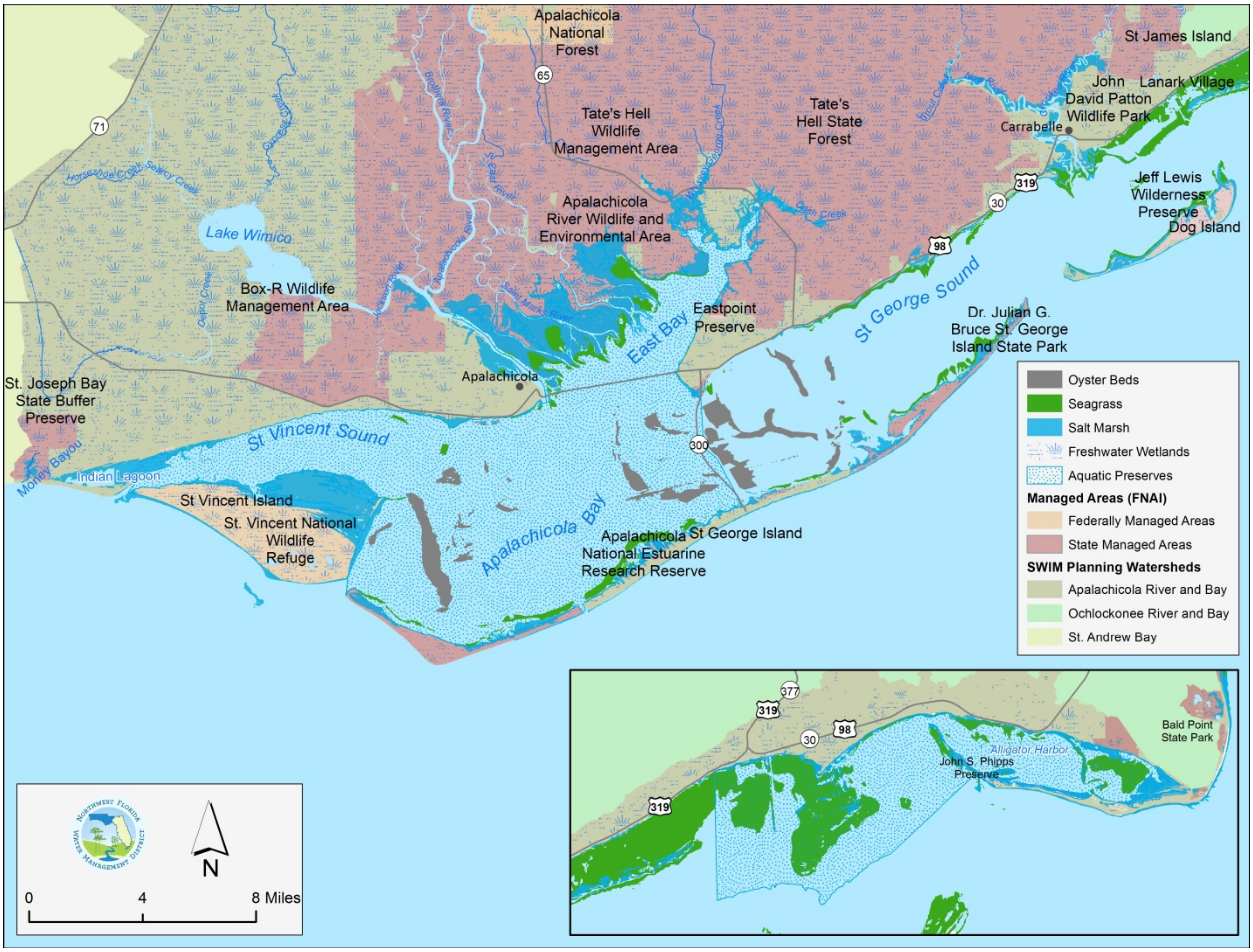
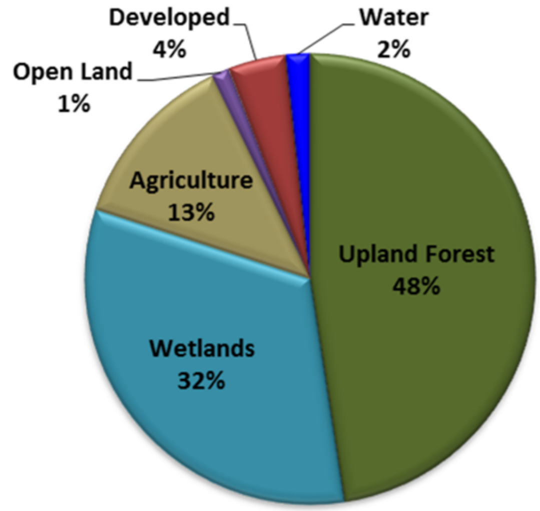


Figure 2-6 Coastal Features of Apalachicola Bay

2.3 Land Use and Population

The Apalachicola River and Bay watershed is rural and heavily forested (Figures 2-7 and 2-8). In the coastal extent of the watershed, residential and commercial land uses are more prominent, as are facilities associated with the seafood industry. The largest concentration of agriculture within Florida's portion of the watershed is within Jackson County, extending into northeast Calhoun County. The lower portion of the watershed supports large areas of managed forests and forested and non-forested wetlands.

Public and conservation lands encompass approximately 610,571 acres of the watershed within Florida (approximately 33 percent of the watershed in Florida). These include the District's Apalachicola River Water Management Area (WMA), Tate's Hell State Forest (Florida Forest Service), and the Apalachicola River Wildlife and Environmental Area (Florida Fish and Wildlife Conservation Commission [FWC]). State Parks in the watershed include Torreya, Florida Caverns, Three Rivers, and St. George Island state parks. Federal lands include the St. Vincent National Wildlife Refuge on St. Vincent Island, and the Apalachicola National Forest. Private conservation lands include The Nature Conservancy's Bluffs and Ravines Preserve, among others. There are also local government maintained parklands and other state, federal, and private conservation lands in the watershed. Public and conservation lands are depicted in Figure 2-9 and listed in Appendix G.



Source: FDEP 2015c

Figure 2-7 Land Use and Land Cover in the Apalachicola River and Bay Watershed (Florida)

Table 2-1 Watershed Population Estimates: 2010-2030

County	2010	2020	2030
Bay	708	774	850
Calhoun	14,560	14,834	15,332
Franklin	11,448	11,796	11,895
Gadsden	7,126	7,558	7,804
Gulf	9,242	9,963	10,545
Jackson	42,118	43,264	44,111
Liberty	2,671	2,938	3,225
Washington	540	562	594
Total	**88,413**	**91,688**	**94,356**

Based on spatial analysis of U.S. Census data, it is estimated that the population of the Apalachicola River and Bay watershed was 88,413 in 2010 (Table 2-1). As a point of comparison, the population of the tristate ACF basin was estimated at 3.8 million in 2010, with nearly 75 percent within the Atlanta metropolitan area (Lawrence 2016). In the Florida watershed, the largest concentration of population is within Jackson County. Throughout the basin, population density is low, with fluctuations along the coast corresponding with seasonal visitors. Table 2-1 displays population estimates (permanent population) for the watershed, based on analysis of 2010 Census data, together with projections to 2030 calculated based on countywide population growth projections of the University of Florida's Bureau of Economic and Business Research (UF-BEBR 2016).

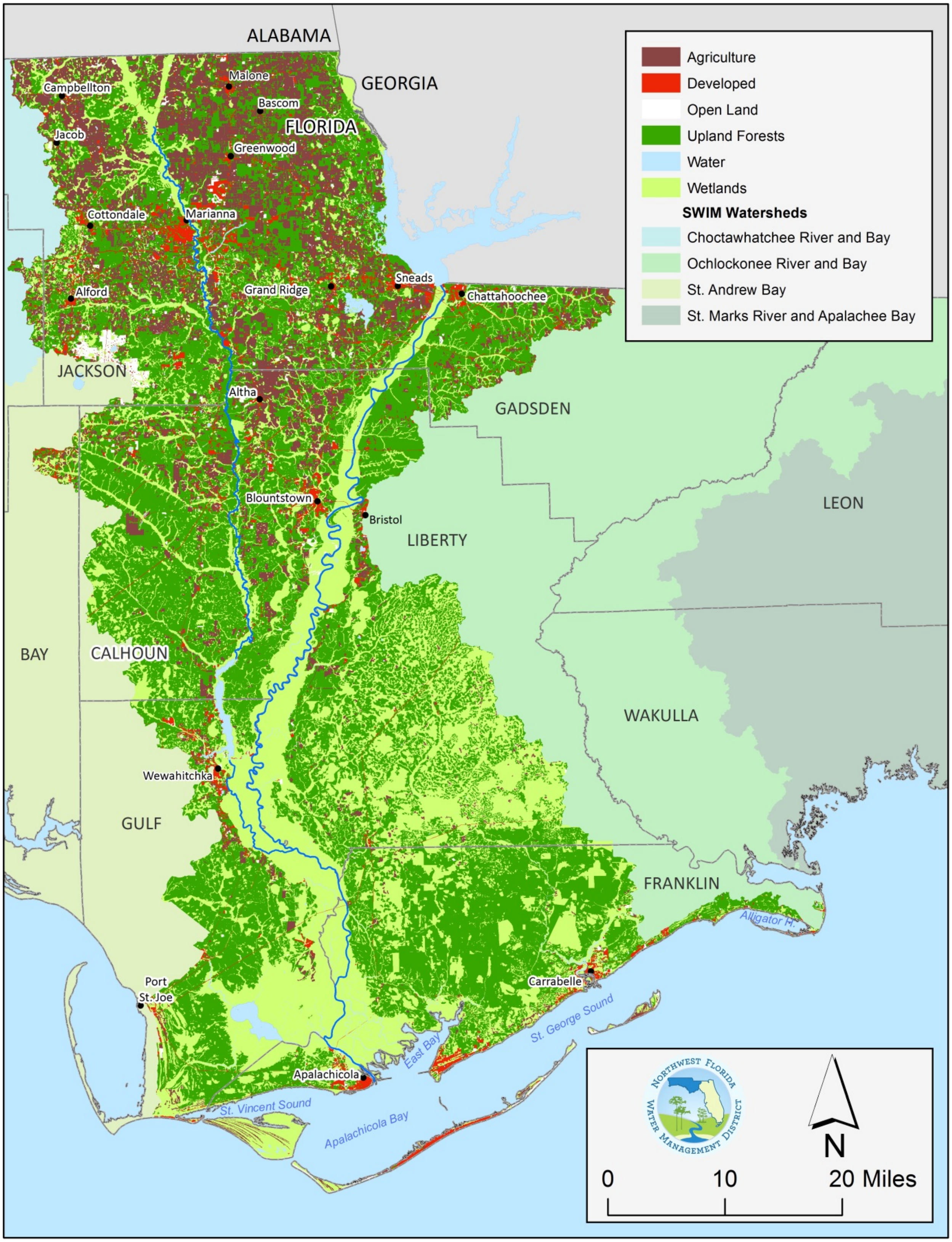


Figure 2-8 Apalachicola River and Bay Watershed Land Use

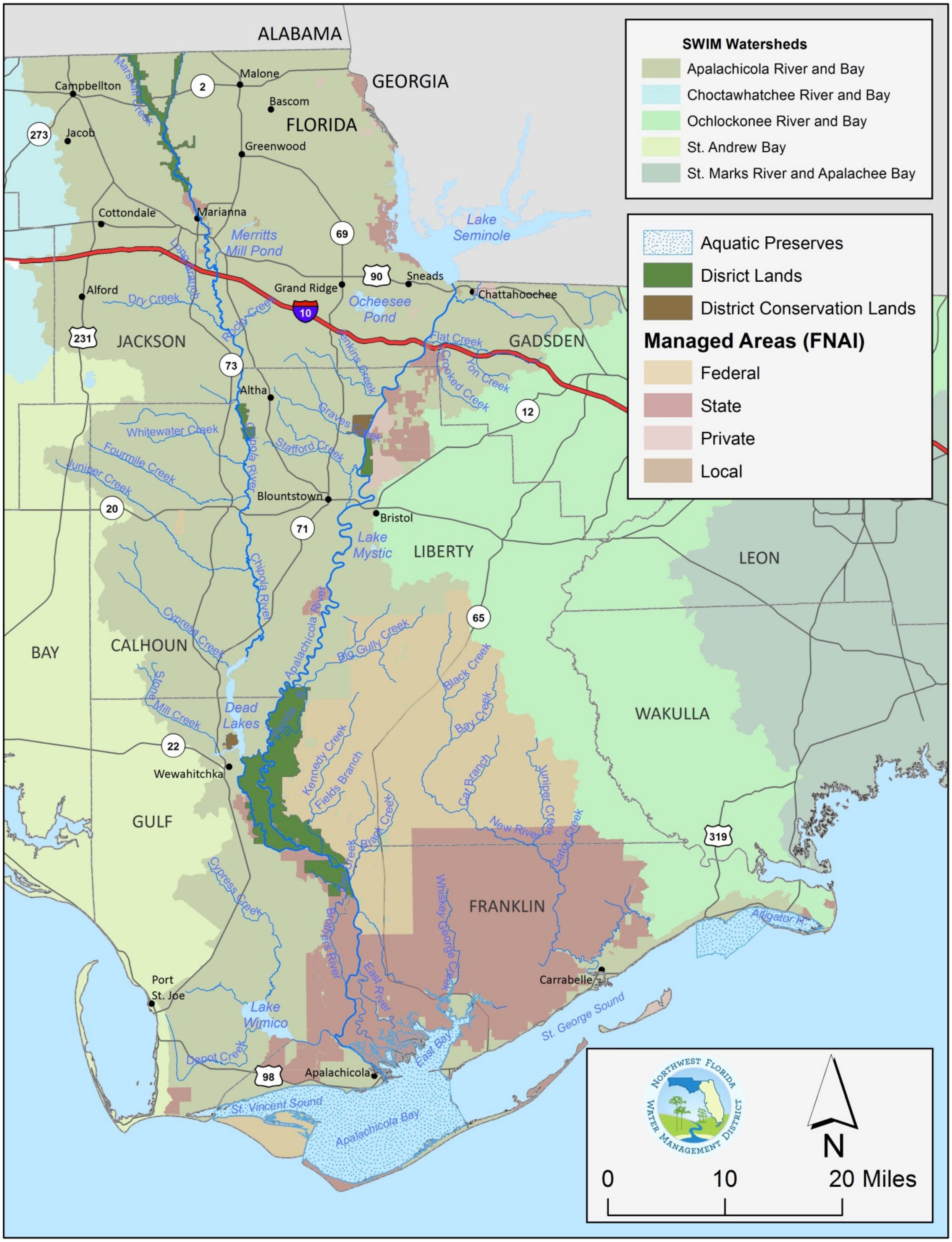


Figure 2-9 Public and Conservation Lands in the Apalachicola River and Bay Watershed

2.4 Natural Communities

The Apalachicola River and Bay watershed encompasses a diversity of natural habitats, including upland, coastal, transitional, wetland, aquatic, estuarine, and marine communities (FNAI 2010). Based on geographic analysis, the watershed includes 35 distinct natural communities within 15 broader community categories as characterized by FNAI (FNAI 2010,).

2.4.1 Terrestrial Communities

The terrestrial ecology of the Apalachicola River and Bay watershed, as described by a number of authors (e.g., Couch et al. 1996; NWFWMD 1996; Leitman *et al.* 1983; Edmiston and Tuck 1987; Clewell 1971), consists of a diverse array of upland and wetland ecosystems that transition with physiographic characteristics of the watershed. These include extensive high pine and pine flatwood forests, mixed hardwood forests, forested wetlands, bogs and savannahs, marshes, and coastal scrub.

Upland communities in the watershed include sandhill, clayhills, scrub, pine flatwoods, mixed hardwood forests, scrubby flatwoods, mesic flatwoods, wet flatwoods, xeric hammocks, coastal grassland, coastal interdunal swale, and beach dune communities (ANERR 2013; NWFWMD 1996; FNAI 2010). These are described in some detail in Appendix E. Listed species supported by upland communities include the gopher tortoise (*Gopherus polyphemus*), the reticulated flatwoods salamander (*Ambystoma bishopi*), the eastern indigo snake (*Drymarchon corais couperi*), and the red-cockaded woodpecker (*Picoides borealis*). Noteworthy plant species, indicative of the origins of the basin in the Appalachian Mountains, include the Florida Torreya (*Torreya taxifolia*) and the Florida yew (*Taxus floridana*). These species are endemic to the bluffs and ravines along the east side of the Apalachicola River.

Along the eastern valley of the Apalachicola River are examples of deep tributary ravine ecosystems. These ravines developed by a combination of surface erosion and, in some cases, undercutting of the ravine slope by discharge of surficial ground water. They are characterized by mixed hardwood and pine slope forests and support concentrations of rare, endangered, and endemic plant and animal species, including northern species representative of the Appalachian origin of this system (Wolfe *et al.* 1988; NWFWMD 1996). Certain ravine systems are steepheads, which are formed by the action of ground water leaking through porous sand. Resulting springs undercut ravine walls and form steep "U"-shaped valleys. The associated slope forests are included in one of the six biodiversity hotspots in the United States designated by The Nature Conservancy and are noted for high diversity of rare species, including the endemic tree species Ashe’s magnolia and Florida yew. Rare animals include the Apalachicola dusky salamander, copperhead snake, and Torreya pygmy grasshopper (FNAI 2010).

2.4.2 Apalachicola and Chipola Rivers and Tributaries

Aquatic habitats within the main stem of the Apalachicola River include steep natural bank, gently sloping natural bank, dike field, sandbar, rock, and submersed vegetation (Edmiston and Tuck 1987). Snags play a major role in determining habitat usage and significantly affect the productivity of these areas (Edmiston and Tuck 1987). In addition to the main stem of the river, inundated floodplain provides essential feeding, spawning, and nursery grounds. Inundation varies with seasonal river flows. Aquatic habitats within the floodplain include floodplain streams, lakes, tributary lakes, and floodplain forests (Light *et al.* 1998). Light *et al.* (1998) provides a detailed characterization of the river by reach, including descriptions of floodplain habitats in relation to river flow.

The Apalachicola River is believed to support the greatest number of freshwater fish species of Florida rivers (Bass 1983; Seaman 1985; ANERR 2008). Within the Apalachicola and lower Chipola rivers, 131 freshwater and estuarine species have been identified (Light *et al.* 1998; ANERR 2008). Included in the identified species are eight diadromous species, four endemic species, seven introduced species, and two marine species commonly found throughout the system (Edmiston and Tuck 1987).

The Apalachicola and Chipola river basins provide habitat for six species of federally listed freshwater mussels: the fat threeridge (*Amblema neislerii*), shinyrayed pocketbook (*Lampsilis subangulata*), Gulf moccasinshell (*Medionidus penicillatus*), oval pigtoe (*Pleurobema pyriforme*), Chipola slabshell (*Elliptio chipolaensis*), and purple bankclimber (*Elliptoideus sloatianus*). The fat threeridge, shinyrayed pocketbook, Gulf moccasinshell, and oval pigtoe are listed as endangered species under the Endangered Species Act of 1973; and the Chipola slabshell and purple bankclimber are listed as threatened species. Critical habitat has been designated in the Apalachicola River for the fat threeridge and purple bankclimber and in the Chipola River for the fat threeridge, shinyrayed pocketbook, Gulf moccasinshell, and Chipola slabshell. The Apalachicola River, as well as Apalachicola Bay, also provides designated critical habitat for the federally listed Gulf sturgeon (*Acipenser oxyrinchus desotoi*).

In addition to the Apalachicola and Chipola rivers, there are numerous tributaries that support aquatic and wetland communities and provide fish and wildlife habitat. Among the tributaries in Florida are the Brothers and Jackson rivers and Big Gully, Black, Owl, and Whiskey George Creeks, among many others. Additional freshwater habitats in the watershed include ravine and blackwater streams, floodplain lakes, ponds, Lake Wimico, and Lake Seminole. Lake Seminole, the largest lake in the Florida panhandle, supports lacustrine phytoplankton and fish populations, and a substantial portion of its surface area tends to be occupied by exotic and native macrophytes.

2.4.3 Riparian, Wetland, and Floodplain Habitats

Riparian habitats include those areas along waterbodies that serve as an interface between terrestrial and aquatic ecosystems. The Apalachicola River and Bay watershed supports diverse wetland communities. Among these are cypress swamps, dwarf cypress swamps, tupelo-cypress swamps, Atlantic white cedar swamps, wet prairie, wet pine flatwoods, and mixed forested wetlands (FNAI 1997, 2000; NWFWMD and DOF 2010). In addition to the riverine floodplain, large wetland systems are common east of the river across much of Liberty and Franklin counties. Listed animal species known from wetlands and aquatic habitats within the watershed include the reticulated flatwoods salamander (*Ambystoma bishop*) and frosted flatwoods salamander (*Ambystoma cingulataum*).

Florida's largest forested floodplain spans the length of the Apalachicola River, expanding to large coastal wetland systems near the coast (Figure 2-5). The floodplain is approximately 71 miles long, with widths from one to five miles, and coverage of approximately 112,000 acres (Light *et al.* 1998.). As previously noted, the overall floodplain area, including coastal floodplain, is approximately 1,139,655 acres. Floodplains provide essential aquatic habitat when inundated during high flow periods.

Tidal marsh is abundant in the coastal extent of the watershed, including the Apalachicola River delta, St. Vincent Island, littoral zones along tidal influenced lower reaches of estuarine tributaries, the bay side of barrier islands, and around Alligator Harbor (Figure 2-6). Marsh species composition is influenced by a combination of salinity tolerance and differences in soil type, elevations and competitive interactions. Salt marshes in the Florida Panhandle are usually characterized by large, fairly homogeneous expanses of dense black needlerush (*Juncus roemerianus*). Often, they are accompanied on the waterward side by smooth cordgrass (*Spartina alterniflora*). The *Juncus* and *Spartina* zones are distinctive and can be separated easily by elevation.

2.4.4 Estuarine Habitats

The Apalachicola Bay estuary may be divided into four sections based both on natural bathymetry and man-made structural alterations: East Bay, St. Vincent Sound, Apalachicola Bay, and St. George Sound. East Bay, north and east of the Apalachicola delta, is surrounded by extensive marshes and swamps and has an average depth of about three feet. The John Gorrie Bridge is considered its southern limit. A causeway extending from Eastpoint and a causeway island near the mouth of the Apalachicola River form partial barriers between East Bay and Apalachicola Bay.

St. Vincent Sound is shallow, with an average depth of about four feet. It contains numerous oyster bars and separates St. Vincent Island from the mainland. It is linked to the Gulf by Indian Pass with a maximum water depth of about 12 feet. This inlet separates the eastern end of Gulf County from St. Vincent Island in Franklin County. The channel is subject to extreme shoaling and is unreliable for navigation (NOAA 2017).

Apalachicola Bay is the central and widest portion of the estuary. It is separated from St. Vincent Sound by shoal areas and oyster bars. To the north, it is separated from the river mouth, delta, and East Bay by the John Gorrie Memorial Bridge. The bay is connected to the Gulf through West Pass, a deep tidal inlet, and Sikes Cut, a man-made navigation channel which separates St. George and Little St. George islands.

Depths in Apalachicola Bay average six to nine feet at mean low water. Oyster bars are scattered throughout the central bay area and near the John Gorrie Memorial Bridge. To the east, Apalachicola Bay is bounded by Bulkhead Shoal, a natural submerged bar that extends from the mainland to St. George Island. Construction of a causeway island in the center of the bar and a causeway extension at St. George Island raise part of the bar above sea level. St. George Sound has an average depth of nine feet and extends from Bulkhead Shoal to the Carrabelle River and East Pass.

Major estuarine habitats include oyster bars, tidal flats, soft sediment, tidal marshes, open water habitats, and seagrass beds (ANERR 2013; Yarbro and Carlson 2016). Figure 2-6 illustrates major habitat types, including oyster bars, seagrasses, and salt marsh. In 2014, the Apalachicola National Estuarine Research Reserve reported that oyster bars covered over 10,600 acres of submerged bottom within reserve boundaries – which include most of the estuary's oyster habitat (ANERR 2013). The Eastern oyster is the dominant component on the bars within the bay. In addition to sustaining an economically important resource, oyster reefs have importance for the wider ecosystem (FWC 2013). Oyster beds provide habitat and food sources for numerous estuarine organisms, including mussels, shrimp, small fish, and crabs, as well as nursery habitat for species such as flounder. Other fish species using oyster reefs include red drum, sheepshead, and spotted seatrout.

The watershed planning area extends eastward to include Alligator Harbor, a shallow estuary east of St. George Sound separated from the open Gulf by the Alligator Point peninsula. The harbor is approximately four miles long and one and a half miles wide with a mean low water depth of approximately four feet (FDEP 2017d). There is little freshwater inflow into Alligator Harbor, and salinity remains relatively consistent and similar to adjacent Gulf of Mexico waters. Due to its relatively high and stable salinity, Alligator Harbor is ecologically distinct from estuarine waters further east. Submerged and littoral habitats include seagrasses, mollusk reefs, unconsolidated substrate, and tidal marsh (FDEP 2017d). The harbor supports important feeding grounds for the Kemp's ridley sea turtle (*Lepidochelys kempii*) and the harbor and littoral and shoreline areas provide habitat for migratory birds. Clam aquaculture sites were established in 2002 and state approved oyster harvesting in 2013 (FDEP 2017d).

Seagrass beds provide important habitats within the bay, particularly on the bay side of St. George, Cape St. George, and Dog islands, and in St. George Sound and Alligator Harbor. Yarbro and Carlson (2016) estimate coastal Franklin County 2010 seagrass coverage at 14,611 acres. About half of this area and most of the continuous beds were identified in region generally encompassing Dog Island and reef, Turkey Point, and the Carrabelle River.

2.4.5 Coastal Barrier System

The Apalachicola estuary is bounded on the Gulf side by four barrier islands: St. Vincent Island, St. George Island, Little St. George Island, and Dog Island. The barrier island system lies roughly parallel to the mainland. The islands played a crucial role in the formation of the Apalachicola estuary and provide protection to the mainland by providing a "first line of defense" to destructive hurricanes (Edmiston and Tuck 1987). Each of the barrier islands has a unique plant community profile and structure.

St. Vincent Island is a triangular-shaped island about nine miles long and up to 4.5 miles wide, encompassing about 11,800 acres. It contains a mosaic of forest, scrub, wetland, interdunal swale, lacustrine, and beach dune habitats. The island managed by the U.S. Fish and Wildlife Service as St. Vincent National Wildlife Refuge.

St. George Island lies opposite the mouth of the Apalachicola River and is connected to the mainland by the St. George Island Bridge. The island is 30 miles long and very narrow, averaging less than one-third mile in width. It contains approximately 7,340 acres of land and 1,200 acres of marshes (Edmiston and Tuck 1987). On the Gulf of Mexico side is a narrow band of beaches and low-lying sand dunes that grade into mixed woodland grass, palmetto, and bayside marshes. Dr. Julian G. Bruce St. George Island State Park is located on the east end of the island and consists of approximately 2,023 acres (FNAI 2016). Bob Sikes Cut separates the west end of the island from Little St. George Island.

Little St. George Island is nine miles long and varies in width from one-quarter mile to a maximum width of one mile. The State of Florida acquired the island in 1977 and designated it a State Reserve. The reserve consists of approximately 2,300 acres, with an additional 400 acres of perimeter tidal marshland and lower beach areas which are inundated at high tide. The island is a coastal dune, dune flat washover formation (Edmiston and Tuck 1987).

Dog Island is offshore of the City of Carrabelle and is approximately 1,842 acres in size. The island is approximately seven miles long with a maximum width of one mile. Dog Island contains 690 acres of freshwater wetlands and 352 acres of intertidal wetlands (Edmiston and Tuck 1987).

3.0 Watershed Assessment and Water Resource Issues

3.1 Water Quality

The Apalachicola River and Bay watershed experiences water quality challenges in all three states. Surface water quality varies by stream reach and contributing land uses. Tributaries in all states are affected by NPS pollution and alterations associated with land use practices within their contributing sub-watersheds. Additional long-term challenges correspond with runoff from major urban areas, mostly outside of Florida. Within Florida, agricultural and silvicultural activities and unpaved roads are among sources of NPS pollution, as is runoff from developed communities. Pollution associated with impacts from septic tanks is a concern throughout much of the watershed.

3.1.1 Impaired Waters

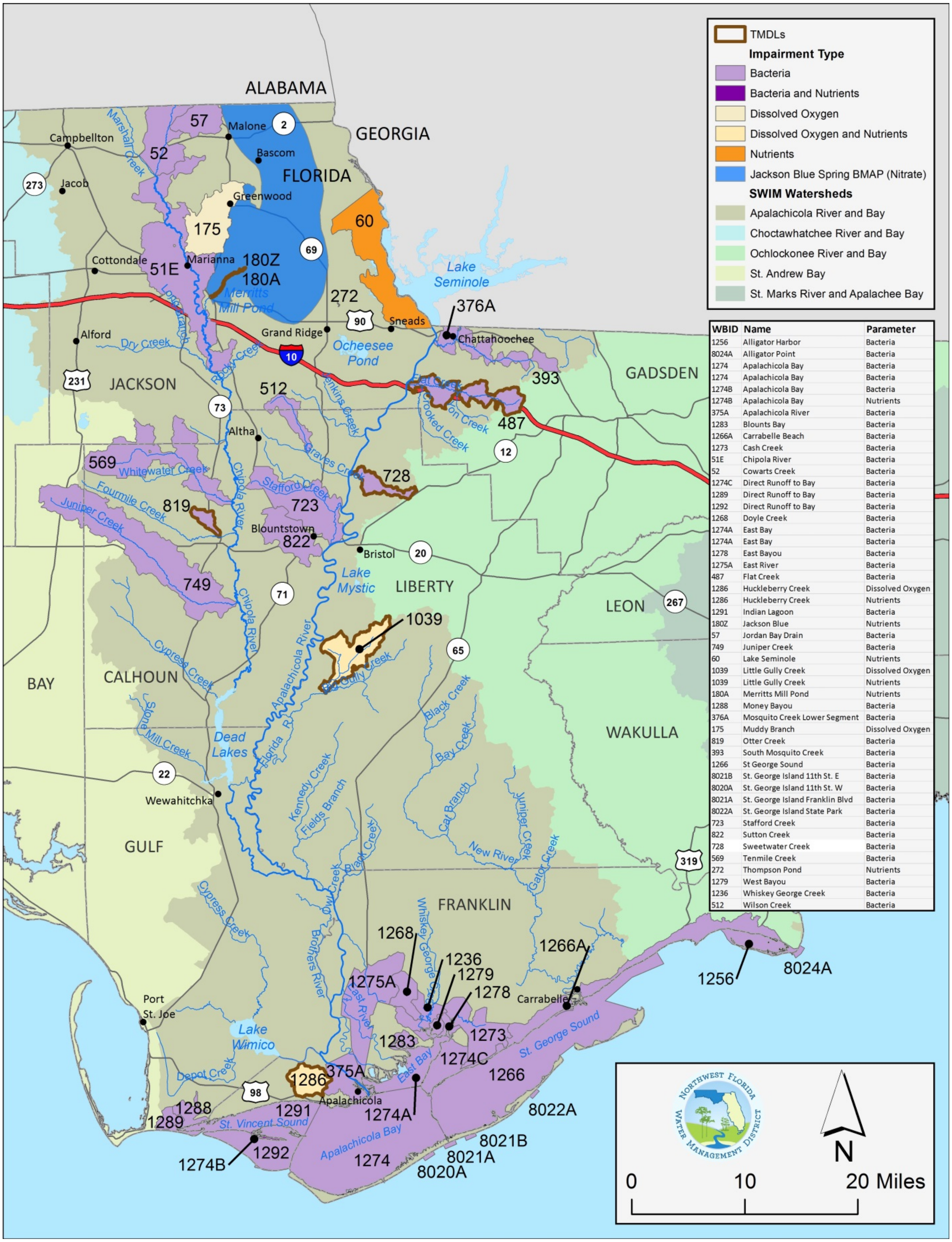
Of 312 waterbody segments in the Apalachicola River and Bay watershed, FDEP has identified 92 separate impairments (69 segments), including 24 for bacteria (beach advisories or shellfish harvesting classification), 17 for fecal coliform, seven for nutrients, three for dissolved oxygen (DO), and 41 for mercury (fish consumption advisory) (FDEP 2009). Impairments associated with bacteria are particularly concentrated in the Apalachicola Bay area, as well as in portions of Jackson and Calhoun counties. (Figure 3-1 and Appendix F). The Department conducted an updated assessment in 2016; however, the results have not been finalized as of the time of this writing. Total Maximum Daily Loads (TMDLs) have been established for fecal coliform, nutrients, and for DO (Figure 3-1; Table 3-1) (FDEP 2016d). A Basin Management Action Plan was adopted by FDEP in 2016 to implement nutrient TMDLs for the Jackson Blue Spring and Merritts Mill Pond Basin (FDEP 2016j). The BMAP was developed by FDEP in cooperation with agricultural producers, Jackson County, municipalities, the Florida Farm Bureau, the University of Florida IFAS, the NWFWMD, FDACS, FDOH, FDOT, and interested citizens. In addition to State-listed impaired waters, TMDLs established by the U.S. EPA are listed in Appendix F.

Table 3-1 Adopted TMDLs[1]

Waterbody	WBID(s)[2]	Waterbody	WBID(s)
Fecal Coliform Bacteria		Nutrients	
Flat Creek	487	Merritts Mill Pond	180A
Sweetwater Creek	728	Jackson Blue Spring	180Z
Otter Creek	819	Little Gully Creek	1039
Huckleberry Creek	1286		
		Dissolved Oxygen	
		Little Gully Creek	1039

[1]Not including mercury
[2]Waterbody Identification Number

The FDEP has also adopted a statewide TMDL for reducing human health risks associated with consuming fish taken from waters impaired for mercury. Mercury impairments are based on potential human health risks (fish consumption advisories), not exceedances of water quality criteria. The primary source of mercury is atmospheric deposition, with 30 percent from natural sources and 70 percent from anthropogenic international sources outside of North America. It is estimated that approximately 0.5 percent of mercury from anthropogenic sources is from Florida (FDEP 2013). Only a very small part of mercury in the environment is in the form of methylated mercury, which is biologically available and able to enter the food chain. For these reasons, the statewide TMDL that the FDEP has adopted for mercury includes a reduction target for fish consumption by humans and by wildlife and an 86 percent reduction in mercury from mercury sources in Florida (FDEP 2013).



WBID	Name	Parameter
1256	Alligator Harbor	Bacteria
8024A	Alligator Point	Bacteria
1274	Apalachicola Bay	Bacteria
1274	Apalachicola Bay	Bacteria
1274B	Apalachicola Bay	Bacteria
1274B	Apalachicola Bay	Nutrients
375A	Apalachicola River	Bacteria
1283	Blounts Bay	Bacteria
1266A	Carrabelle Beach	Bacteria
1273	Cash Creek	Bacteria
51E	Chipola River	Bacteria
52	Cowarts Creek	Bacteria
1274C	Direct Runoff to Bay	Bacteria
1289	Direct Runoff to Bay	Bacteria
1292	Direct Runoff to Bay	Bacteria
1268	Doyle Creek	Bacteria
1274A	East Bay	Bacteria
1274A	East Bay	Bacteria
1278	East Bayou	Bacteria
1275A	East River	Bacteria
487	Flat Creek	Bacteria
1286	Huckleberry Creek	Dissolved Oxygen
1286	Huckleberry Creek	Nutrients
1291	Indian Lagoon	Bacteria
180Z	Jackson Blue	Nutrients
57	Jordan Bay Drain	Bacteria
749	Juniper Creek	Bacteria
60	Lake Seminole	Nutrients
1039	Little Gully Creek	Dissolved Oxygen
1039	Little Gully Creek	Nutrients
180A	Merritts Mill Pond	Nutrients
1288	Money Bayou	Bacteria
376A	Mosquito Creek Lower Segment	Bacteria
175	Muddy Branch	Dissolved Oxygen
819	Otter Creek	Bacteria
393	South Mosquito Creek	Bacteria
1266	St George Sound	Bacteria
8021B	St. George Island 11th St. E	Bacteria
8020A	St. George Island 11th St. W	Bacteria
8021A	St. George Island Franklin Blvd	Bacteria
8022A	St. George Island State Park	Bacteria
723	Stafford Creek	Bacteria
822	Sutton Creek	Bacteria
728	Sweetwater Creek	Bacteria
569	Tenmile Creek	Bacteria
272	Thompson Pond	Nutrients
1279	West Bayou	Bacteria
1236	Whiskey George Creek	Bacteria
512	Wilson Creek	Bacteria

Figure 3-1 Impaired Waters in Florida's Portion of the Watershed (excluding Mercury)

3.1.2 Pollution Sources

Nonpoint source (NPS) pollution is generated when stormwater runoff collects pollutants from across the landscape (lawns, pavement, highways, dirt roads, buildings, farms, forestry operations, and construction sites, etc.) and carries them into receiving waters. Pollutants entering the water in this way include nutrients, microbial pathogens, sediment, petroleum products, toxic metals, pesticides, and other contaminants. Pollutants entering the groundwater may also emerge in surface waters via seepage and spring discharges. Typical categories of NPS pollution include surface runoff and stormwater from agricultural areas and urban lands, leaching of on-site sewage treatment and disposal systems (OSTDS), and erosion and sedimentation from cleared lands, construction sites, or unpaved roads. Atmospheric deposition of nitrogen, sulfur, mercury, and other substances via fossil fuel combustion also contributes to NPS pollution.

Stormwater runoff is the primary source of NPS pollution, and it is closely associated with land use. Urban land uses generate the greatest NPS pollution per unit area due to impervious surfaces that increase runoff. In urban areas, lawns, roadways, buildings, parking lots, and commercial and institutional properties all contribute to NPS pollution. Urban land uses are quite limited in Florida’s portion of the watershed, primarily occurring within and adjacent to small communities as described in Section 2.3.

Fertilizer application, ditching, road construction, and harvesting associated with agriculture and silviculture can also cause NPS pollution, erosion, sedimentation, and physical impacts to streams and receiving waters (Stanhope *et al.* 2008). Within Florida’s portion of the watershed, agricultural activities are concentrated primarily within Jackson and northern Calhoun counties. Silviculture is widespread across most of the watershed. Ditching associated with historic forestry operations, particularly within Tates Hell Swamp, have disrupted hydrology and created pathways for runoff and delivery of sediments, suspended solids, and other pollutants.

Erosion and sedimentation are natural phenomena that can be accelerated by human activities, with resulting water quality impacts, including habitat smothering, elevated turbidity and suspended solids, and hydrologic impacts. Factors such as highly erodible soils, steep unstable slopes, and high rainfall intensities, are important factors in erosion and sedimentation (Reckendorf 1995). Construction activities, unpaved roads, abandoned borrow pits, historical dredging activities, and agricultural and silvicultural practices lacking proper BMPs are potential sources of sedimentation. Accelerated stream bank erosion caused by runoff associated with impervious surfaces can also be a significant source of sedimentation into receiving waters.

In the Apalachicola River and Bay watershed, most rural and unincorporated communities rely on OSTDS for wastewater treatment (Figure 3-2). Concentrations of OSTDS can degrade the quality of groundwater and proximate surface waters. While conventional OSTDS can control pathogens, surfactants, metals, and phosphorus, mobility in the soil prevents complete treatment and removal of nitrogen. Dissolved nitrogen is frequently exported from drainfields through the groundwater (NRC 2001). Additionally, OSTDS in areas with high water tables or soil limitations may not effectively treat other pollutants. Florida Water Management Inventory data indicate over 23,000 known or likely septic systems in the watershed (FDOH 2016). Known septic is based on permit data combined with inspection records. Likely septic is based on results of the review of nine criteria, but without inspection verification.

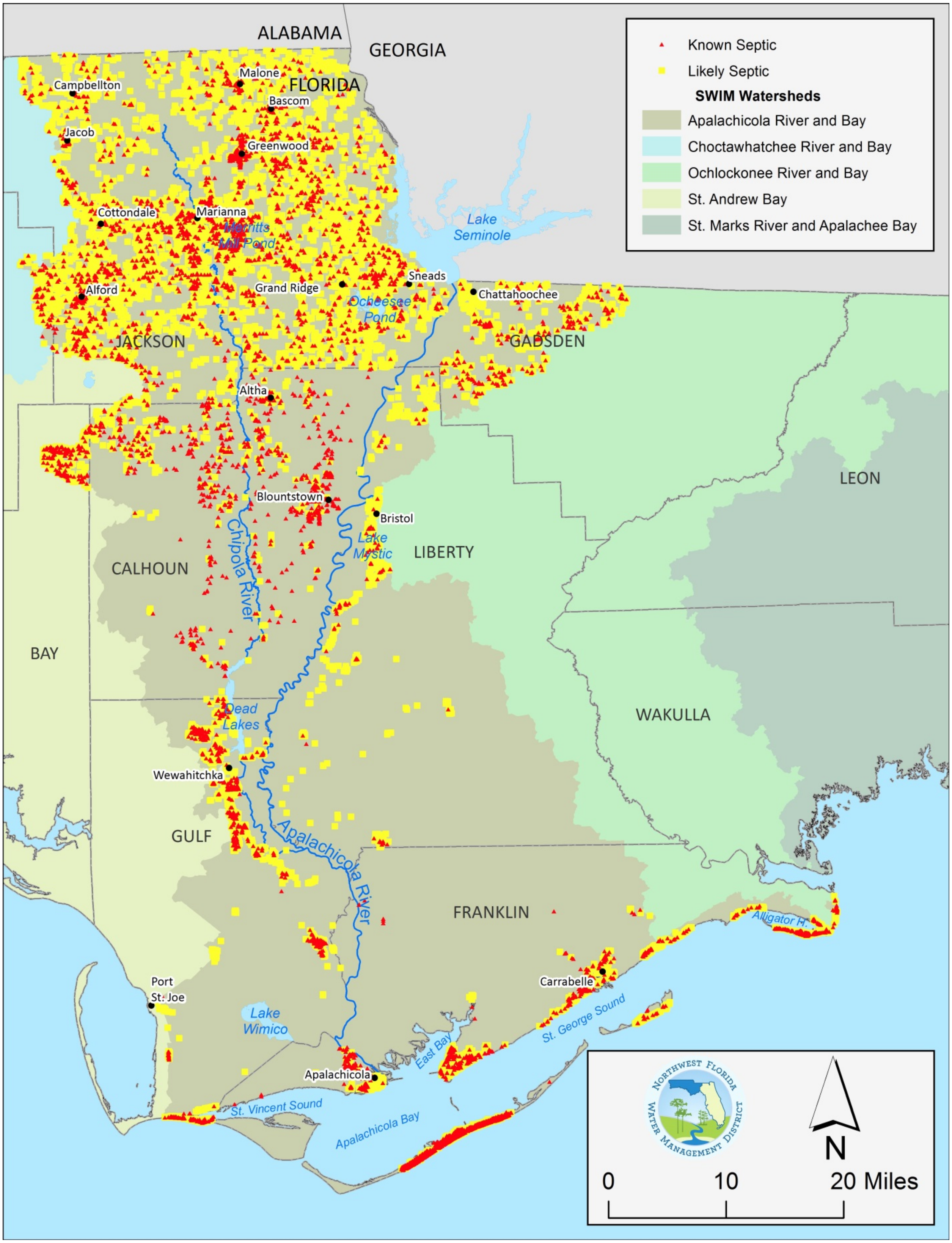


Figure 3-2 **Septic Systems in the Apalachicola River and Bay Watershed**

Marinas and other facilities for vessel storage and operation may be sources of NPS pollution from maintenance, refueling, and marine sewage management, and due to runoff from parking lots. Pollution can depend on the availability of pump-out facilities and the level and consistency of BMP implementation. Marinas are located at Carrabelle and Apalachicola. Commercial facilities are located at several locations in coastal Franklin County, and educational and research facilities are located near Turkey Point. Two marinas in the watershed have been designated as Clean Marinas by FDEP as of 2017.

There are 23 permitted domestic wastewater facilities and 16 industrial wastewater facilities within the watershed (Table 3-1; Figure 3-4). Wastewater treatment facilities are located primarily within or near municipalities and unincorporated communities.

Table 3-2 Domestic Wastewater Facilities

Facility Name	County	Permitted Flow (mgd)	2015 Flow (mgd)	Discharge Type*
Blountstown WWTP	Calhoun	1.50	0.50	Surface water
Cottondale WWTF	Jackson	0.25	0.08	Sprayfield
FDOT Highway 231 Welcome Center WWTF	Jackson	0.03	0.005	Absorption field; Rapid Infiltration Basin (RIB)
FDOT Jackson County I-10 Rest Area WWTP	Jackson	0.03	0.009	Absorption field
Grand Ridge WWTF	Jackson	0.21	0.06	Sprayfield
Marianna WWTP	Jackson	4.00	1.07	Reuse at WWTP; sprayfield
Sneads WWTP	Jackson	0.73	0.42	Sprayfield
Jackson Correctional Institution WWTP	Jackson	0.24	0.21	Sprayfield
Marianna - Sunland Training Center	Jackson	0.01	0.001	Sprayfield
Apalachicola WWTF	Franklin	1.00	0.30	Public access reuse, AWT
Buccaneer Inn WWTF	Franklin	0.01	0.006	Absorption field
Carrabelle – Kenneth B. Cope AWT Facility	Franklin	1.20	0.38	Sprayfield, public access reuse
Eastpoint WWTP	Franklin	0.30	0.10	Other landscape irrigation
Summercamp WWTF	Franklin	0.09	**	RIB
Sunset Beach WWTF	Franklin	0.05	0.01	RIB
Villas of St George WWTP	Franklin	0.01	0.003	Absorption field
Wewahitchka, Ricky McMillon WWTP	Gulf	0.24	0.14	Surface water
Gulf Correctional Institution	Gulf	0.35	0.29	Sprayfield
Gulf Forestry Work Camp WWTP	Gulf	0.04	0.04	Sprayfield
Chattahoochee WWTP	Gadsden	0.40	0.21	Surface water
FDOT Gadsden County I-10 Rest Area WWTP	Gadsden	0.03	0.01	Sprayfield
Florida State Hospital WWTP	Gadsden	1.30	0.28	Surface water

Note: Although portions of the City of Bristol are within the watershed, the WWTP and its discharge are located in the Ochlockonee River and Bay watershed.

Source: FDEP 2016k, 2017k
*See Parts II-VII of Chapter 62-610, F.A.C. for more information.
** FDEP Annual Reuse Inventory only includes facilities permitted at 0.1 mgd or greater.

Figure 3-3 **Apalachicola River and Bay Watershed Wastewater Facilities**

As of 2016, there were three Toxics Release Inventory sites in the watershed, one in Gadsden County, and two in Jackson County (U.S. EPA 2017). Additionally, 531 closed, seven abandoned, and 325 active petroleum contamination tracking sites within the watershed are registered with the Storage Tank and Petroleum Contamination Monitoring (STCM) database. There are 3 contaminated dry cleaning sites eligible for the state-funded Dry-cleaning Solvent Cleanup Program within the basin. Most STCM sites are in the historically populated areas; being in the north portion of the basin and along the coastal areas. The dry-cleaning sites are in Chattahoochee and Marianna.

There are currently two EPA National Priority List (NPL) Superfund sites within the Apalachicola River and Bay watershed. The Sapp Battery Site has undergone historic restoration and is now being reused as pasture and natural habitat. At the Anrich Industries site (formerly United Metals, Inc.), the EPA and the Florida Department of Environmental Protection (FDEP) have investigated site conditions and taken steps to clean up the site in order to protect people and the environment from contamination. One state funded clean-up site, Cohee-Barnes Battery Recycling, is subject to a remedial action plan for lead contaminated wetland sediments.

3.2 Natural Systems

Unrestrained consumptive uses of water within Georgia have increased the frequency of very low river flows. This has in turn reduced the area of connected aquatic habitats within the floodplain, diminishing availability of habitat and spawning area for numerous fish species (Allan 2016). Additional impacts include alterations to floodplain forest composition, harm to freshwater mussel populations, and degraded habitat suitability for the federally listed (threatened) Gulf sturgeon. Upstream water consumption exacerbated by sustained drought additionally resulted in unprecedented losses in oyster productivity and harvest in Apalachicola Bay during 2012 and 2013. Reduced freshwater inflow increased estuarine salinity, leading to severe predation from marine species, spread of oyster disease, and oyster recruitment failure (Kimbro 2016; UF-IFAS 2013). The extent of the damage has prompted concerns about the potential for permanent or long-term losses in productivity (FWC 2013). In addition to significant impacts to the regional economy, depleted oyster resources have had spin-off effects on the wider ecosystem, including loss of habitat for an array of organisms, including shrimp, fish, and crabs, and reduced availability of nursery habitats for estuarine species. The loss of oyster reefs has also reduced the cumulative capacity of oysters to filter and benefit water quality within the bay.

From the 1950s through the 1970s, Tates Hell swamp was altered to facilitate forestry operations. Thousands of acres of pine flatwoods and wetland habitats were converted to slash pine plantation. More than 800 miles of roads were constructed, as was an extensive network of drainage ditches. These actions impacted wetland hydrology and disrupted the timing and quality of surface water runoff from the swamp to Apalachicola Bay, East Bay, and surrounding waters (NWFWMD and DOF 2010). To facilitate restoration, over 200,000 acres were acquired by the state as Tate’s Hell State Forest, and the District and the Florida Division of Forestry (now Florida Forest Service) developed and have proceeded to implement the Tate’s Hell State Forest Hydrologic Restoration Plan (NWFWMD and DOF 2010). A number of hydrologic and wetland restoration projects have been completed within several separate drainage basins of the swamp. There are opportunities to accomplish additional priority restoration activities, continuing the progress made to date and improving protection and restoration of wetland and aquatic habitats and resources. To advance this objective, the Gulf Coast Ecosystem Restoration Council funded Tate’s Hell Strategy 1, which includes planning, engineering, and implementation of high priority restoration activities within Tate’s Hell State Forest.

From the late 1950s to early 2000s, the Apalachicola River was managed by the U.S. Army Corps of Engineers as a navigation project. As a result, the river was subjected to repeat dredging, with extensive disposal of dredged material within the floodplain and at within-bank disposal sites (Mossa *et al.* 2017). Impacts of these activities included loss of floodplain and riverine habitat, and increased erosion and channel sedimentation. In 1980, extensive ditching and diking of wetlands occurred at M-K Ranch, within the Lake Wimico drainage basin (ANERR 1998). The site was subject to regulatory and initial restoration activities. Much of the impacted area was acquired by the state, and planning for restoration of an area encompassing approximately 6,400 acres has been initiated.

Seagrass trends appear generally stable, but with apparent changes in areas of the estuary. In 2010, seagrasses coverage was estimated at 14,611 acres in coastal Franklin County (Yarbro and Carlson 2016). As comparison, seagrass area mapped in 1992 was about 14,452 acres. Seagrass area in Apalachicola Bay, however, appeared to decline by approximately 2,000 acres during this timeframe, while coverage in the region encompassing Dog Island and reef, Turkey Point, and the Carrabelle River appeared to increase by nearly an equivalent area. Similarly, losses were apparent in Alligator Harbor, with increases evident in St. Vincent Sound and St. George Sound. Imagery from 2010 indicates that over half of the seagrasses and most of the continuous beds were in the eastern portion of the region, with patchy seagrass beds predominant elsewhere.

3.3 Floodplains and Floodplain Management

The Apalachicola River floodplain is subject to annual flooding of the river, and floodplain area within coastal Franklin and Gulf counties is periodically affected by storm surges that accompany hurricanes and tropical storms. As noted above, the Apalachicola River has the largest forested floodplain in Florida. This floodplain is exceptionally important for protecting downstream water quality, as well as for providing important fish and wildlife habitat and for protecting communities in the watershed from what might otherwise be damaging floods.

Floodplains protect water quality by allowing storage of floodwaters, reducing runoff velocity and preventing erosion and sedimentation. Floodplains in their natural state also attenuate potential flood effects while providing an ecological link between aquatic and upland ecosystems and habitat for many terrestrial and aquatic species. Development of and encroachment into floodplains can reduce water storage capacity, increase flood heights and velocities, and degrade natural systems in areas beyond the encroachment itself.

Flood protection needs are closely related with stormwater management, as well as land use planning and land development regulation. Riparian wetlands, marshes, and floodplain forests help to slow stormwater runoff, protecting water quality and regulating the release of water into streams and aquifers. Optimally, stormwater management systems provide both flood protection and water quality treatment.

4.0 Watershed Protection and Restoration

4.1 Management Practices

Watershed protection and restoration is inherently a collaborative effort on the part of state, regional, and federal agencies; local governments; nongovernment organizations; the business community; and the public. Implementation is conducted at the watershed, sub-watershed, and local scale. Recommended management strategies are described below.

4.1.1 Nonpoint Source Pollution Abatement

Addressing NPS pollution is a vital part of watershed management in the Apalachicola River and Bay watershed. As described above, stormwater runoff carries pollutants from the landscape that diminish water quality, and it physically impacts streams and aquatic habitats. Multiple strategies can be employed to collectively reduce NPS pollution and protect and improve water quality and watershed resources.

<u>Stormwater Retrofit</u>

Among the most effective means of reducing NPS pollution is to retrofit existing stormwater management systems to add treatment and improve restore or approximate natural hydrology. In addition to improving water quality, appropriately designed retrofit projects improve flood protection, reduce physical disturbance from erosion and sedimentation, and provide aesthetic and recreational use benefits.

Implementation may include a mixture of traditional and nonstructural approaches. There are numerous methods of stormwater management and treatment, among which are wet and dry detention ponds, infiltration systems, stormwater harvesting, wetland treatment systems, stormwater separator units, vegetated swales and buffers, pervious pavement, bioretention, ditch blocks, green roofs, and chemical (alum) treatment. Specific measures employed depend on site conditions, including soils, water table conditions, flow, intended uses, and available land area. Optimally, a treatment train approach is employed, addressing hydrology and water quality treatment across a basin. Implementation is best accomplished within a wider, watershed context that incorporates initiatives such as Florida Friendly Landscaping (section 373.185, F.S.) and public outreach and awareness.

Within the Apalachicola River and Bay watershed, the greatest potential for stormwater retrofit efforts is within municipal and fringe areas with relatively dense development and significant areas of impervious surface. Among examples are Marianna, Sneads, Apalachicola, Carrabelle, and elsewhere in the vicinity of Apalachicola Bay. Local governments normally take the lead in implementing stormwater retrofit projects, as they most commonly own, operate, and maintain stormwater management systems. Grant funding and planning assistance may be provided by state and federal agencies.

<u>Agricultural Best Management Practices</u>

Best management practices are individual or combined practices determined through research, field-testing, and expert review to be effective and practicable means for improving water quality, considering economic and technological constraints. Such measures can promote water use efficiency and protect fish and wildlife habitat. Such practices were pioneered for agriculture but have also been developed and effectively applied to silvicultural and urban land uses. Best management practices reduce soil loss, nutrient enrichment, sedimentation, discharge of chemical pollutants, and other adverse impacts (see, for example, Wallace *et al.* 2017, among many others). Implementation also often provides benefits for stream bank stability and fish and wildlife habitat. In addition to protecting water and habitat quality and conserving water, BMPs may reduce costs to producers by increasing operational efficiency and effectiveness.

Agricultural BMPs generally fall into two categories – structural and management. Structural BMPs, e.g., water-control structures and fencing, involve the installation of structures or changes to the land and are usually costlier than management BMPs. Management BMPs, such as nutrient and irrigation management, comprise the majority of the practices but may not be readily observable. Nutrient management addresses fertilizer type, amount, placement, and application timing, and it includes practices such as soil and tissue testing, application methods and rates, correct fertilizer formulations, and setbacks from water resources. Irrigation management addresses system maintenance, scheduling, and other measures that improve the overall efficiency of irrigation systems.

The Florida Department of Agriculture and Consumer Services has developed, evaluated, and approved BMPs that are specific to individual agricultural operations within Florida watersheds. As of August 2017, the DACS has adopted manuals for cow/calf, statewide citrus, vegetable and agronomic crops, nurseries, equine operations, specialty fruit and nut, sod, dairy, and poultry operations. A small farms manual is under development and adoption is expected in 2017. The sod and cow/calf manuals are currently under review and revision. Guidance for and assistance in enrolling in approved BMPs are provided by FDACS. Cost share programs are also conducted both by FDACS and the District. Additionally, FWC provides technical assistance to private landowners through its Landowner Assistance Program.

Implementation of approved BMPs or water quality monitoring is required in basins with adopted BMAPs. Whether required or not, however, implementation of BMPs are effective means of protecting and restoring watershed resources and functions and are recommended land use practices for implementation of this plan.

Within the Apalachicola River and Bay watershed, the most extensive and concentrated areas of agricultural land use are within Jackson and Calhoun counties, including spring ground water contribution areas in the Chipola River basin. Within these areas, application of agricultural BMPs has significant potential to further protect and improve water quality and aquatic habitat.

Silviculture Best Management Practices

The Florida Forest Service (FDACS 2008) defines silviculture BMPs as “the minimum standards necessary for protecting and maintaining the State’s water quality as well as certain wildlife habitat values, during forestry activities.” These practices are protective of water resources, including streams, downstream receiving waters, sinkholes, lakes, and wetlands. The FFS provides specific guidance on BMPs (FDACS 2008) and has established compliance monitoring requirements and procedures. FDEP (1997) evaluated the effectiveness of silviculture BMPs and concluded that forestry operations conducted in accordance with the BMP manual resulted in no major adverse habitat alterations.

The primary BMPs established for forestry are special management zones (SMZs). These zones provide buffering, shade, bank stability and erosion-control, as well as detritus and woody debris. They are intended to protect water quality by reducing or eliminating sediment, nutrients, logging debris, chemicals, and water temperature fluctuations. They also maintain forest attributes that provide wildlife habitat. Widths of SMZs vary depending on the type and size of the waterbody, soils, and slope. Specific SMZs are described as follows.

1. The **Primary Zone** varies between 35 and 200 feet and applies to perennial streams, lakes, and sinkholes, OFWs, Outstanding Natural Resource Waters (ONRW), Class I Waters, and, in some cases, wetlands. A primary zone generally prohibits clear-cut harvesting within 35 feet of perennial

waters and within 50 feet of waters designated OFW, ONRW, or Class I. Other operational prescriptions also apply to forestry practices to protect water and natural resources.

2. The **Secondary Zone** applies to intermittent streams, lakes, and sinkholes. Unrestricted selective and clear-cut harvesting is allowable, but mechanical site preparation, operational fertilization, and aerial application or mist blowing of pesticide, are not. Loading decks or landings, log bunching points, road construction other than to cross a waterbody, and site preparation burning on slopes exceeding 18 percent are also prohibited. These zones vary in width between 0 and 300 feet.

3. The **Stringer** provides for trees to be left on or near both banks of intermittent streams, lakes, and sinkholes to provide food, cover, nesting, and travel corridors for wildlife.

Other BMPs detailed in the Florida silviculture BMP manual include practices for forest road planning, construction, drainage, and maintenance; stream crossings; timber harvesting; site preparation and planting; fire line construction and use; pesticide and fertilizer use; waste disposal; and wet weather operations. The BMP manual further includes specific provisions to protect wetlands, sinkholes, and canals. Associated with the BMP manual are separate forestry wildlife best management practices for state imperiled species (FDACS 2014).

Given that the Apalachicola River and Bay watershed is predominantly forested with significant working forests, silviculture BMPs are among the most important tools for protecting water quality and wetland and aquatic habitat quality within the watershed. The significant relief that exists within the upper watershed suggests application of SMZs are particularly important for protecting downstream aquatic habitats from further impacts.

Low Impact Development

Inclusive of green infrastructure, urban best management practices, and Florida Friendly Landscaping, low impact development represents a framework for implementing innovative stormwater management, water use efficiency, and other conservation practices during site planning and development. Benefits include reduced runoff and NPS pollution, improved flood protection, and reduced erosion and sedimentation. Some specific practices include the following.

- Minimized effective impervious area
- Vegetated swales and buffers
- Bioretention cells
- Rain gardens
- Infiltration and exfiltration systems
- Community greenways
- Green roofs
- Certification programs, such as Florida Water Star^{SM}, and the Florida Green Building Coalition

For transportation infrastructure, practices recommended to protect water quality and floodplain and wetland functions include incorporating bridge spans that accommodate bank-full stream flows while maintaining intact floodplain, wetland, and wildlife passage functions.

Riparian Buffers

A riparian buffer zone is an overlay that protects an adjoining waterbody from effects of adjacent development, such as runoff, NPS pollution, erosion, and sedimentation. A buffer zone in this context refers to an area along the shoreline that is maintained in or restored to generally natural vegetation and habitat. In this condition, an intact buffer zone helps to simultaneously achieve three important goals: water quality protection, shoreline stability, and fish and wildlife habitat. Associated with these are other benefits, including aesthetic improvements and public access and recreation. These benefits are achievable for riparian areas along all types of waterbodies: stream/riverine, estuarine, lacustrine, and wetlands, and karst features.

In general, the wider the buffer zone, the better these goals may be achieved, although specific requirements are defined based on community goals. Limited areas, for example, might be developed into recreational sites, trails, or other access points. Table 4-1 is a representation of generalized buffer zones, adapted from USFWS documentation, listing benefits provided by buffers of successively larger widths. Complicating buffer zone design is the fact that different sites have different ecological and physical characteristics. These characteristics (type of vegetation, slope, soils, etc.), when accounted for, would lead to different buffer widths for any given purpose. Alternatives to fixed-width buffer policies include tiered systems that can be adapted to multiple goals and site-specific characteristics and uses. Wenger (1999) and Wenger and Fowler (2000) provide additional background, detail, and guidance for the design of buffer zone systems and policies.

Table 4-1 Generalized Buffer Zone Dimensions

	Buffer Width:					
Benefit Provided:	**30 ft**	**50 ft**	**100 ft**	**300 ft**	**1,000 ft**	**1,500 ft**
Sediment Removal - Minimum	💧	💧	💧	💧	💧	💧
Maintain Stream Temperature	🐟	🐟	🐟	🐟	🐟	🐟
Nitrogen Removal - Minimum		💧	💧	💧	💧	💧
Contaminant Removal		💧	💧	💧	💧	💧
Large Woody Debris for Stream Habitat		🐟	🐟	🐟	🐟	🐟
Effective Sediment Removal			💧	💧	💧	💧
Short-Term Phosphorus Control			💧	💧	💧	💧
Effective Nitrogen Removal			💧	💧	💧	💧
Maintain Diverse Stream Invertebrates			🐟	🐟	🐟	🐟
Bird Corridors				🐦	🐦	🐦
Reptile and Amphibian Habitat					🐦	🐦
Habitat for Interior Forest Species					🐦	🐦
Flatwoods Salamander Habitat – Protected Species						🦎

Key
Water quality protection 💧
Aquatic habitat enhancement 🐟
Terrestrial riparian habitat 🐦
Vulnerable species protection 🦎

Adapted from USFWS 2001

Basinwide Sedimentation Abatement

Unpaved roads frequently intersect and interact with streams, creating erosion and runoff conditions that transport roadway materials directly into streams, smothering habitats and impacting water quality and the physical structure of the waterbodies. Borrow pits also have the potential to cause progressive erosion conditions that smother streams, severely damaging or destroying habitats and diminishing water quality. Spoil sites from dredging activity have disbursed material along numerous sites, primarily on the main stem of the Apalachicola River. While navigational dredging in the river no longer continues, impacts from past actions continue to impact the watershed.

Given the site specific and physical nature of the impacts, efforts taken at the local and regional level can lead to significant restoration of aquatic habitat conditions and improved water quality. Corrective actions may include replacing inadequate culverts with bridge spans or larger culverts that maintain floodplains and flows, hilltop-to-hilltop paving, use of pervious pavement, establishment of catch basins to treat and manage stormwater, and establishment of vegetated or terraced basins to eliminate gulley erosion.

Within the river corridor and floodplain, hydrologic restoration and establishment of vegetated buffers within historic spoil areas, as described below, has the potential to further reduce sedimentation impacts within the river.

In addition to addressing existing erosion sites, comprehensive application of construction BMPs to include sediment and erosion controls protects water and habitat quality as well as the physical structure of streams and other waterbodies. Extremely heavy and sustained precipitation events are common in northwest Florida; thus, for large-scale construction and transportation projects, implementing sediment controls and staging land clearing and stormwater treatment systems in a manner that exceeds standard practice for smaller projects would avoid major sedimentation and pollution events that are otherwise possible.

4.1.2 Ecological Restoration

A wide array of measures may be employed to restore natural and historic functions to former or degraded wetland, aquatic, stream, riparian, and estuarine habitats. Enhancement actions, such as improving vegetation conditions, invasive exotic plant removal, and prescribed fire, are also often discussed in the context of restoration. Wetland, hydrologic, floodplain, shoreline, spring, and stream restoration are discussed further below.

Habitat challenges relate to aquatic and wetland issues as well those in upland areas that correspond with surface water pollution. Primary issues correspond with hydrologic alteration, sedimentation, loss of submerged aquatic vegetation, lack of springs protection and riparian buffer zones, damage to fishery and spawning sites for finfish, shellfish, and others as well as complications due to invasive species.

<u>Wetland, Hydrologic and Floodplain Restoration</u>

Wetland restoration includes actions to reestablish wetland habitats, functions, and hydrology. It frequently includes substrate composition and profile restoration and vegetation community reestablishment, including shrub reduction, exotic species removal, application of prescribed fire, and replanting.

Hydrologic and floodplain restoration include actions to reestablish flow ways and the timing of surface water flow and discharges. Actions include removing fill, replacing bridges and culverts with appropriate designs, establishing low-water crossings, restoring pre-impact topography and vegetation, and abandoning unneeded roads. Restoration activities can have broad water resource benefits, including improved water quality, enhanced fish and wildlife habitat, and other restored wetland functions.

There are continuing opportunities for hydrologic and habitat restoration within the watershed. Among known priority areas are Tates Hell Swamp, M-K Ranch, and the Apalachicola River floodplain. Additionally, restoration activities to address riverine hydrologic and habitat impacts may include establishment of flow pathways that increase or restoring more natural communication between the river and floodplain, establishing vegetated buffers along the edge of floodplain spoil areas to reduce sedimentation, and sediment removal and other restoration actions designed to restore natural habitat and functions to sloughs that hydrologically connect the river with floodplain habitats.

Restoration of sloughs, including through sediment removal and revegetation where needed, may further address the impacts of sedimentation related to historic dredge spoil disposal and may assist in restoration of the natural connectivity of floodplain habitats with the main stem of the Apalachicola River.

Stream Restoration

Stream restoration includes actions to restore the hydrology and aquatic habitat and riparian habitat that may have been impacted by inadequate culverts, road crossings, instream impoundments, erosion and sedimentation, runoff or other hydrologic effects of adjacent or upstream developments. This may also include developing more natural hydrology, wetlands, storage/treatment, and riparian vegetation along stormwater conveyances. Stream restoration actions include efforts to reestablish natural channel and floodplain process and should accompany efforts to address offsite processes (runoff, erosion, sedimentation, etc.).

Shoreline Restoration

Shoreline restoration refers to measures taken to restore previously altered shorelines and to protect eroding or threatened shorelines. Such restoration is accomplished using “living shorelines” techniques, which are a set of evolving practices that incorporate productive intertidal and shoreline habitats to protect shorelines while also enhancing or restoring natural communities, processes, and productivity. When planned and implemented appropriately, such efforts result in direct and tangible benefits for residents and the larger community, including fish and wildlife, improved water quality, shoreline protection, and aesthetic improvements. Specifically, such strategies may provide critical habitat for oysters and other shellfish. In addition to the direct impacts, other impacts such as increased seagrass due to reduction in wave action and improvements in water clarity often result.

Shoreline restoration in this context has been undertaken at several sites, particularly along the northern bay shoreline. Examples include Cat Point and shoreline areas near the Apalachicola National Estuarine Research Reserve office. Additional opportunities exist on altered shorelines along the northern shoreline, on the bay side of St. George Island and potentially on other estuarine shorelines.

Spring Restoration

Springs support regionally distinct ecosystems that are important to the character and quality of the larger river system. Additionally, springs often have cultural, recreational, and historical significance. Springs are direct links to underlying aquifers and are vulnerable to the effects of nutrient applications within groundwater contribution areas, as well as sedimentation and NPS pollution from land use and activities proximate to the springs. Nitrate has been identified as the primary pollutant affecting Jackson Blue Spring. Among restoration activities are implementing enhanced agricultural BMPs, connection of residences and other facilities to central sewer service, deployment of advanced onsite treatment systems, and implementation of BMPs to treat stormwater runoff and restore spring bank habitats.

Estuarine Habitat Restoration

Implementation of wetland and shoreline restoration, as described above, as well as aquatic habitat restoration and enhancement can be implemented in a complementary manner to improve and restore estuarine habitat and productivity. Well-established contiguous marshes, seagrass meadows and oyster reefs provide habitat for a wide range of marine species, including recreational and commercially valuable seafood species. Habitat loss has led to the decline of oysters and other marine species of ecological significance.

Emergent marshes and oyster reefs serve as an important buffer between uplands and estuaries, filtering pollutants and consuming nutrients before they enter the water and reducing waves before they reach land. These communities promote sediment accumulation and shoreline stabilization, attenuate wave energy, and buffer upland areas against wind and wave activity that otherwise cause erosion.

Oyster habitat restoration is extremely important within Apalachicola Bay. As described earlier, oyster habitats are an integral part of the larger estuarine ecosystem and they are of exceptional cultural and economic significance. Additionally, each oyster can filter vast quantities of water, removing plankton and suspended particles that would otherwise reduce sunlight penetration.

4.1.3 Wastewater Management and Treatment Improvements

Septic to Sewer Connections

Among the promising approaches for correcting current impacts and impairments are actions to improve the management and treatment of domestic wastewater. While expensive and engineering-intensive, such actions are technically feasible approaches to improving water quality and aquatic habitat conditions, as well as public uses and benefits.

Among those actions that can improve existing conditions are extending sewer service to areas that currently rely on conventional onsite treatment and disposal systems for wastewater treatment and disposal. As outlined above, there are over 23,000 known or likely conventional septic systems in the Apalachicola River and Bay watershed. As illustrated by Figure 3-2, these are particularly concentrated within the Chipola River basin and coastal areas. Connecting residences and businesses in these areas to centralized wastewater treatment systems has the potential to substantially improve wastewater treatment and reduce loading of nutrients and other pollutants to these waterbodies and to downstream receiving waters.

Advanced Onsite Systems

Where extension of sewer service is not practical due to the spatial distribution of rural populations, there is significant potential for installation of advanced onsite treatment systems that achieve water quality treatment significantly exceeding that provided by conventional OSTDS. Advanced passive systems are being developed to provide cost-effective and practical systems for reducing nitrogen and other pollutants from onsite sewage systems (FDOH 2015). At the time of this writing, pilot projects are underway in different areas of the state.

Water Reclamation and Reuse

For the purposes of this plan, water reuse refers to the deliberate application of reclaimed water for a beneficial purpose, with reclaimed water being water that has received at least secondary treatment and basic disinfection (Chapter 62-10, F.A.C.; Section 373.019, F.S.). Beneficial purposes include reusing reclaimed water to offset a current or known future potable water demand or other documented watershed and water resource challenges. Specific purposes include landscape and golf course irrigation, industrial uses, and other applications (FDEP 2016l). Water reuse can be a key strategy in reducing or eliminating wastewater discharges and associated pollution of surface waters.

Centralized Wastewater Treatment Upgrade and Retrofit

For centralized wastewater treatment systems, conversion to advanced wastewater treatment has proven to be an effective means of reducing the discharge of nutrients and other pollutants into surface and ground waters. Additionally, in many areas there are significant needs to rehabilitate existing sewer systems, including to correct inflow and infiltration problems and to reduce the number and severity of sanitary sewer overflow incidents. Accomplishing these actions can be complex and expensive, given the need to retrofit existing systems in highly developed areas. Upon completion, however, significant improvements can be achieved for water quality, public recreational uses, and fisheries.

4.1.4 Land Conservation

While the Apalachicola River and Bay watershed benefits from extensive public conservation lands that protect water quality and wetland and aquatic habitats and provide for public access and use, there are still opportunities to further protect water resources through the conservation of sensitive areas, including riverine, stream-front, and estuarine shorelines. Conservation can be achieved through less than fee (conservation easement), as well as fee simple acquisition. Additionally, resource conservation can be accomplished at a sub-basin or project-level scale to augment other strategies, including stormwater retrofit and hydrologic restoration, and to provide for compatible public access and recreation.

4.1.5 Public Awareness and Education

Public awareness and education efforts span multiple purposes and are an essential component of many of the other actions described here. Among the purposes of awareness and education efforts are:

- Technical outreach to assist in implementing specific programs (for example, best management practices);
- Informing members of the public about the purpose and progress of implementation efforts;
- Providing opportunities for public engagement and participation, as well as public feedback and program accountability; and
- Providing broad-based educational efforts to inform members of the public and specific user groups about watershed resources, their benefits, and personal practices to ensure their protection.

Examples of educational activities include technical training for BMPs, school programs (e.g., Grasses in Classes), public events, citizen science and volunteer programs, and project site visits.

Watershed stewardship initiatives can bring together multiple partners such as federal, state, and local agencies; non-profit groups; and citizen volunteers by identifying common program goals and intended outcomes. Having a variety of participants may offer important insight and expertise, shared experiences through lessons learned, and pooling of available resources to implement projects. Specific program examples include, but are not limited to: Walk the WBIDs; Grasses in Classes; homeowner oyster gardening program; rain garden/rain barrel workshops; storm drain labeling; marina BMPs; landowner cost-share assistance programs for living shorelines; elected official information and training sessions; spring break restoration projects; and messaging through outlets such as public service announcements, social media, events, and festivals.

4.1.6 Options for Further Study and Analysis

Additional work is needed to further advance the scientific understanding of resource conditions and restoration needs and opportunities. Additional analytical work can also support improved project planning and application of innovative methods for improved resource management.

- Develop improved and more detailed assessments of environmental conditions and trends, to include water quality, biology, and habitat.
- Develop a watershed-wide NPS pollution potential assessment, at the 12-digit HUC level, to include analysis of land uses, applied loading rates, and potential BMP application.
- Identify estuarine sites with the potential for seagrass or other benthic habitat restoration through improved water quality treatment and water management within specific contributing basins.
- Complete a current, basin-wide analysis and prioritization of sedimentation sources and sites, to include unpaved road stream crossings, borrow pits, gulley erosion sites, and other erosion and sedimentation sources.
- Further develop alternatives for addressing effects of dredge spoil sites on floodplain and riverine habitats.
- Further develop methods and alternatives for floodplain habitat restoration, including sloughs and floodplain tributary streams.
- Develop a spatial analysis of OSTDS, to include pollutant loading estimates and estimates of potential pollutant load reduction and average receiving waterbody pollutant concentrations following connection to central sewer and/or conversion to advanced onsite systems. Delineate target areas for central sewer connections and for advanced onsite systems.
- Update hydrodynamic model applications to improve estuarine and littoral restoration planning.
- Develop updated, regionally specific storm surge, floodplain, and sea level rise models to support project planning, floodplain protection, and adaptation planning, and to further the understanding of drivers of coastal habitat change.
- Evaluate the feasibility and potential benefits of proposed innovative and large-scale projects. Also identify and evaluate the potential for unintended adverse effects. Examples of such projects may include, but are not limited to:
  - Pumped and tidal flow-through circulation systems
  - Regional-scale shoreline habitat development proposals
  - Stream channel reconfiguration
  - Dredged material removal and disposal
  - Benthic dredging
- Conduct data collection and analysis to better understand Lake Wimico and its connection to the Gulf Intracoastal Waterway.
- Develop improved metrics for monitoring and evaluating projects, programs, and environmental conditions and trends.
- Evaluate integrated water resource management approaches with application to specific water resource challenges in northwest Florida, potentially further developing plans for the reuse of reclaimed water and stormwater harvesting.
- Support continuing analysis of oyster/shellfish habitat, conditions, and trends and efforts to advance methods for oyster habitat restoration.
- Establish a framework for detecting the effects of climate change and ocean acidification on coastal marine resources in the region.

- Conduct a comprehensive review of past projects completed, identifying specific project outcomes and lessons learned.
- Identify locally sensitive indicators of biological condition for dominant diversity-building habitats.
- Develop online consolidation of past and present environmental information, including natural resource coverages, research activities, restoration progress, monitoring results, TMDL updates, and regulatory actions.

4.2 Implementation

Table 4-2 outlines the planning progression for SWIM program priorities, objectives, and selected management options for the Apalachicola River and Bay watershed. These, in turn, inform and guide specific SWIM projects listed in Section 4.3. Following the discussion of watershed issues provided above, priorities and objectives are organized by major priority areas: water quality, floodplain functions, and natural systems. Education and outreach is included as well, since it is applicable to all priority areas.

Table 4-2 Watershed Priorities, Objectives, and Management Options

Watershed Priorities	Objectives	Management Options
Water Quality		
Degraded Water Quality Water quality impairments for listed stream and estuarine waters, to include nutrients, dissolved oxygen, and bacteria Elevated nitrogen concentrations and cultural eutrophication within Jackson Blue Spring and receiving waters Vulnerability of sensitive habitats, including oyster beds, seagrasses, and springs	Meet or exceed the BMAP goal for Jackson Blue Spring and Merritts Mill Pond. Protect water quality basin-wide, and restore water quality in impaired waters.	• Stormwater retrofit projects • Agricultural and silvicultural BMPs • Evaluate, prioritize, and address unpaved roads and associated erosion at stream crossings • Comprehensive and integrated stormwater management plans • Conversion of septic systems to central sewer • Evaluation and deployment of advanced passive onsite treatment systems • Upgrades to wastewater infrastructure • Fee simple and less-than-fee protection of floodplains, riparian habitats, spring groundwater contribution areas, and other sensitive lands • Floodplain and wetland restoration • Riparian buffer zones • Evaluate and address other sedimentation sites, including dredge spoil and erosion sites • Water reclamation and reuse
Wastewater Management Needs and opportunities for improved wastewater collection and treatment Inadequate treatment from conventional OSTDS	Reduce loading of nutrients and other pollutants from OSTDS.	
Nonpoint Source Pollution Stormwater runoff Sedimentation and turbidity from unpaved roads, spoil sites, and other erosion sources	Improve treatment of urban stormwater. Reduce basinwide NPS pollution from agricultural areas and erosion sites. Reduce sedimentation from unpaved roads, dredge spoil sites, erosion, and construction sites.	

Watershed Priorities	Objectives	Management Options
Floodplain Functions		
Direct Impacts to Floodplains Altered floodplain and riparian habitats, slough systems, and tributary streams Disconnection of floodplain habitats due to increased frequency of very low flow periods Riparian buffer loss	Prioritize and correct hydrologic alterations, including wetlands and disconnected sloughs. Restore floodplain habitats and functions. Protect existing functional floodplain area. Protect or restore stream, lacustrine, wetland, and coastal floodplain functions. Continue to make publicly available data and information to enable communities to reduce flood risk.	• Where feasible, conduct natural channel stream restoration to support floodplain functions • Fee simple and less-than-fee protection of floodplains, riparian habitats, and other sensitive lands • Protection and enhancement of riparian buffer zones • Development and dissemination of detailed elevation (LiDAR) data • Stormwater retrofit projects • Continued flood map updates and detailed flood risk studies
Natural Systems		
Wetland Systems Wetland loss and degradation	Protect and where needed restore major wetlands and floodplains. Restore wetland hydrology, vegetation, and functions.	• Restoration of wetland hydrology and vegetation communities • Hydrologic restoration in Tates Hell Swamp, M-K Ranch within the Apalachicola River floodplain • Restoration of riparian habitats and sloughs • Shoreline habitat restoration, integrated across multiple habitats where possible • Restoration of impacted seagrasses and tidal marsh areas • Oyster reef restoration • Fee simple and less-than-fee protection of floodplains, riparian habitats, and other sensitive lands • Development of enhanced modeling tools (such as suitability models for estuarine habitat restoration and enhancement) • Coastal infrastructure retrofits to
Estuarine and Coastal Habitat Impacts to and losses of oyster resources Vulnerability of seagrasses, shellfish, and other estuarine resources and habitats Saltwater intrusion that could alter brackish and freshwater habitats Shoreline destabilization and erosion Need for improved understanding of current and potential effects of sea level rise	Restore and enhance estuarine oyster reefs and other benthic habitats. Restore wetland hydrology, area, and functions. Prioritize and correct hydrological alterations. Ensure restoration projects are compatible with coastal change. Protect seagrass beds, including through water quality protection and improvement.	

Watershed Priorities	Objectives	Management Options
Riverine and Stream Habitats Vulnerability of springs Physically altered and impacted floodplain and riparian habitats, slough systems, and tributary streams	Restore the function of vegetated riparian buffers on public and private lands. Restore stream, wetland, lacustrine, and estuarine benthic habitats. Restore floodplain habitats and functions. Protect existing functional floodplain area. Reduce sedimentation from spoil sites, unpaved roads, and landscape erosion. Evaluate and correct hydrological alterations, if necessary. Reduce erosion and sedimentation from agricultural and silvicultural operations. Protect and restore riparian habitats. Prioritize and correct hydrologic alterations, including wetlands and disconnected sloughs.	enhance adaptation capacity and habitat resiliency • Development and dissemination of detailed elevation (LiDAR) data • Coastal adaptation and land use planning • Water quality improvement actions described above • Agricultural, forestry, and construction best management practices • Enhanced monitoring of hydrologic and water quality data • Prioritization and abatement of sedimentation from unpaved road stream crossings and other sources

Watershed Priorities	Objectives	Management Options
Education and Outreach		
Public Education and Outreach Expanded public understanding of practices to protect water resources Expanded opportunities for public participation Enhanced BMP technical support opportunities	Create long-term partnerships among stakeholders, including government, academic institutions, non-governmental organizations, businesses, residents, and others, to maximize effectiveness of project implementation. Conduct education and outreach about watershed resources and personal practices to protect water and habitat quality. Build the capacity of landowners, agricultural producers, and others to protect watershed resources, functions, and benefits. Support implementation of agricultural, silvicultural, and urban BMPs.	• Dissemination of information about watershed resources and benefits via multiple approaches – Internet, publications, school programs, and workshops • Dissemination of information about resource programs, outcomes, and opportunities for participation • Demonstration projects • Opportunities for volunteer participation in data collection and project implementation • Technical BMP education and training • Collaborative community initiatives, with opportunities for business participation and sponsorship • Internet applications for public participation and to make program information and resource data continually available • Classroom programs, including hands-on restoration activities • Community awareness and education events and programs • Hands-on, citizen science, including volunteer participation monitoring and restoration programs • Education and technical training workshops and resources for local government officials

4.3 Priority Projects

Projects proposed to address above-described priorities and objectives are listed below and described in more detail on the following pages. Priority projects, as described herein, comprise strategies intended to address identified issues that affect watershed resources, functions, and benefits. These projects are intended to support numerous site-specific tasks and activities, implemented by governmental and nongovernmental stakeholders for years to come. Most address multiple priorities, as indicated in Table 4-3. The projects included are limited to those within the scope and purview of the SWIM program; resource projects outside the scope of surface water resource protection and restoration are not included. With each project, conceptual scopes of work are presented, as are planning level cost estimates. Specific details, tasks, and costs will be developed and additional actions may be defined to achieve intended outcomes as projects are implemented. No prioritization or ranking is implied by the order of listing. Project evaluation and ranking will occur in multiple iterations in the future and will vary based on funding availability, specific funding source eligibility criteria, and cooperative participation.

Table 4-3 Recommended Projects: Apalachicola River and Bay SWIM Plan

PROJECT	**WATERSHED PRIORITIES**			
	WQ	**FLO**	**NS**	**EDU**
Stormwater Planning and Retrofit	✓	✓	✓	✓
Septic Tank Abatement	✓			
Advanced Onsite Treatment Systems	✓			
Agriculture and Silviculture BMPs	✓	✓	✓	✓
Basinwide Sedimentation Abatement	✓	✓	✓	
Riparian Buffer Zones	✓	✓	✓	✓
Aquatic, Hydrologic and Wetland Habitat Restoration	✓	✓	✓	✓
Estuarine Habitat Restoration	✓		✓	✓
Strategic Land Conservation	✓	✓	✓	✓
Watershed Stewardship Initiative	✓	✓	✓	✓
Sub-basin Restoration Plans	✓	✓	✓	✓
Wastewater Treatment and Management Improvements	✓		✓	
Analytical Program Support	✓	✓	✓	✓
Comprehensive Monitoring Program	✓	✓	✓	✓
WQ – Water Quality FLO – Floodplain Functions	NS – Natural Systems EDU – Education and Outreach			

Stormwater Planning and Retrofit

Description:

This strategy consists of planning and retrofitting stormwater management systems to improve water quality, as well as to improve flood protection and accomplish other associated benefits. In addition to constructing new facilities, the project includes evaluation and improvement of existing systems and adding additional BMPs within a treatment train to improve overall performance within a given basin.

Scope of Work:

1. Prioritize basins and sites based on water quality, hydrologic, and land use data, together with consideration of local priorities, opportunities for partnerships, and other factors.
2. Support stormwater master planning at the local and regional level.
3. Develop project-specific implementation targets and criteria, to include pollutant load reductions, success criteria, and measurable milestones.
4. Develop a public outreach and involvement plan to engage citizens in the project's purposes, designs, and intended outcomes. The plan should include immediate neighbors that would be affected by the proposed project and other interested citizens and organizations.
5. Develop detailed engineering designs, with consideration of multipurpose facilities, innovative treatment systems where applicable, and treatment train approaches for basin-level stormwater management and treatment.
6. Install/construct individual retrofit facilities.
7. Monitor local water quality, including upstream/downstream and/or before and after implementation, as well as trends in receiving waters.
8. Analyze data to identify water quality trends in receiving waters.

Outcomes/Products:

1. Completed stormwater retrofit facilities
2. Improved water quality and flood protection
3. Data evaluation and system validation, with lessons applicable to future projects

Strategic Priorities:
✓ Water Quality ✓ Floodplain Functions ✓ Natural Systems
Supporting Priorities:
✓ Stormwater runoff and NPS pollution ✓ Sedimentation and turbidity ✓ Water quality impairments for listed stream and estuarine waters ✓ Vulnerability of sensitive habitats
Objectives:
✓ Improve treatment of urban stormwater. ✓ Protect water quality basin-wide, and restore water quality in impaired waters. ✓ Reduce basinwide NPS pollution from agricultural areas and erosion sites. ✓ Reduce sedimentation
Lead Entities:
✓ Local governments
Geographic Focus Areas:
Developed areas of the watershed, including but not limited to: ✓ Apalachicola Bay coastal area, including Apalachicola, Carrabelle and Eastpoint ✓ Upper reach municipalities such as Marianna, Sneads, and Chattahoochee
Planning Level Cost Estimate:
>$17,000,000

Septic Tank Abatement

Description:

This strategy consists of converting OSTDS to central sewer to reduce pollutant export and improve surface and ground water quality. To facilitate accomplishment, among the project goals is to reduce or eliminate connection costs to homeowners.

Scope of Work:

1. Prioritize areas of need through spatial analysis of OSTDS distribution, proximity to karst and other sensitive resources, proximity to existing infrastructure, and resource monitoring data.
2. In cooperation with local governments and utilities, complete alternatives analysis, considering sewer extension, advanced onsite systems, and other approaches as appropriate.
3. Develop project-specific implementation targets and criteria, to include pollutant load reductions, success criteria, and measurable milestones.
4. Initiate a public outreach and involvement plan to engage the public in the project's purposes, designs, and intended outcomes.
5. Work with directly affected residents throughout the project; coordinate with neighborhoods and individual homeowners.
6. Install sewer line extensions, connect residences and businesses, and abandon septic tanks.
7. Monitor bacteria, nutrients, and other parameters in nearby groundwater and surface waterbodies.
8. Analyze data to identify changes in trends of target pollutants.

Strategic priority:
✓ Water Quality ✓ Natural Systems
Supporting Priorities:
✓ Inadequate treatment from conventional OSTDS ✓ Elevated nitrogen concentrations and cultural eutrophication within Jackson Blue Spring and receiving waters. ✓ Vulnerability of sensitive habitats ✓ Water quality impairments for listed stream and estuarine waters
Objectives:
✓ Meet or exceed the BMAP goal for Jackson Blue Spring and Merritts Mill Pond. ✓ Reduce loading of nutrients and other pollutants from OSTDS. ✓ Protect water quality basin-wide, and restore water quality in impaired waters.
Lead Entities:
✓ Utilities, local governments
Geographic Focus Areas:
✓ Jackson Blue Spring and Merritts Mill Pond Springshed ✓ Apalachicola Bay basin ✓ Chipola River basin
Planning Level Cost Estimate:
>$30,000,000

Outcomes/Products:

1. Completed implementation plans, prioritizing areas for septic-to-sewer conversion
2. Improved surface and groundwater quality

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Advanced Onsite OSTDS

Description:

This strategy consists of installation of advanced OSTDS to reduce pollutant loading. This approach is most appropriate in areas remote from existing central sewer infrastructure or likely extensions. It may be considered an adjunct to the Septic Tank Abatement project.

Scope of Work:

1. Prioritize areas of need through spatial analysis of OSTDS distribution, proximity to karst and other sensitive resources, proximity to existing infrastructure, and resource monitoring data.
2. In cooperation with FDOH and FDEP, evaluate passive technology onsite systems.
3. In cooperation with local governments, conduct outreach to property owners to facilitate installation of advanced onsite systems as an alternative to conventional OSTDS.
4. Develop project-specific implementation targets and criteria, to include pollutant load reductions, success criteria, and measurable milestones.
5. Install/construct advanced OSTDS based on prioritization of sites and funding availability.
6. Monitor bacteria, nutrients, and other parameters in nearby groundwater and surface waterbodies.
7. Analyze data to identify changes in trends of target pollutants.

Outcomes/Products:

1. Improved surface and groundwater quality

Strategic priority:
✓ Water Quality ✓ Natural Systems
Supporting Priorities:
✓ Inadequate treatment from conventional OSTDS ✓ Elevated nitrogen concentrations and cultural eutrophication within Jackson Blue Spring and receiving waters. ✓ Vulnerability of sensitive habitats ✓ Water quality impairments for listed stream and estuarine waters
Objectives:
✓ Meet or exceed the BMAP goal for Jackson Blue Spring and Merritts Mill Pond. ✓ Protect and, as needed, restore water quality in impacted or designated priority areas. ✓ Restore water quality in impaired stream and estuarine waters to meet state standards.
Lead Entities:
✓ Utilities, local governments
Geographic Focus Areas:
✓ Chipola River basin ✓ Apalachicola Bay basin
Planning Level Cost Estimate:
$15,000,000 (initial implementation)

Agriculture and Silviculture BMPs

Description:

This strategy consists of development and implementation of agriculture and silviculture BMPs to reduce basinwide NPS pollution, protect habitat, and promote water use efficiency.

Scope of Work:

1. Continue cost-share programs for enhanced BMPs, in cooperation with FDACS, NRCS, and agricultural producers.
2. In consultation with FDACS, FWC, and NRCS, develop a comprehensive inventory of employed agriculture and silviculture BMPs and identify potential gaps and/or potential improvements for implementation in the watershed.
3. In cooperation with FDACS FFS, evaluate relationships between forest management practices and hydrologic and water quality effects.
4. Based on funding resources, develop plans for expanded cost-share or other assistance for implementation.
5. Develop an outreach plan to engage agricultural producers and forestry practitioners; supporting technical training and participation in developing implementation strategies.
6. Conduct program outreach to support implementation of property-specific approved BMPs, potentially including annual cost-share grant cycles as defined by funding sources.
7. Work with FDACS to offer free technical assistance in the design and implementation of property- and resource-specific BMPs.
8. Monitor local water quality, including upstream/downstream and/or before and after project implementation, as well as trends in receiving waters. Additionally, conduct monitoring of participant experiences, encouraging feedback throughout and following implementation.
9. Analyze data to identify water quality trends.

Outcomes/Products:

1. Improved water quality
2. Improved capacity on the part of landowners to implement practices protective of water quality and watershed resources

Strategic Priorities:

- ✓ Water Quality
- ✓ Floodplain Functions
- ✓ Natural Systems
- ✓ Education and Outreach

Supporting Priorities:

- ✓ Elevated nitrogen concentrations and cultural eutrophication within Jackson Blue Spring and receiving waters
- ✓ Stormwater runoff and NPS pollution
- ✓ Sedimentation and turbidity
- ✓ Water quality impairments for listed stream and estuarine waters, to include nutrients, dissolved oxygen, and bacteria
- ✓ Vulnerability of sensitive habitats
- ✓ Riparian buffer loss
- ✓ Enhanced BMP technical support opportunities

Objectives:

- ✓ Meet or exceed the BMAP goal for Jackson Blue Spring and Merritts Mill Pond.
- ✓ Reduce basinwide NPS pollution from agricultural areas and erosion sites.
- ✓ Protect water quality basin-wide, and restore water quality in impaired waters.
- ✓ Reduce sedimentation from unpaved roads and landscape erosion.
- ✓ Protect and restore riparian habitats.
- ✓ Build the capacity of landowners, agricultural producers, and others to protect watershed resources, functions, and benefits.
- ✓ Support implementation of agricultural, silvicultural, and urban BMPs.

Lead Entities:

- ✓ NWFWMD
- ✓ FDEP
- ✓ FDACS
- ✓ Jackson Soil and Water Conservation District
- ✓ FWC
- ✓ Private landowners
- ✓ NRCS
- ✓ IFAS

Geographic Focus Areas:

For silviculture BMPs, the focus is basinwide. For agriculture, the primary focus is within Jackson and Calhoun counties.

Planning Level Cost Estimate:

$1,500,000 annually

Basinwide Sediment Abatement

Description:

This strategy consists of development and implementation of activities related to sedimentation abatement to improve surface water and aquatic habitat quality. It may include any or all activities aimed at preventing and mitigating sedimentation and restoring impacted sites.

Scope of Work:

1. Review existing inventories of sedimentation sites and identify gaps.
2. Prioritize sites based on inventory and site evaluation, as well as consideration of water quality, other resource data, severity of impacts, and cumulative sub-basin effects.
3. Consider annual grant program for local governments to address high priority sites.
4. Develop individual site plans; detail proposed improvements and cost estimates.
5. Execute on-the-ground construction projects.
6. Implement complementary initiatives that may include education and outreach, development of new/improved BMPs, inspection programs, cost-share programs, training, demonstration projects, and maintenance.
7. Incorporate individual site improvements within geodatabase.
8. Monitor local water quality and habitat quality, including upstream/downstream and/or before and after implementation.
9. Analyze data to identify water quality trends.

Outcomes/Products:

1. Improved water quality, both onsite and in receiving riverine and estuarine waters
2. Improved aquatic habitat quality

Strategic Priorities:
✓ Water Quality ✓ Floodplain Functions ✓ Natural Systems
Supporting Priorities:
✓ Stormwater runoff and NPS pollution ✓ Sedimentation and turbidity from unpaved roads, spoil sites, and other erosion sources ✓ Physically altered and impacted floodplain and riparian habitats, slough systems, and tributary streams
Objectives:
✓ Protect water quality basin-wide, and restore water quality in impaired waters. ✓ Reduce basinwide NPS pollution from agricultural areas and erosion sites basin-wide. ✓ Reduce sedimentation from unpaved roads, dredge spoil sites, erosion, and construction sites. ✓ Prioritize and correct hydrologic alterations, including wetlands and disconnected sloughs. ✓ Restore floodplain habitats and functions. ✓ Protect existing functional floodplain area. ✓ Protect or restore stream, lacustrine, wetland, and coastal floodplain functions. ✓ Restore the function of vegetated riparian buffers on public and private lands.
Lead Entities:
✓ Local governments ✓ State and federal agencies
Geographic Focus Areas:
✓ Watershed-wide, particularly within rural areas
Planning Level Cost Estimate:
$3,000,000 annual cost

Riparian Buffer Zones

Description:

This strategy consists of protection and restoration of riparian buffers to protect or improve water quality, habitat, and shoreline stability.

Scope of Work:

1. Coordinate planning and implementation with other projects to achieve overarching objectives.
2. Conduct screening evaluation of riparian areas; classify sites based on character and function and geomorphologic stresses.
3. Prioritize sites based on potential for protection or restoration of riparian habitat and function.
4. Conduct outreach to local governments and private landowners to identify sites for implementation. Develop site specific implementation options, including streamside enhancements, overlay zones and vegetation restoration.
5. Develop individual site plans, which detail proposed improvements and cost estimates.
6. Coordinate and support implementation by property owners and local governments.
7. Implement complementary initiatives that may include education and outreach, inspection programs, training, demonstration projects, and maintenance.
8. Conduct outreach by providing signage, tours, public access amenities, or similar for specific sites.
9. Monitor local water quality and habitat quality, including upstream/downstream and/or before and after project implementation.
10. Analyze data to identify water quality trends.

Outcomes/Products:

1. Improved protection of water quality, habitat, and shoreline stability
2. Establishment of demonstration sites to promote additional implementation of buffer zone concepts by private landowners, local governments, and state/federal agencies

Strategic Priorities

- ✓ Water Quality
- ✓ Floodplain Functions
- ✓ Natural Systems
- ✓ Education and Outreach

Supporting Priorities:

- ✓ Stormwater runoff and NPS pollution
- ✓ Sedimentation and turbidity from unpaved roads, spoil sites, and other erosion sources
- ✓ Vulnerability of oyster habitats, seagrasses, and springs
- ✓ Shoreline destabilization and erosion

Objectives:

- ✓ Protect water quality basin-wide, and restore water quality in impaired waters.
- ✓ Reduce sedimentation from unpaved roads, dredge spoil sites, erosion, and construction sites.
- ✓ Protect or restore stream, lacustrine, wetland, and coastal floodplain functions.
- ✓ Restore the function of vegetated riparian buffers on public and private lands.
- ✓ Support agricultural, silvicultural, and urban BMPs.
- ✓ Ensure restoration projects are compatible with coastal change.
- ✓ Restore and enhance estuarine oyster reefs and other benthic habitats.

Lead Entities:

- ✓ Private landowners
- ✓ Local governments
- ✓ ANERR
- ✓ USFWS (Partners for Fish and Wildlife)
- ✓ FWC
- ✓ Southeast Aquatic Resources Partnership

Geographic Focus Areas:

- ✓ Riverine and stream riparian zones
- ✓ Estuarine shorelines

Planning Level Cost Estimate:

TBD*

*Variable; includes passive implementation by property owners.

Aquatic, Hydrologic and Wetland Habitat Restoration

Description:

This strategy consists a broad array of hydrologic and wetland protection and restoration measures to improve and protect surface water quality and to restore aquatic and wetland habitats. Such measures include but are not limited to vegetation reestablishment, restoration and enhancement of hydrologic connectivity, stream channel restoration, and floodplain reconnection and restoration.

Target areas include sites where floodplain storage has been diminished or where wetland hydrology has been disrupted. Additional focus areas include sites containing impediments to hydrological function such as culverts, dikes, levees, barriers to tidal flow, and barriers to freshwater exchange.

Scope of Work:

1. Conduct a site inventory and evaluation, to include existing plans for Tates Hell swamp and M-K Ranch, the Apalachicola River floodplain, and other sites within the watershed. Evaluate freshwater and tidal drainage patterns and restrictions to tidal flow. This includes initial desktop data collection and analysis, together with field data collection and site evaluation.
2. Develop a river bank habitat assessment, to include bank habitat mapping, evaluation, and change detection.
3. Identify restoration options, to include hydrologic reconnection (e.g., fill removal, low water crossings), tidal creek restoration, natural channel stream restoration, floodplain reestablishment, river bank habitat stabilization and revegetation, tidal and riparian marsh restoration, and other options based on site characteristics and historic habitats.
4. Identify and evaluate options for floodplain habitat restoration, to include potential options for slough restoration, floodplain hydrologic connectivity, vegetation. Identify corresponding water level and flow regime expectations. Develop project feasibility assessments.
5. Prioritize sites based on assessments, as well as consideration of water quality, other site and resource data, severity of impacts, cumulative effects, land ownership, and accessibility.
6. Conduct interagency and stakeholder coordination to identify and develop consensus projects.
7. Develop proposed restoration strategies for floodplains and major wetland systems.

Strategic Priorities:

- ✓ Water Quality
- ✓ Floodplain Functions
- ✓ Natural Systems

Supporting Priorities:

- ✓ Water quality impairments for listed stream and estuarine waters
- ✓ Disconnection of floodplain habitats due to increased frequency of very low flow periods
- ✓ Wetland loss and degradation
- ✓ Altered floodplain and riparian habitats, slough systems, and tributary streams

Objectives:

- ✓ Prioritize and correct hydrologic alterations, including wetlands and disconnected sloughs.
- ✓ Restore floodplain habitats and functions.
- ✓ Protect existing functional floodplain area.
- ✓ Protect or restore stream, lacustrine, wetland, and coastal floodplain functions.
- ✓ Protect and where needed restore major wetlands and floodplains.
- ✓ Restore wetland hydrology, area, and functions.
- ✓ Restore stream, wetland, lacustrine, and estuarine benthic habitats.
- ✓ Ensure restoration projects are compatible with coastal change

Lead Entities:

- ✓ FWC
- ✓ NWFWMD
- ✓ FDEP
- ✓ USFWS
- ✓ ANERR

Geographic Focus Areas:

- ✓ Tates Hell Swamp
- ✓ M-K Ranch
- ✓ Apalachicola River floodplain
- ✓ Lake Wimico
- ✓ Dead Lakes
- ✓ Apalachicola River – bank habitat

Planning Level Cost Estimate:

$4,000,000 (initial implementation)

*Costs variable depending on specific sites.

8. Implement pilot projects to advance and inform large-scale implementation.
9. Conduct public outreach adaptable to specific project sites. Characterize individual projects with a list of stakeholders for each site. For project sites adjacent to communities or private property, as well as those with significant public visibility, consider demonstration sites, public meetings, site visits, project website, and other forms of engagement.
10. Develop detailed site restoration designs for priority sites, taking into account public input and preferences.
11. Execute on-the-ground restoration projects.
12. Monitor local water quality and physical and biological site characteristics, including before and after implementation.
13. Analyze data to identify water quality trends.
14. Communicate results to watershed stakeholders and participating agencies.

Outcomes/Products:

1. Updated restoration assessment and prioritization
2. Updated restoration strategy
3. Restored wetland, aquatic, and floodplain habitats and functions
4. Improved protection of water quality and natural systems
5. Established demonstration sites to promote additional implementation by private landowners and local governments

Estuarine Habitat Restoration

Description:

This strategy consists of activities related to estuarine habitat restoration to improve surface water quality, aquatic habitats, and coastal resiliency. Implementation should be coordinated with other project options, to include stormwater retrofits and other NPS pollution abatement, and upstream wetland and hydrologic restoration.

Scope of Work:

1. Support cooperative efforts of state agencies, local governments, nonprofits, and the private sector to restore and establish oyster habitat.
2. Conduct additional site inventory and evaluation, to include assessment of such factors as erosion, habitat stability, stressors impacting shorelines, projected sea level rise, shoreline profile, ecosystem benefits, property ownership, public acceptance of project options, and feasibility.
3. Identify project options, which may include, but are not limited to:
4. Restoration/establishment of riparian and littoral vegetation communities;
5. On previously altered shorelines, establishment of integrated living shorelines and estuarine habitats, which may include oyster or limerock breakwaters/sills, substrate augmentation, and marsh vegetation establishment;
6. Restoration/creation of oyster reefs;
7. Restoration/reconnection of tidal marsh;
8. Integrated restoration of multiple shoreline/estuarine habitats along the elevation gradient to increase shoreline resiliency to the anticipated effects of climate change;
9. Restoration of seagrass beds;
10. Removal of barriers to fish passage.
11. Identify and evaluate estuarine shorelines susceptible to erosion and at risk of hardening or other alteration.
12. In cooperation with resource agencies, develop BMPs for living shoreline projects.
13. Implement public outreach and education on options for protecting and restoring functional and resilient littoral habitats.

Strategic priorities:

- ✓ Water Quality
- ✓ Floodplain Functions
- ✓ Natural Systems

Supporting Priorities:

- ✓ Impacts to and losses of oyster resources
- ✓ Wetland loss and degradation
- ✓ Vulnerability of seagrasses, shellfish, and other estuarine resources and habitats
- ✓ Saltwater intrusion that could alter brackish and freshwater habitats
- ✓ Shoreline destabilization and erosion
- ✓ Need for improved understanding of current and potential effects of sea level rise

Objectives:

- ✓ Restore and enhance estuarine oyster reefs and other benthic habitats.
- ✓ Restore wetland hydrology, area, and functions.
- ✓ Restore the function of vegetated riparian buffers on public and private lands.
- ✓ Prioritize and correct hydrological alterations.
- ✓ Ensure restoration projects are compatible with coastal change.
- ✓ Protect seagrass beds, including through water quality protection and improvement.
- ✓ Protect and restore riparian habitats.

Lead Entities:

- ✓ FWC
- ✓ FDEP
- ✓ USFWS
- ✓ ANERR
- ✓ FDACS
- ✓ Commercial fishing community
- ✓ Local governments

Geographic Focus Areas:

- ✓ Estuary-wide

Planning Level Cost Estimate:

TBD*

*Cost estimates will await completion of site inventory and evaluation.

14. Prioritize sites based on inventory, site evaluation, and public support, as well as consideration of water quality, other site and resource data, modeling tools, severity of impacts, cumulative effects, land ownership, and accessibility. Coordinate directly with riparian landowners.
15. Develop of demonstration projects on public lands.
16. Conduct public outreach adaptable to specific project sites. For project sites adjacent to communities or private property, as well as those with significant public visibility, consider demonstration sites, public meetings, site visits, volunteer participation, project website, and other forms of engagement. Extend opportunities for participation to property owners, local governments, and other stakeholders.
17. Develop detailed site restoration designs for priority sites, taking into account public input and preferences.
18. Execute on-the-ground restoration projects, as identified under Paragraph 2 above.
19. Monitor water quality and habitat conditions before and after construction
20. Compile and evaluate data to determine trends and to objectively measure project benefits and outcomes.
21. Evaluate and implement needed design adjustments or maintenance needs, such as the need to replant certain areas or remove invasive species.
22. Disseminate project data and evaluation summaries for continued project adaptive management and future project planning.

Outcomes/Products:

1. Restored wetland and estuarine habitats and functions
2. Improved protection of water quality and natural systems
3. Establishment of demonstration sites to promote additional implementation by private landowners and local governments
4. Increased resiliency of estuarine habitats to anticipated sea level rise and extreme weather events
5. Estuarine habitat restoration projects identified, prioritized, and executed
6. Shared knowledge of project design, monitoring data/summary reports, and adaptive management decisions

Strategic Land Conservation

This strategy supports protection of floodplains, riparian areas, and other lands with water resource value to protect and improve surface water quality, with additional benefits for floodplain function and fish and wildlife habitat.

Scope of Work:

1. Use approved management plans and priority lists (such as the Florida Forever Work Plan) to inventory potential acquisition projects.
2. Evaluate whether potential sites augment other projects.
3. Identify potential funding sources that allow land acquisition as a component of achieving stated goals.
4. Where landowners have expressed interest, conduct a site analysis to include potential for achieving intended outcomes and potential for augmenting other projects.
5. Accomplish acquisition in accordance with statutory requirements.
6. Develop and implement restoration/ enhancement plans if appropriate.
7. Implement long-term monitoring program for conservation easements.

Outcomes/Products:

1. Improved long-term protection of water quality, habitat, and floodplain functions

Strategic Priorities:
✓ Water Quality ✓ Floodplain Functions ✓ Natural Systems
Supporting Priorities:
✓ Elevated nitrogen concentrations and cultural eutrophication within Jackson Blue Spring and receiving waters ✓ Stormwater runoff and NPS pollution ✓ Sedimentation and turbidity from unpaved roads and other erosion sources ✓ Water quality impairments for listed stream and estuarine waters ✓ Riparian buffer loss ✓ Wetland loss and degradation ✓ Vulnerability of sensitive habitats ✓ Shoreline destabilization and erosion
Objectives:
✓ Meet or exceed the BMAP goal for Jackson Blue Spring and Merritts Mill Pond ✓ Protect water quality basin-wide, and restore water quality in impaired waters. ✓ Protect existing functional floodplain area. ✓ Protect and where needed restore major wetlands and floodplains. ✓ Protect or restore stream, lacustrine, wetland, and coastal floodplain functions. ✓ Protect seagrass beds, including through water quality protection and improvement. ✓ Protect and restore riparian habitats.
Lead Entities:
✓ FDEP ✓ Private landowners and working forests ✓ Local governments
Geographic Focus Areas:
✓ Apalachicola River/Upper Apalachicola River Ecosystem ✓ Springs and groundwater contribution areas ✓ Middle Chipola River ✓ Apalachicola Bay Estuary Coastal Buffer
Planning Level Cost Estimate:
$30,000,000

Watershed Stewardship Initiative

Description:

The purpose of the watershed stewardship initiative is to create experiences that result in action-oriented tasks leading to improvements in water quality, tangible improvements in habitat quality, and public knowledge of and appreciation of watershed resources and functions. Outreach activities should be well structured, project-oriented, and include hands-on activities, as well as education about personal practices to protect watershed resources.

Scope of Work:

1. Develop a comprehensive inventory of current watershed stewardship and education efforts underway within the watershed, including funding sources for each.
2. Evaluate initiatives ongoing elsewhere within the state and the country.
3. Analyze the feasibility of combining efforts and resources, where practical and beneficial, with existing community-based initiatives.
4. Identify potential gaps and/or additional areas of focus.
5. Continue existing programs and implement new individual programs based on availability of funding.
6. Include hands-on activities, such as vegetation planting, invasive species removal, site tours, project demonstrations, and monitoring.
7. Implement technical training for landowners, including for implementation of agricultural and silvicultural BMPs, as well as urban BMPs and pollution prevention practices.
8. Monitor program accomplishments and outcomes, including through feedback from participant and citizen surveys.

Outcomes/Products:

1. Improved long-term protection of water quality, habitat, and floodplain functions
2. Improved capability on the part of property owners to implement BMPs
3. Improved public understanding of watershed resources, functions, and public benefits
4. Improved public understanding of, and participation in, resource programs and projects

Strategic Priorities:

- ✓ Water Quality
- ✓ Floodplain Functions
- ✓ Natural Systems
- ✓ Education and Outreach

Supporting Priorities:

- ✓ Water quality impairments for listed stream and estuarine waters
- ✓ Stormwater runoff and NPS pollution
- ✓ Vulnerability of sensitive habitats
- ✓ Needs for improved public understanding and participation; as well as for improved BMP technical support

Objectives:

- ✓ Protect water quality basin-wide, and restore water quality in impaired waters.
- ✓ Reduce basinwide NPS pollution from agricultural areas and erosion sites.
- ✓ Continue to make publicly available data and information to enable communities to reduce flood risk.
- ✓ Expand education and outreach about watershed resources and personal practices to protect water and habitat quality
- ✓ Create long-term partnerships among stakeholders.
- ✓ Supports agricultural, silvicultural, and urban BMPs
- ✓ Build the capacity of landowners, agricultural producers, and others to protect watershed resources, functions, and benefits.

Lead Entities:

- ✓ ANERR
- ✓ Local governments
- ✓ IFAS
- ✓ FDEP
- ✓ FDACS
- ✓ NWFWMD
- ✓ FWC

Geographic Focus Areas:

Watershed-wide

Planning Level Cost Estimate:

$100,000 annually

Sub-basin Restoration Plans

Description:

1. Evaluate and identify priority sub-basins in cooperation with local initiatives, state and federal agencies, and local governments.
2. Develop a scoping document outlining actions to be undertaken, customized for specific areas and needs.
3. Develop a public outreach and engagement plan to facilitate participation by affected neighborhoods and stakeholders.
4. With public and agency participation, identify specific goals for waterbody protection and restoration.
5. Incorporate separate strategies, including stormwater retrofit planning; OSTDS abatement; floodplain, wetland and hydrologic restoration; monitoring; and public outreach and engagement.
6. Identify separate actions and project types that can cumulatively achieve identified goals.
7. Implement public outreach and engagement by conducting field visits, public meetings, and providing innovative hands-on engagement opportunities. Coordinate with established watershed groups.
8. Implement selected actions.
9. Monitor program accomplishments and outcomes, including through feedback from participants and surveys of affected residents. Conduct monitoring pre- and post-implementation and of environmental trends within affected waterbodies.

Strategic Priorities:
✓ Water Quality ✓ Floodplain Functions ✓ Natural Systems ✓ Education and Outreach
Supporting Priorities:
✓ All supporting priorities
Objectives:
✓ All identified objectives
Lead Entities:
✓ Local governments ✓ ANERR ✓ FDEP ✓ FWC ✓ NWFWMD
Geographic Focus Areas:
Targeted sub-basins within the watershed, including, but not limited to: ✓ Jackson Blue Spring contribution area ✓ Alligator Harbor ✓ Chipola River basin
Planning Level Cost Estimate:
TBD* *Costs depend on specific projects included

Outcomes/Products:

1. Focused restoration plans, specific to priority waterbodies and basins
2. Improved water quality and aquatic and wetland habitat quality

Wastewater Treatment and Management Improvements

Strategic priorities:
✓ Water Quality ✓ Natural Systems
Supporting Priorities:
✓ Inadequate treatment from conventional OSTDS ✓ Needs and opportunities for improved wastewater collection and treatment
Objectives:
✓ Protect water quality basin-wide, and restore water quality in impaired waters.
Lead Entities:
✓ Local governments ✓ Utilities
Geographic Focus Areas:
✓ Chipola River basin ✓ Apalachicola Bay ✓ Systems within or proximate to spring contribution areas
Planning Level Cost Estimate:
>$60,000,000

Description:

This strategy consists of development and implementation of upgrades to centralized wastewater treatment collection systems to reduce pollutant loading within the watershed. Additional opportunities exist for water reclamation and reuse.

Scope of Work:

1. In cooperation with utilities and local governments, evaluate existing wastewater systems to identify areas and components with upgrade opportunities, as well as sewer service extension needs.
2. Prioritize systems based on factors such as age, pollutant discharge, apparent leakage, capacity, and access.
3. Develop detailed cost estimates. Show cost estimates for areas with outdated sewer systems that need to be upgraded, areas with a high density of septic tanks that can connect to a central water system, and areas where upgrades are needed, but are determined to be lower in priority.
4. Implement/construct enhanced wastewater treatment and water reclamation and reuse systems.
5. In accordance with wastewater permits, monitor water quality in proximate surface and ground waters.
6. Evaluate data to identify trends of target pollutants.

Outcomes/Products:

1. Improved water and aquatic habitat quality
2. Reduced wastewater discharges into the environment, coupled with improved conservation of potable water resources

Analytical Program Support

Strategic Priorities:
✓ All identified program priorities
Supporting Priorities:
✓ All identified program priorities
Objectives Addressed:
✓ All watershed objectives
Management Approaches:
✓ All identified management approaches
Lead Entities:
✓ State and federal resource agencies ✓ US EPA ✓ USFWS ✓ NWFWMD ✓ ANERR ✓ Educational and research institutions
Geographic Focus Areas:
✓ Watershed-wide, including across jurisdictional boundaries
Planning Level Cost Estimate:
TBD* *Costs highly variable

Description:

This strategy is intended to support dedicated scientific assessment and analysis to improve watershed management, protection, and restoration. The tasks involved are inherently progressive and will therefore change and be redefined as information is developed and in response to ongoing and future conditions and management actions.

Scope of Work:

Integral components of this strategy include but are not limited to the actions presented below.

1. For specific resource functions and at the sub-basin level, develop and refine metrics for evaluating conditions and guiding implementation.
2. In support of Urban Stormwater Retrofits, develop a stormwater pollutant loading analysis to include NPS pollutant loading estimates at the sub-basin level and pollutant load reduction estimates based on proposed or potential BMPs and facilities. Develop planning level estimates of potential water quality effects (pollutant concentrations) for receiving waterbodies.
3. Also in support of Urban Stormwater Retrofits, evaluate existing stormwater management systems to identify potential or needed improvements.
4. Evaluate innovative methods and designs to improve stormwater treatment, wastewater treatment and management, and ecological restoration.
5. In support of Septic Tank Abatement and implementation of Advanced Onsite Systems, develop a spatial analysis of OSTDS to include pollutant loading estimates and estimates of potential pollutant load reduction following connection to central sewer and/or conversion to advanced onsite systems. In cooperation with local governments and utilities, delineate proposed target areas for central sewer connections and for advanced onsite systems.
6. In support of Agricultural and Silvicultural BMPs, develop an agricultural NPS pollution abatement plan. For this purpose, develop nonpoint source pollutant loading estimates at the sub-basin level for watershed areas that are substantially agricultural in land use, and develop pollutant load reduction estimates and targets based on application of proposed or potential BMPs. Develop planning level estimates of water quality effects (pollutant concentrations) for receiving waterbodies.
7. Inventory, evaluate, and prioritize unpaved road stream crossings and other sedimentation sites in support of Basinwide Sedimentation Abatement.
8. Evaluate the site-specific feasibility and potential benefits and impacts of proposed innovative and/or large-scale projects, which may include but are not necessarily limited to:
   a. Regional-scale shoreline habitat development proposals
   b. Passive and/or pumped estuarine flushing systems
   c. Proposals for major hydrologic alterations, such as causeway alterations, locks and dams, and barrier island pass alteration and maintenance
   d. Stream channel reconfiguration

   e. Benthic dredging
   f. Dredged material removal and disposal

9. Identify estuarine sites with the potential for seagrass or other benthic habitat restoration through improved water quality treatment and water management within specific contributing basins.
10. Identify and describe the conditions, status, and trends of oyster and shellfish habitats.
11. Develop and refine hydrodynamic and water quality modeling tools. Develop specific management applications in cooperation with resource agencies and other public and nonprofit initiatives.
12. Evaluate effects of land use and management, to include forest management practices, on water quality. Identify and/or refine management options to protect and improve water quality.
13. Identify and describe long-term trends with respect to wetland and aquatic habitats, aquatic plants, and water chemistry. Identify management implications and recommendations.
14. Develop improved quantitative and qualitative metrics, to include biocriteria, for evaluating conditions and guiding program and project implementation.
15. Conduct a review of past projects completed, identifying specific project outcomes and lessons learned.
16. Establish a research and monitoring framework for detecting the effects of climate change and ocean acidification on coastal marine resources in the region.

Outcomes/Products:

1. Improved understanding of watershed challenges and opportunities
2. Updated project priorities
3. Innovative project planning
4. Improvement in scientific basis for management strategies and actions
5. Improved understanding of quantitative potential of and expectations for environmental change in response to resource management
6. Improved metrics for evaluating conditions and guiding and tracking program implementation
7. Reduced risks of unintended adverse environmental or economic effects

Comprehensive Monitoring Program

Strategic Priorities:
✓ All identified program priorities
Supporting Priorities:
✓ All identified program priorities
Objectives:
✓ All watershed objectives
Lead Entities:
✓ State resource agencies ✓ NWFWMD ✓ ANERR ✓ Federal resource agencies ✓ Local governments ✓ Institutions of higher education; other environmental and watershed organizations
Geographic Focus Areas:
✓ Watershed-wide
Planning Level Cost Estimate:
$100,000 annually

Description:

This strategy provides for monitoring of program and project implementation, project outcomes, water quality, and habitat quality.

Scope of Work:

1. Identify appropriate parameters, to include environmental conditions and trends, and program parameters.
2. Establish a comprehensive and cumulative geodatabase of projects.
3. Further clarify and incorporate indicators at the watershed and subwatershed level.
4. Delineate sensitive/priority areas, e.g., proximity to surface waters and karst.
5. Develop public outreach application/website to communicate program implementation, outcomes, and trend data.
6. Develop updated inventory of organizations (and associated contacts) that currently or previously conducted field monitoring within the watershed, including funding sources for each. Evaluate the feasibility of combining efforts and resources, where practical and beneficial.
7. Identify potential gaps and/or additional areas of focus.
8. Develop core sampling designs for field monitoring. Determine optimal site distribution.
9. If appropriate, develop and implement a volunteer pool and volunteer training program.
10. Establish cooperative efforts with existing community initiatives and state and local agencies.
11. Support equipment acquisition where needed.
12. Where existing initiatives are not in place, consider developing a citizen water quality monitoring volunteer pool for target areas within the watershed.
13. Periodically conduct a comprehensive evaluation, at the watershed level, of program implementation, outcomes, and resource trends.

Outcomes/Products:

1. Improved long-term protection of water quality, habitat, and floodplain functions
2. Evaluations of project and program effectiveness, facilitating feedback and adaptive management
3. Improved public understanding of watershed resources, functions, and public benefits
4. Communication of program accomplishments to the public, elected officials, and stakeholders
5. Improved program accountability to the public and stakeholders
6. Improved public understanding of, and participation in, resource programs and projects

4.4 Project Criteria and Guidelines

This section outlines recommended guidelines to be applied to project development and prioritization. These items are not intended to be pass-fail for projects, but rather identify provisions that should receive consideration in project development and evaluation. Criteria specific to any given prioritization or funding decision are often defined, at least in part, by the funding resources under consideration. Individual sources of funding often are guided by criteria and guidelines established by statute or program documentation.

Generally suggested criteria for project evaluation are as follows.

1. Projects with responsible parties that will implement, operate, and maintain the completed facilities should be given priority consideration. Responsible parties optimally have dedicated sources of funding that will facilitate long-term operation and maintenance. Examples may include stormwater utilities and local option sales taxes.
2. Restoration that is substantially self-sustaining should be considered. Optimally, funded projects should not require continual or frequent human intervention beyond basic maintenance.
3. Responsible parties should support long-term monitoring to facilitate verification, lessons learned, and adaptive management. Long-term monitoring is also beneficial to support verification, lessons learned, and adaptation.
4. For restoration projects, sites and systems should be selected such that they reflect and are adaptable to natural variability. Restored habitats, for example, should be adaptable to cyclic climatic conditions (e.g., seasonal, hydrologic), discrete events (e.g., coastal storms), and long-term changes in the environment (e.g., climate change and sea level rise).
5. Cost effectiveness, technical feasibility, and regulatory factors are criteria to be considered in any prioritization and funding decision.

4.5 Funding Sources

Funding sources change over time. An outline of current funding sources, including descriptions of eligibility and project types contemplated, is provided in Table 4.4. These include Deepwater Horizon related sources and state, federal, and local government programs. Private funding sources, including from nonprofit organizations and private grant programs, may also be available.

Table 4-4 Funding Sources and Eligibility

Funding Source	Eligibility[1]	Project Types
RESTORE Act		
Equal State Allocation (also known as Direct Component or Bucket/Pot 1)	75% of funds allocated to the eight disproportionately affected Panhandle coastal counties: Bay, Escambia, Franklin, Gulf, Okaloosa, Santa Rosa, Wakulla, and Walton. Remainder of funds allocated to the 15 non-disproportionately affected Gulf Coast counties, including Jefferson County in northwest Florida.	• Restoration and protection of the natural resources, ecosystems, fisheries, marine and wildlife habitats, beaches and coastal wetlands; • Mitigation of damage to fish, wildlife and natural resources; • Implementation of a federally-approved conservation management plan; • Workforce development and job creation; • Improvements to state parks located in coastal areas affected by the *Deepwater Horizon* oil spill; • Infrastructure projects benefitting the economy or ecological resources; including port infrastructure; • Coastal flood protection and related infrastructure; • Promotion of tourism and Gulf seafood consumption; or • Administrative costs and planning assistance.
Gulf Coast Ecosystem Restoration Council (also known as The RESTORE Council or Bucket/Pot 2)	Project selection based on Comprehensive Plan developed by the RESTORE Council with input from the public.	The Initial Comprehensive Plan adopts five goals: • Restore and Conserve Habitat; • Restore Water Quality; • Replenish and Protect Living Coastal and Marine Resources; • Enhance Community Resilience; or • Restore and Revitalize the Gulf Economy.
Oil Spill Restoration Impact Allocation (also known as The Gulf Consortium, or Bucket/Pot 3)	The Gulf Consortium, consisting of 23 Gulf Coast counties, is developing the State Expenditure Plan for Florida that must be submitted by the Governor to the RESTORE Council for its review and approval.	All projects, programs, and activities in the State Expenditure Plan that contribute to the overall ecological and economic recovery of the Gulf Coast (same project types as listed under the Equal State Allocation above).
NOAA RESTORE Act Science Program (also known as Bucket/Pot 4)	• Institutions of higher education; • Non-profit organizations; • Federal, state, local and tribal governments; • Commercial organizations; and • U.S. territories.	Research, observation, and monitoring to support the long-term sustainability of the ecosystem, fish stocks; fish habitat; and the recreational, commercial, and charter fishing industry in the Gulf of Mexico, including: • Marine and estuarine research; • Marine and estuarine ecosystem monitoring and ocean observation; • Data collection and stock assessments; • Pilot programs for fishery independent data and reduction of exploitation of spawning aggregations; • Cooperative research; or • Administrative costs.

Funding Source	Eligibility[1]	Project Types
Centers of Excellence (also known as Bucket/Pot 5)	University of South Florida, Florida Institute of Oceanography is administering Florida's Centers of Excellence Program.	• Coastal and deltaic sustainability, restoration, and protection, including solutions and technology that allow citizens to live in a safe and sustainable manner in a coastal delta in the Gulf Coast Region; • Coastal fisheries and wildlife ecosystem research and monitoring in the Gulf Coast Region; • Offshore energy development, including research and technology to improve the sustainable and safe development of energy resources in the Gulf of Mexico; • Sustainable and resilient growth, economic and commercial development in the Gulf Coast Region; and • Comprehensive observation, monitoring, and mapping of the Gulf of Mexico.
Other Deepwater Horizon Funding		
Natural Resource Damage Assessment (NRDA)	Trustee Implementation Groups develop restoration projects guided by the programmatic restoration plan finalized in 2016. Public may submit project ideas & comment on plans.	The final plan takes a comprehensive and integrated ecosystem-level approach to restoring the Gulf of Mexico: • Restore and Conserve Habitat • Restore Water Quality • Replenish and Protect Living Coastal and Marine Resources • Provide and Enhance Recreational Opportunities
National Fish and Wildlife Foundation (NFWF)	NFWF manages the Gulf Environmental Benefit (GEBF) fund established in 2013. In consultation with FWC and FDEP, NFWF identifies priority restoration and conservation projects for GEBF funding.	Projects that: • Restore and maintain the ecological functions of landscape-scale coastal habitats, including barrier islands, beaches & coastal marshes; • Restore and maintain the ecological integrity of priority coastal bays and estuaries; and • Replenish and protect living resources including oysters, red snapper and other reef fish, Gulf Coast bird populations, sea turtles and marine mammals.
Federal Sources		
NOAA Coastal Resilience Grants	• Non-profit organizations • Institutions of higher education • Regional organizations • Private entities • States, territories and federally recognized Indian tribes • Local governments	• Strengthening Coastal Communities: activities that improve capacity of coastal jurisdictions (states, counties, municipalities, territories, and tribes) to prepare and plan for, absorb impacts of, recover from, and/or adapt to extreme weather events and climate-related hazards. • Habitat Restoration: activities that restore habitat to strengthen the resilience of coastal ecosystems and decrease the vulnerability of coastal communities to extreme weather events and climate-related hazards.
NOAA Office of Education Grants	Educational institutions and organizations for education projects and programs	• Environmental Literacy Program provides grants and in-kind support for programs that educate and inspire people to use Earth systems science to improve ecosystem stewardship and increase resilience to environmental hazards. • Bay Watershed Education and Training (B-WET) provides competitive funding to support meaningful watershed educational experiences for K–12 audiences • Cooperative Science Centers provide awards to educate and graduate students who pursue degree programs with applied research in NOAA mission-related scientific fields.

Funding Source	Eligibility[1]	Project Types
US EPA Environmental Education Grants	• Local education agencies • State education or environmental agencies • Colleges or universities • Non-profit organizations • Noncommercial educational broadcasting entities • Tribal education agencies	Environmental education projects that promote environmental awareness and stewardship and help provide people with the skills to take responsible actions to protect the environment. This grant program provides financial support for projects that design, demonstrate, and/or disseminate environmental education practices, methods, or techniques.
US EPA – Exchange Network Grant Program	States, territories and federally recognized Indian tribes	Promotes improved access to, and exchange of, high-quality environmental data from public and private sector sources.
US EPA - Water Infrastructure Finance and Innovation Act (WIFIA) Program	• States, territories and federally recognized Indian tribes • Partnerships and joint ventures • Corporations and trusts • Clean Water and Drinking Water State Revolving Fund (SRF) programs	Accelerates investment in water infrastructure by providing long-term, low-cost supplemental loans for regionally and nationally significant projects.
State Sources		
FDEP (WMDs) Spring Restoration Program	•Local governments •Public and non-profit utilities •Private landowners	State Spring Restoration funding efforts include land acquisition and restoration, septic to sewer conversion, and other projects that protect or restore the quality or quantity of water flowing from Florida's springs.
FDEP Special Management Area Grants	State agencies and water management districts	Research or coordination efforts in areas of special management. Examples of areas of special management would include, but not be limited to Areas of Critical State Concern, Critical Wildlife Areas, Aquatic Preserves, National Estuary Programs, and Surface Water Improvement and Management waterbodies
FDEP Coastal Partnership Initiative	Coastal counties and municipalities within their boundaries required to include a coastal element in the local comprehensive plan	Coastal resource stewardship and working waterfronts projects.
FDEP Beach Management Funding Assistance (BMFA) Program	• Local governments • Community development districts • Special taxing districts	Beach restoration and nourishment activities, project design and engineering studies, environmental studies and monitoring, inlet management planning, inlet sand transfer, dune restoration and protection activities, and other beach erosion prevention related activities consistent with the adopted Strategic Beach Management Plan.
FDEP Florida Communities Trust	Local governments and eligible non-profit organizations	Acquisition of land for parks, open space, greenways and projects supporting Florida's seafood harvesting and aquaculture industries.
Florida Forever	Funding is appropriated by the legislature distributed by the FDEP to state agencies	Acquisition of public lands in the form of parks, trails, forests, wildlife management areas, and more.
FDEP Coastal and Estuarine Land Conservation Program	States that have a coastal zone management program approved by NOAA or a National Estuarine Research Reserve (NERR)	Acquisition of property in coastal and estuarine areas that have significant conservation, recreation, ecological, historical, or aesthetic values, or that are threatened by conversion from a natural or recreational state to other uses.
FDEP Clean Vessel Act Grants	Facilities that provide public access to pump-out equipment	Construction, renovation or installation of pump out equipment or pump out vessels.

Funding Source	Eligibility[1]	Project Types
FDEP Clean Water State Revolving Fund Loan Program (CWSRF)	Project sponsors	Planning, designing, and constructing water pollution control facilities.
FDEP Clean Water State Revolving Fund Program Small Community Wastewater Construction Grants	Small communities and wastewater authorities	This grant program assists in planning, designing, and constructing wastewater management facilities. An eligible small community must be a municipality, county, or authority with a total population of 10,000 or less, and have a per capita income (PCI) less than the State of Florida average of $26,503.
FDEP 319 grants	• State and local governments • Special districts, including water management districts • Nonprofit public universities and colleges • National Estuary Programs	Projects or programs that reduce NPS pollution. Projects or programs must be conducted within the state's NPS priority watersheds, including SWIM watersheds and National Estuary Program waters. All projects should include at least a 40% nonfederal match.
FDEP 319 Education Grants	Local governments in Florida	For projects that provide education and outreach about nonpoint source pollution in the adopted Basin Management Action Plan (BMAP) areas.
FDEP TMDL Water Quality Restoration Grants	Local governments and water management districts	Projects that: • Reduce NPS loadings from urban areas affecting verified impaired waters. • Are at least the 60% design phase. • Have permits issued or pending. • Include storm monitoring to verify load reduction. • Will be completed within three years of appropriation. • Include a minimum of 50% match with at least 25% provided by the local government. • Allocate grant funds to construction of BMPs, monitoring, or related public education.
FDACS Rural and Family Lands Protection Program	Agricultural landowners	State conservation easements that: • Protect valuable agricultural lands. • Ensure sustainable agricultural practices and reasonable protection of the environment. • Protect natural resources in conjunction with economically viable agricultural operations.
FDACS Forest Stewardship Program	Private forest landowners with at least 20 acres of forest land	Cost-share grants for implementation of stewardship to improve and maintain timber, wildlife, water, recreation, aesthetics, and forage resources.
FDACS Endangered and Threatened Plant Conservation Program	Private individuals and non-federal government entities	Actions that restore and maintain populations of listed plants on public land and on private lands managed for conservation purposes.

Funding Source	Eligibility[1]	Project Types
Natural Resources Conservation Service	Private agricultural producers, landowners, and local governments	• Conservation Innovation Grants (CIG) stimulate development and adoption of innovative conservation approaches and technologies. • The Environmental Quality Incentives Program (EQIP) provides financial and technical assistance to agricultural producers that address natural resource concerns and improve water and air quality, conserve ground and surface water, reduce soil erosion and sedimentation, or improve or create wildlife habitat • Emergency Watershed Protection Program includes assistance to remove debris from streams, protect streambanks, establish cover on critically eroding lands, repair conservation practices, and purchase of floodplain easements.
Florida Fish and Wildlife Conservation Commission Wildlife Grants Program	State fish and wildlife agencies	Projects identified within State Wildlife Action Plan, including fish and wildlife surveys, species restoration, habitat management, and monitoring.
Florida Fish and Wildlife Conservation Commission Landowner Assistance Program	Private landowners	Cooperative and voluntary effort between landowners, the FWC, and the USFWS to improve habitat conditions for fish and wildlife.
Local Governments		
Local Government General Revenue	Defined by local statute. Generally local projects as approved by elected body, frequently leveraging state, federal, and other funding sources.	Defined by local statute and elected board.
Utility Funds – Stormwater and Wastewater	Utility projects benefiting rate payers. May leverage other local, state, and federal funding.	Stormwater and wastewater capital improvement and maintenance projects.

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Appendix A Implementation and Achievements of the Previous SWIM Plan

Previous SWIM Plan Issues and Priorities

The previous SWIM plan for the Apalachicola River and Bay watershed was the Apalachicola River and Bay Management Plan completed in 1996. Since that time, substantial progress was made toward implementing projects and priorities outlined in the plan. Table A-1 lists projects and funding proposed in the 1996 plan.

Table A-1 1996 SWIM Plan Project Cost Estimates

#	Project	Proposed Funding (1995-1998)
AP1	Plan management	$325,000
BM1	Legal strategies	*
BM2	Interstate coordination	$600,000
BM3	Oil spill contingency plan	$50,000
BM4	Navigation main./coordination and planning	$60,000
BM5	Permitted activity impacts	$32,000
LM3	Buffer zones	$40,000
LM4	Develop PLRG's	$65,000
LM5	East Bay/Tates Hell restoration	$85,500
LM6	Franklin County stormwater	$77,000
LM7	Floodplain restoration	$250,000
WQ1	Geophysical Studies	$143,830**
WQ2	River WQ assessment	$10,000
WQ3	Bay WQ assessment	$25,000
WQ5	Lake Seminole sediment	*
WQ7	Ground/surface water interaction	*
WQ8	Salinity fronts	**
WQ9	St. George Island sewer/septic	*
WQ10	Bay WQ modeling	*
BR1	Coupling of primary and secondary production	**
BR2/3	Examination of nutrient transport and primary productivity	**
BR4	Tidal marsh examination	$100,000

#	Project	Proposed Funding (1995-1998)
BR6	Association Between Apalachicola River Flows and Shellfish Harvests	*
BR7	Examination of Habitats and distribution patterns of dominant organisms	**
BR8	Biological monitoring program	*
BR9	Impacts of impacts of mechanical redistribution	*
BR10	Disposal site restoration	*
BR11	Riverine habitats characterization	$8,467**
BR12	Instream flow requirements	*
BR13	Slough/creek re-openings	**
BR14	Integration of biological database	**
BR15	River habitat mapping and monitoring	*
PE1	Educational working group	*
PE2.2	Field trip expansion	$20,000
PE2.3	Bulletin board kits	*
PE2.4	Teacher workshops	*
PE3	Media relations	$23,950
PE4.3	Citizen stewardship program	$60,000
PE5	Integration of fishermen and scientists' knowledge	*
PE6.1	ACF public awareness	$15,600
* Not scheduled for SWIM funding during this timeframe; related activities conducted by state and local agencies. ** Comprehensive Study Projects funded or partially funded by outside sources.		

Progress toward Meeting Plan Goals and Objectives

The 1996 Apalachicola River and Bay Management Plan sought to implement comprehensive basin-wide management through coordination of government interests and cooperation with private interests, applying a research-based and regional approach to water quality and habitat issues. The stated goal for the State of Florida is equitable management of the system to maintain and/or improve the natural resources of the Apalachicola River and Bay. Objectives identified included the following

- Preserve the existing natural system through conservation and protection of water quality and aquatic habitat, particularly unique or critical habitats.

- Prevent further degradation of the system from point sources, nonpoint sources, and predictable impacts associated with growth and increased utilization of the system, both commercially and recreationally.
- Enhance scientific understanding of the system to better determine functions and needs for the development of appropriate long-term management strategies for the system.
- Educate the public to help develop an understanding about the needs of the ecosystem, especially how local and individual actions impact the ecosystem.
- Promote and initiate coordination and cooperation between appropriate governmental agencies as well as the private sector regarding use of the system.

Significant progress has been achieved toward implementation of priorities of the SWIM plan and associated programs. Most activities were coordinated as interagency cooperative efforts. In practice, many of the activities were implemented as more broadly defined projects than those listed. A brief listing of some of the major accomplishments follows.

Basin Management – Multiple coordination activities were conducted to include project planning and management. Technical support was provided to the State of Florida during interstate negotiations and actions during and subsequent to the Interstate Compact. Additionally, District staff helped coordinate establishment of a Certified Cooperative Spillage Control Team for the Apalachicola Ecosystem, supporting FDEP and ANERR with contingency planning coordination and technical assistance.

Land and NPS Pollution Management – Initial land use/cover and nonpoint source assessments were completed prior to 1996. Final reports summarizing results provided data and some quantification of potential pollutant loading to the river and bay. A detailed nonpoint assessment funded by SWIM and EPA was completed, with a final report entitled Land Use, Management Practices, and Water Quality in the Apalachicola River and Bay Watershed being released in 1998.

Water Quality and Quantity Analysis – A number of analytical activities were conducted, in part to provide technical assistance to the state as part of the Comprehensive Study. Project WQ1 (Apalachicola Bay Geophysical Study: 3-D Circulation Model) was completed with development of a salinity and water circulation model for the bay. Subsequent work under Project WQ2 (Water Quality Assessment for Apalachicola River) included analysis of water quality constituents gathered from various stations on the Apalachicola River from 1970-1991.

Project BR1 (Coupling of Primary and Secondary Production in the Apalachicola System), completed in 1997, indicated that estuarine primary production was the dominant source of organic matter to secondary consumers in Apalachicola Bay. Projects BR 2 and 3 (Examination of Nutrient Transport and Primary Productivity within the Apalachicola River and Bay) were completed in 1999. Results of these studies included an evaluation of spatial and temporal trends in nutrient distribution and primary productivity, an assessment of the effects of changing freshwater inflows on estuarine productivity, as well as the development of nutrient budgets for the estuary. Project BR5 (Association between Apalachicola River Flows and Shellfish Harvest) was completed in 1997. Results indicated that freshwater inflows significantly influenced Apalachicola Bay oyster and blue crab fisheries, but with species-specific effects. Project BR6 (Salinity and Oyster Distribution) coupled output from the bay hydrodynamic model with oyster life history information to develop predictions concerning growth and mortality under different river flow regimes.

Public Education and Awareness – Public awareness activities included completion of WaterWays, Chapter Five, Companion Slide/Tape Presentation and Video, produced and distributed to public middle schools throughout the Apalachicola River and Bay watershed. Additionally, over 7,500 students had opportunities to participate in field trips, which served to expose the students to the Apalachicola River and Bay. An updated SWIM Guide to Protecting our Surface Waters was revised and reprinted in 1998. Finally, District staff completed *Voices of the Apalachicola* (Eidse 2006), which includes a compilation of oral histories of more than 30 long-time residents of the Apalachicola River and Bay watershed.

Restoration activities have focused extensively on hydrologic and wetland habitat restoration in cooperation with the Florida Forest Service in Tate's Hell State Forest. To date, major projects have been completed within eight separate sub-basins or project areas within the forest. Actions completed have included, installation of 50 low water crossings, over 100 ditch plugs, 51 culvert repairs or replacements, and three bridges; removal of about 13 miles of unpaved roads; and vegetation restoration to include shrub reduction and planting of wiregrass and cypress. Funding for these efforts was provided by multiple sources, including SWIM, U.S. EPA, FDOT mitigation, and the Florida Forest Service. Additional restoration activities included a breakwater and marsh planting project conducted in at Cat Point as part of the mitigation for the newly constructed St. George Island Bridge.

Reflecting the shared responsibility inherent in watershed management, accomplishments should be recognized on the part of numerous watershed stakeholders, including local governments, state and federal agencies, academic institutions, and others. Among other noteworthy accomplishments are:

1. Continued implementation of broad-based restoration, monitoring, analysis, and educational activities by the Apalachicola National Estuarine Research Reserve, with funding support from the State of Florida and the National Oceanic and Atmospheric Administration.
2. Implementation of projects to retrofit stormwater systems and reduce NPS pollution by the cities of Apalachicola and Carrabelle and by the Eastpoint Water and Sewer District;
3. Update of the Alligator Harbor Aquatic Preserve Management Plan by FDEP;
4. Implementation of ERP by the District and FDEP; and
5. Implementation of water reuse with potable water offset by the cities of Apalachicola and Carrabelle.

Recently, significant progress has been achieved toward both retrofitting existing stormwater systems for water quality treatment and for implementing enhanced agricultural BMPs in the Jackson Blue Spring groundwater contribution area. Cooperative projects implemented in the watershed are listed in Table A-1. The District's Consolidated Annual Reports (http://www.nwfwater.com/Data-Publications/Reports-Plans/Consolidated-Annual-Reports) provide listings and descriptions of specific projects that have been completed under the auspices of the SWIM and Florida Forever programs.

Table A-2 Project Implementation

Project	General Description	Lead Entity	Corresponding SWIM Project*	Status
Eastpoint Regional Stormwater Management Systems	Installed eight continuous deflection separation (CDS) units or baffle boxes. Funded in part by EPA 319 grant.	Eastpoint Water and Sewer District	Stormwater Planning and Retrofit	Complete 2008
Water Street & Avenue G Stormwater	Stormwater retrofit and treatment for eight acre basin.	City of Apalachicola	Stormwater Planning and Retrofit	Complete 2008
10th Street Basin Stormwater Improvements	Stormwater treatment management facility and other drainage improvements, for 145 acre contributing basin of St. George Sound.	City of Carrabelle	Stormwater Planning and Retrofit	Complete 2010
Marine Street Stormwater Retrofit Project	Stormwater conveyance and water quality improvements and bioretention facility.	City of Carrabelle	Stormwater Planning and Retrofit	Complete 2015
Battery Park Stormwater Retrofit	Stormwater retrofit and treatment for 54 acre basin.	City of Apalachicola	Stormwater Planning and Retrofit	Complete 2015
US 98 and 16th Street Stormwater Quality Improvement	Stormwater retrofit and treatment for 76 acre basin.	City of Apalachicola	Stormwater Planning and Retrofit	Complete 2017
Prado Outfall Stormwater Quality Improvements	Stormwater retrofit and treatment for 46 acre basin.	City of Apalachicola	Stormwater Planning and Retrofit	Complete 2017
Avenue I Water Quality Improvement	Stormwater retrofit and treatment for 54 acre basin.	City of Apalachicola	Stormwater Planning and Retrofit	Complete 2017
Lighthouse Estates Sewer Phase I	Extension of sewer lines to connect 53 residences adjacent to St. George Sound	City of Carrabelle	Septic Tank Abatement	In progress
Indian Springs Sewer Extension (Phases 1 and 2A)	Extension of sewer lines to connect 200 residences in the Merritts Mill Pond basin.	Jackson County	Septic Tank Abatement	In progress
Blue Spring Road Sewer Extension	Extension of sewer lines to connect 74 residences in the Merritts Mill Pond basin.	Jackson County	Septic Tank Abatement	In progress
Jackson Blue Springs Agricultural BMPs	Cooperative and cost share efforts with producers to reduce nitrogen loads to the Floridan aquifer.	NWFWMD	Agriculture and Silviculture BMPs	In progress
Malone High School Sewer	Connection of sewer lines to Malone High School, abandoning 10 septic systems	Town of Malone	Septic Tank Abatement	New in 2017
Jackson Blue Spring Recreation Area Improvements	Extension of sewer lines to connect 74 residences in the Merritts Mill Pond basin.	Jackson County	Stormwater Planning and Retrofit	New in 2017

Appendix B Related Resource Management Activities

Much of the progress to date is attributable to cooperative efforts made on the part of local governments, state and federal agencies, the District, and private initiatives. Many programs and projects share common goals, and their implementation is most frequently accomplished through coordinated planning, funding, management, and execution. This section describes historical and ongoing activities and programs to address resource issues within the watershed.

Special Resource Management Designations

Outstanding Florida Waters

The FDEP designates Outstanding Florida Waters (OFWs) under section 403.061(27), F.S., which are approved by the Environmental Regulation Commission. An OFW is defined by FDEP as a waterbody "…worthy of special protection because of its natural attributes." A number of waterbodies and segments in the watershed have been recognized and receive additional regulatory protection through designation as OFWs, per Section 62-302.700, F.A.C. Designated OFWs in the watershed include:

- Apalachicola Bay
- Apalachicola River
- Chipola River
- Apalachicola National Estuarine Research Reserve
- St. Vincent National Wildlife Refuge
- Cape St. George State Reserve
- Dr. Julian G. Bruce St. George Island State Park
- Three Rivers State Park
- Torreya State Park
- Alligator Harbor Aquatic Preserve
- Apalachicola Bay Aquatic Preserve

Aquatic Preserves

Florida currently has 41 aquatic preserves, managed by FDEP, encompassing approximately 2.2 million acres of submerged lands that are protected for their biological, aesthetic, and scientific value. As described in Chapter 18-20, F.A.C., aquatic preserves were established for the purpose of being preserved in an essentially natural or existing condition so that their aesthetic, biological, and scientific values may endure for the enjoyment of future generations. There are two aquatic preserves in the Apalachicola River and Bay watershed: Apalachicola Bay Aquatic Preserve and Alligator Harbor Aquatic Preserve. Details on each preserve and its management may be found at the links below.

- Apalachicola Bay Aquatic Preserve: http://www.dep.state.fl.us/coastal/sites/apalachicola/aquatic.htm
- Alligator Harbor Aquatic Preserve: http://www.dep.state.fl.us/coastal/sites/alligator/

Conservation Lands

As described previously, the Apalachicola River and Bay watershed system contains extensive conservation and protected lands (Figure 2-9), which are important for the long-term protection of watershed functions and resources. Conservation lands account for approximately 33 percent, or 610,571 acres, of the land area within the watershed in Florida.

The NWFWMD owns and manages over 211,000 acres across the District and protects an additional 12,403 acres through conservation easements. More than 45,000 acres of the lands owned and managed by the district are within the Apalachicola River and Bay watershed, including the Apalachicola River and Chipola River WMAs. Land-management activities include prescribed burning, timber management, groundcover restoration, reforestation, and other activities. In addition to District land, the watershed is protected by 263,040 acres of federal lands, 331,650 acres state lands, 223 acres of locally managed lands, and 15,658 acres of privately managed conservation lands. A detailed summary of conservation lands within the watershed is provided by Appendix G.

Apalachicola National Estuarine Research Reserve

The Apalachicola National Estuarine Research Reserve (ANERR) includes most of Apalachicola Bay, as well as the lower 52 miles of the Apalachicola River and floodplain. The reserve encompasses the Apalachicola Bay Aquatic Preserve and lands managed by the USFWS, FWC, Florida Park Service, NWFWMD, and Florida Coastal Office. Core programs of the reserve include education and outreach; coastal training; resource management; and monitoring of water quality, fish, benthic macroinvertebrates, listed species, shorelines, emergent and submerged vegetation, and oyster growth and spatfall. The Reserve is administered by the Florida Coastal Office, with funding and program support provided by both FDEP and the National Oceanic and Atmospheric Administration (NOAA).

Gulf Ecological Management Sites

The Apalachicola River Bay watershed also includes four Gulf Ecological Management Sites (GEMS): Alligator Harbor Aquatic Preserve, which encompasses 14,184 acres of submerged lands, Apalachicola Bay Aquatic Preserve, with 80,000 acres of submerged lands, the Apalachicola National Estuarine Research Reserve (234,715 acres), and the 11,868-acre St. Vincent National Wildlife Refuge. The GEMS Program is an initiative of the Gulf of Mexico Foundation, the EPA Gulf of Mexico Program, and the five Gulf of Mexico states (Gulf of Mexico Foundation 2015). Designated GEMS are considered high priority for protection, restoration, and conservation by state and federal authorities due to unique ecological qualities such as habitats significant to fish, wildlife, or other natural resources (Gulf of Mexico Foundation 2015).

Critical and Strategic Habitat Conservation Areas

Portions of the Apalachicola River and Bay watershed are designated critical habitat for several federally listed species: the Gulf sturgeon; freshwater mussels, including the fat threeridge, shinyrayed pocketbook, Gulf moccasinshell, oval pigtoe, Chipola slabshell, and purple bankclimber; the frosted flatwoods salamander, and the reticulated flatwoods salamander. Portions of the watershed have also been identified by the FWC as Strategic Habitat Conservation Areas (SHCAs). These areas are important habitats that do not have conservation protection and would increase the security of rare and imperiled species if they were protected. Within the Apalachicola River and Bay watershed, SHCAs have been identified for several species including the swallow-tailed kite (*Elanoides forficatus forficatus*), gray bat (*Myotis grisescens*), Florida black bear (*Ursus americanus*), Gulf salt marsh snake (*Nerodia clarkii clarkia*), Cooper’s hawk (*Accipiter cooperii*), snowy plovers (*Charadrius alexandrinus*), and Scott’s Seaside Sparrow (*Ammodramus maritimus peninsulae*) (FWC 2009).

Deepwater Horizon: RESTORE Act, Natural Resource Damage Assessment (NRDA), and NFWF Projects

The FDEP and the FWC are the lead state agencies in Florida for responding to the impacts of the 2010 Deepwater Horizon oil spill and the resulting restoration process. Restoration projects submitted through the FDEP are considered for funding under the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast Act (RESTORE Act) Comprehensive Plan Component, the NRDA, and the NFWF's GEBF.

RESTORE

The RESTORE Act of 2012 allocates to the Gulf Coast Restoration Trust Fund 80 percent of the CWA administrative and civil penalties resulting from the oil spill. The major means of allocation under the RESTORE Act are as follows:

Direct Component Funds ("Bucket 1"): Seven percent of these funds will be directly allocated to counties affected in Florida (5.25 percent to the eight disproportionately affected counties in the Panhandle from Escambia to Wakulla counties; and 1.75 percent to the non-disproportionately impacted Gulf Coastal counties). To receive funds under the Direct Component, each county is required to submit a Multiyear Implementation Plan, subject to review by the U.S. Department of the Treasury, detailing the county's plan to expend funds for a set of publicly vetted projects and goals (FDEP 2016g).

Comprehensive Plan Component ("Bucket 2"): A portion of RESTORE funds will go toward projects with a wider geographic benefit (multiple states). These projects are selected by the Gulf Coast Ecosystem Restoration Council, which includes the five Gulf States and six federal agencies. Projects can be submitted by the Council members and federally recognized Native American tribes.

Spill Impact Component ("Bucket 3"): Each of the five Gulf states will receive these funds to implement a State Expenditure Plan. In Florida, this plan is being developed through the Gulf Consortium, which was created by inter-local agreement among Florida's 23 Gulf Coast counties. Projects will be submitted by each of the 23 counties on Florida's Gulf Coast.

Natural Resource Damage Assessment (NRDA)

The Oil Pollution Act of 1990 authorizes certain state and federal agencies to evaluate the impacts of the Deepwater Horizon oil spill. This legal process, known as NRDA, determines the type and amount of restoration needed to compensate the public for damages caused by the oil spill. The FDEP, along with the FWC, are co-trustees on the Deepwater Horizon Trustee Council.

National Fish and Wildlife Foundation (NFWF)

The NFWF established the GEBF to administer funds arising from plea agreements that resolve the criminal cases against British Petroleum and Transocean. The purpose of the GEBF, as set forth in the plea agreements, is to remedy harm and eliminate or reduce the risk of future harm to Gulf Coast natural resources. The plea agreements require the NFWF to consult with state and federal resource agencies in identifying projects. The FWC and the FDEP work directly with the NFWF to identify projects for the state of Florida, in consultation with the USFWS and NOAA. From 2013 to 2018, the GEBF will receive a total of $356 million for natural resource projects in Florida. However, the allocation of funds is not limited to five years. NFWF funded the development of the 2017 SWIM plan updates through the GEBF.

The Nature Conservancy (TNC): Watershed Management Planning

To achieve comprehensive and long-term success for Gulf restoration, TNC facilitated a community-based watershed management planning process in 2014 and 2015 along Florida's Gulf Coast for the following six watersheds: Perdido Bay, Pensacola Bay, Choctawhatchee Bay, St. Andrew and St. Joseph bays, Apalachicola to St. Marks, and the Springs Coast. The process was designed to:

- Develop watershed-based plans that identify the most pressing environmental issues affecting each watershed and solutions that address the issues, regardless of political jurisdiction and funding source;
- Create long-term partnerships among stakeholders in each watershed and across the regions to maximize effectiveness of project implementation and funding efforts; and
- Provide a screening tool to evaluate the project priorities of these watershed plans for potential funding by the communities, the FDEP, the FWC, the NFWF, and the Gulf Coast Restoration Council (TNC 2014).

The plan developed for the Apalachicola to St. Marks watersheds identifies 13 projects to address seven major actions (TNC 2014):

- Protect, restore, create and/or manage natural habitat and resources and increase buffer areas;
- Increase cooperation and coordination for management, monitoring, funding, implementation, outreach, and enforcement;
- Reduce impacts to groundwater and ensure adequate fresh water availability;
- Reduce and treat stormwater;
- Reduce nutrient loading;
- Reduce sedimentation; and
- Increase economic diversification.

Monitoring Programs

Much of the monitoring data in the Apalachicola River and Bay watershed, including chemical and biological data, has been collected by the FDEP Northwest District staff (FDEP 2003). Data-gathering activities include working with environmental monitoring staff in the NWFWMD and local and county governments to obtain applicable monitoring data from their routine monitoring programs and special water quality projects in the Basin. All the data collected by the FDEP and its partners is uploaded to the statewide water quality database for assessment.

FDEP/NWFWMD

Long-term trends in the water quality of Florida's rivers, streams, and canals are monitored by the Surface Water Temporal Variability (SWTV) Monitoring Network. This is a statewide network of 78 fixed sites selected to reflect the water quality impacts of the land use within each basin. The SWTV network includes four sites on the Apalachicola and Chipola Rivers. Parameters monitored include color alkalinity, turbidity, suspended and dissolved solids, nutrients, total organic carbon, chlorides, sulfate, metals (calcium, potassium, sodium, magnesium), pH, conductivity, temperature, DO, total coliform bacteria, fecal coliform bacteria, *enterococci* bacteria, and *escherichia* bacteria. Bi-annual biological sampling is also performed to evaluate the ecological health of the waters. These water quality stations are on gauged streams, which provide for calculated stream discharges (FDEP 2016h, 2016i).

The FDEP has also developed the Nitrogen Source Inventory and Loading Tool to identify and quantify the major contributing nitrogen sources to groundwater in areas of interest. This GIS- and spreadsheet-based tool provides spatial estimates of the relative contribution of nitrogen from various sources. It takes into consideration the transport pathways and processes affecting the various forms of nitrogen as they move from the land surface through soil and geologic strata that overlie and comprise the Upper Floridan aquifer (FDEP 2016j).

The Florida Geological Survey Aquifer Vulnerability Assessment model can facilitate protection of groundwater and surface waters by identifying less vulnerable areas that may support development and more vulnerable areas that should be prioritized for conservation (Arthur et al. 2007).

FDEP Northwest District

The FDEP's Northwest District has collected considerable biological data and conducted biological evaluations of numerous stream and other aquatic habitat sites throughout the watershed (FDEP 2009). The biological data collected by the FDEP Northwest District includes Stream Condition Index, Wetland Condition Index, and Bioassessment data; all are reported and accessible in the STOrage and RETrieval (STORET) database. The data is included in the Impaired Surface Waters Rule (IWR) assessments, including the most recent assessment IWR run which can be found on the FDEP website: http://www.dep.state.fl.us/ water/watersheds/assessment/basin411.htm.

Florida Department of Agriculture and Consumer Services (FDACS)

To minimize the risk of shellfish-borne illness, the Florida Department of Agriculture and Consumer Services (FDACS) continually monitors and evaluates shellfish harvesting areas and classifies them accordingly. It also ensures the proper handling of shellfish sold to the public (FDACS 2017a).

Under the Shellfish Harvesting Classification Program, FDACS monitors bottom and surface temperature, salinity, DO, surface pH, turbidity, fecal coliform bacteria, water depth, and wind direction and speed at 82 sites in Apalachicola Bay and 20 sites in Alligator Harbor. The data set for both sites begins in 1979 and continues to the present. County public health units also conduct weekly monitoring of enterococcus and fecal coliform bacteria at nine sites in Franklin County (FDACS 2017b).

FDACS (2017a) identified: five approved harvesting areas in Apalachicola Bay, six conditionally approved, one restricted and one prohibited. This classification was based on shellfish classifications issued by FDACS and managed year-round, with specific areas just managed during the summer and other areas just managed during the winter due to differing water quality conditions.

In Alligator Harbor, FDACS identified one approved and one prohibited harvesting area, based on shellfish classifications issued by FDACS. There is also an area dedicated to aquaculture leases, growing clams and oysters (FDACS 2017a).

Florida Department of Health (FDOH)

The Florida Healthy Beaches Program was begun by the FDOH as a pilot beach monitoring program in 1998 with expansion to include all the state's coastal counties in August 2000. The Florida Department of Health in Franklin County monitors recreational beaches for *enterococcus* bacteria at Alligator Point, Carrabelle Beach, and St. George Island. County health departments issue health advisories or warnings when bacterial counts exceed safe levels.

Apalachicola National Estuarine Research Reserve

As part of the broad set of programs described above, ANERR conducts monitoring of water quality, biology, and physical processes affecting Apalachicola Bay. Water quality monitoring has continued for decades, to include temperature, specific conductivity, salinity, dissolved oxygen, pH, water level, and turbidity. Monitoring sites are strategically located to support resource management priorities, including oyster resource management. The Reserve also monitors fish and benthic macroinvertebrates at 12 sites in the bay, and it monitors listed species, water levels, oyster growth, and shoreline conditions. Submerged aquatic vegetation monitoring has included evaluation of seagrass bed coverage and condition, species, and epiphyte coverage. Marsh vegetation monitoring includes species composition and density.

Submerged Aquatic Vegetation (SAV) Monitoring

Submerged aquatic vegetation can be an indicator of the health of an estuarine system. This vegetation provides food and habitat for waterfowl, fish, shellfish, and invertebrates. These plants add dissolved oxygen to the water while absorbing nutrient pollution and stabilizing shorelines (NERRA 2017). ANERR began the monitoring program for Apalachicola Bay SAV in 2002 (FDEP 2012).

The FWC monitors seagrasses through the Seagrass Integrated Mapping and Monitoring Program (SIMM). In 2010, the program identified a generally stable trend in seagrass composition and frequency in Apalachicola Bay over an 18-year monitoring period. However, a decrease was observed in Alligator Harbor (FWC 2016b).

Florida Healthy Beaches Program

The Florida Department of Health (FDOH) began the grant funded pilot program for the Florida Healthy Beaches program in 1998 with five coastal counties monitoring for enterococci bacteria. The presence of enteric bacteria can be an indication of fecal pollution, which may come from stormwater runoff, pets and wildlife, and human sewage (FDOH 2017b). In 2000, the Beach Water Sampling Program was extended to 30 coastal counties and added fecal coliform monitoring. In August 2002, weekly sampling commenced as additional funding was secured (FDOH 2017b).

County health departments issue health advisories or warnings when bacterial counts are too high (FDOH 2017a). Beaches that have more than 21 beach closures in a year are classified as “impaired” by FDEP. Three segments were issued advisories in 2015-16. Two were on Carrabelle Beach and one at Saint George Island (FDOH 2017a).

Resource Restoration and Protection Programs and Initiatives

Water quality in the Apalachicola River and Bay watershed is protected through several associated programs. These include FDEP’s adopted TMDLs; BMPs for silviculture, agriculture, construction, and other activities related to land use and development; and permitting programs including NPDES, domestic and industrial wastewater permits, stormwater permits, and ERP. Additionally, water quality is protected through conservation, mitigation, and management programs that protect water resources, aquifer recharge areas, floodplains, and other natural systems within the watershed. These programs include Florida Forever, regional mitigation for state transportation projects, and spring protection and restoration. The following provides an overview of these programs and their contribution to water quality restoration and protection.

Total Maximum Daily Loads (TMDLs)

Total maximum daily loads are developed for waterbodies that are verified as not meeting adopted water quality standards to support their designated use. They provide important water quality restoration goals to guide restoration activities. They also identify the reductions in pollutant loading required to restore water quality. Total maximum daily loads are implemented through the development and adoption of BMAPs that identify the management actions necessary to reduce the pollutant loads. Basin Management Action Plans are developed by local stakeholders (public and private) in close coordination with the water management districts and the FDEP. Although water segments with adopted TMDLs are removed from the state's impaired waters list, they remain a high priority for restoration.

National Pollutant Discharge Elimination System (NPDES) Permitting

All point sources that discharge to surface waterbodies require a NPDES permit. These permits can be classified into two types: domestic or industrial wastewater discharge permits, and stormwater permits. All communities' NPDES-permitted point sources may be affected by the development and implementation of a TMDL. All NPDES permits include "reopener clauses" that allow the FDEP to incorporate new discharge limits when a TMDL is established. These new limitations may be incorporated into a permit when a TMDL is implemented or at the next permit renewal, depending on the timing of the permit renewal and workload. For NPDES municipal stormwater permits, the FDEP will insert the following statement once a BMAP is completed (FDEP 2003):

> *The permittee shall undertake those activities specified in the (Name of Waterbody) BMAP in accordance with the approved schedule set forth in the BMAP.*

The FDEP implements the NPDES stormwater program in Florida under delegation from the EPA. The program requires the regulation of stormwater runoff from MS4s generally serving populations of more than 10,000 and denser than 1,000 per square mile, construction activity disturbing more than one acre of land, and ten categories of industrial activity. An MS4 can include roads with drainage systems, gutters, and ditches, as well as underground drainage, operated by local jurisdictions, the FDOT, universities, local sewer districts, hospitals, military bases, and prisons. Currently there are no MS4 permits within the Apalachicola River and Bay watershed in Florida.

Domestic and Industrial Wastewater Permits

In addition to NPDES-permitted facilities, all discharge to surface waters, Florida also regulates domestic and industrial wastewater discharges to groundwater via land application. Since groundwater and surface water are so intimately linked in much of the state, reductions in loadings from these facilities may be needed to meet TMDL limitations for pollutants in surface waters. If such reductions are identified in the BMAP, they would be implemented through modifications of existing state permits (FDEP 2003).

Best Management Practices (BMPs)

Best management practices may include structural controls (such as treatment ponds) or nonstructural controls (such as street sweeping and public education). Many BMPs have been developed for urban stormwater to reduce pollutant loadings and peak flows. These BMPs accommodate site-specific conditions, including soil type, slope, depth to groundwater, and the use designation of receiving waters.

The passage of the 1999 Florida Watershed Restoration Act (Chapter 99-223 Laws of Florida) increased the emphasis on implementing BMPs to reduce NPS pollutant discharges from agricultural operations. It authorized the FDEP and the FDACS to develop interim measures and agricultural BMPs. While BMPs are adopted by rule, they are voluntary if not covered by regulatory programs. If adopted by rule and the FDEP verifies their effectiveness, then implementation provides a presumption of compliance with water quality standards, similar to that granted a developer who obtains an ERP (FDACS 2016a, 2016b). Best management practices have been developed and adopted into rules for silviculture, row crops, container plants, cow/calf, and dairies. A draft BMP for poultry has been developed and adoption is expected by late 2016 (FDACS 1993, 2016a, 2016b).

Over the last several years, the FDACS has worked with farmers, soil and water conservation entities, the UF-IFAS, and other interests to improve product marketability and operational efficiency of agricultural BMPs, while at the same time promoting water quality and water conservation objectives. In addition, programs have been established and are being developed to create a network of state, local, federal, and private sources of funds for developing and implementing BMPs.

Florida Environmental Resource Permitting (ERP)

Florida established the ERP program to prevent stormwater pollution to Florida's rivers, lakes, and streams, and to help provide flood protection. The ERP program regulates the management and storage of surface waters and provides protection for the vital functions of wetlands and other surface waters. Environmental resource permits are designed to obtain 80 percent average annual load reduction of total suspended solids. In northwest Florida, the ERP program is jointly implemented by the NWFWMD and the FDEP. These permits are processed by either the FDEP or a water management district throughout Florida. (USFWS 2016c)

Regional Mitigation for State Transportation Projects

Under Section 373.4137, F.S., the NWFWMD offers mitigation services, as an option, to the FDOT for road projects with unavoidable wetland impacts when the use of private mitigation banks is not feasible. As required by this statute, a regional mitigation plan (a.k.a., Umbrella Plan) has been developed, and is updated annually to address the FDOT mitigation needs submitted to the NWFWMD. Components of the Umbrella Plan include the federally permitted "In-Lieu Fee Program" instrument and other mitigation projects (NWFWMD 2017b). The District does not compete with private mitigation banks, although no mitigation banks are currently within the Apalachicola River and Bay watershed. The District's mitigation is developed and implemented in consultation with the FDOT, FDEP, the USACE, the EPA, the USFWS, the U.S. National Marine Fisheries Service, and the FWC and is maintained and available for review at http://www.nwfwmdwetlands.com/.

Since 1997, the NWFWMD has implemented mitigation at 32 sites districtwide. In the Apalachicola River and Bay watershed, these include shoreline marsh restoration at Cat Point; preservation and habitat restoration at the Bellamy mitigation area on the Chipola River; and hydrologic restoration activities in Tates Hell Swamp (Pine Log Creek, Doyle Creek, Whiskey George Creek, and Sumatra basins) and the Money Bayou basin.

Florida Forever Work Plan

Florida Forever is Florida's conservation and recreation lands acquisition program. Under Section 373.199, F.S., and the NWFWMD Florida Forever 2016 Five Year Work Plan, a variety of projects may be implemented, including capital projects, land acquisition, and other environmental projects. Since its inception, the District's land acquisition program has sought to bring as much floodplain as possible of the major rivers and creeks under public ownership and protection. District managed lands are described above and in Appendix G.

In 2015, voters in the state passed the Florida Land and Water Conservation Amendment (Amendment 1). The amendment funds the Land Acquisition Trust Fund to acquire, restore, improve, and manage conservation lands including wetlands and forests; fish and wildlife habitat; lands protecting water resources and drinking water sources, including the Everglades, and the water quality of rivers, lakes, and streams; beaches and shores; outdoor recreational lands; working farms and ranches; and historic or geologic sites, by dedicating 33 percent of net revenues from the existing excise tax on documents for 20 years. In 2016, the Florida legislature appropriated $15 million to Florida Forever for conservation easements and increasing water supplies (FDEP 2016k).

Spring Protection and Restoration

In 1999, the Secretary of the FDEP formed a multiagency Florida Springs Task Force to recommend strategies for protecting and restoring Florida’s springs. The Task Force was composed of a group of 16 that included scientists, planners, and other citizens. Its recommendations included action steps for research and monitoring, education, and assistance with BMPs for landowners. In November 2002, the Florida Department of Community Services and the FDEP published *Protecting Florida’s Springs: Land Use Planning Strategies and Best Management Practices*. This manual was based on the recommendations developed by the Florida Springs Task Force.

In 2001, the legislature first approved funding for the Florida Springs Initiative, an effort to understand more about the water quality and quantity of over 30 first-magnitude springs throughout north and central Florida. The FDEP requested the assistance of the Northwest Florida, Suwannee River, and Southwest Florida Water Management Districts to help collect and interpret water quality and discharge data from first-magnitude springs within district boundaries. This effort includes activities such as sample collection and analysis, the delineation of spring recharge areas, the development of a groundwater monitoring network, and implementation of projects to help landowners reduce nutrient loading in spring recharge areas.

Protection and restoration of northwest Florida’s springs and associated systems are a continuing priority. Current and recent activities include several restoration and protection projects for Jackson Blue Spring, including agricultural BMP cost share grants and connection of residences currently served by septic systems to central sewer. In 2016, the Florida legislature passed the Legacy Florida Act and appropriated $50 million for springs restoration and protection, which is anticipated to result in significant benefits for this and other watersheds around the state (FDEP 2017e).

Florida Forever Work Plan

Florida Forever is Florida’s conservation and recreation lands acquisition program. Under section 373.199, F.S., and the NWFWMD Florida Forever 2016 Five Year Work Plan, a variety of projects may be implemented, including capital projects, land acquisition, and other environmental projects. Since its inception, the District’s land acquisition program has sought to bring floodplain the major rivers and creeks, as well as springs and priority recharge areas, under public ownership and protection.

In 2015, voters in the state passed the Florida Land and Water Conservation Amendment (Amendment 1). The amendment funds the Land Acquisition Trust Fund to acquire, restore, improve, and manage conservation lands including wetlands and forests; fish and wildlife habitat; lands protecting water resources and drinking water sources, outdoor recreational lands; working farms and ranches; and historic or geologic sites, by dedicating 33 percent of net revenues from the existing excise tax on documents for 20 years. In 2016, the Florida legislature appropriated $15 million to Florida Forever for conservation easements and increasing water supplies.

Minimum Flows and Minimum Water Levels (MFLs)

Section 373.042, F.S., requires each water management district to develop minimum flows and minimum water levels (MFLs) for specific surface and groundwaters within their jurisdiction. A minimum flow is defined by section 373.042, F.S., as "the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area," and a minimum water levels is "the level of groundwater in an aquifer and the level of surface water at which further withdrawals would be significantly harmful to the water resources or ecology of the area." Minimum flows and minimum water levels are calculated using best available data and consider natural seasonal fluctuations; non-consumptive uses; and environmental values associated with coastal, estuarine, riverine, spring, aquatic, and wetlands ecology as specified in Section 62-40.473, F.A.C.

The process of establishing MFLs involves a series of steps including identification of priority waterbodies, data collection, technical assessments, peer review, rule-making and rule adoption. Adopted MFLs are considered when reviewing consumptive use permit applications. A recovery or prevention strategy must be developed for any waterbody where consumptive uses are currently or anticipated to result in flows or levels below an adopted MFL.

The technical evaluation for each MFL is expected to require approximately five years of data collection and analysis. Data collection is being conducted concurrently for several waterbodies. The District is currently working on an MFL for Jackson Blue Spring, with a technical assessment scheduled for completion in 2022 (NWFWMD 2017c). Additionally, the District adopted a reservation for the Apalachicola and Chipola rivers, reserving the magnitude, duration, and frequency of observed flows for the protection of fish and wildlife, as specified in Chapter 40A-2.223, FAC.

University of Florida Institute of Food and Agricultural Sciences Extension (UF-IFAS)

The UF-IFAS is a federal-state-county partnership that focuses on research, teaching, and extension to "develop knowledge in agriculture, human and natural resources, and the life sciences, and enhance and sustain the quality of human life by making that information accessible."

Many UF-IFAS and other UF programs are active in protecting water resources across the Apalachicola River and Bay watershed through research and extension programs conducted by faculty from many colleges, institutes and program partnerships. Such programs include the School of Forest Resources and Conservation, the Florida Cooperative Fish and Wildlife Research Unit, the Natural Resources Leadership Institute, and County Extension Faculty in each of the six river counties. According to Lovestrand (2017), work conducted by these programs includes freshwater and marine fisheries, wildlife, invasive species, community outreach and education on water issues, and agricultural BMPs. The Florida Sea Grant College program is also housed at UF and supports many activities in the coastal region of the watershed related to water resources such as shellfish aquaculture extension, and seafood industry research and support through the UF Oyster Recovery Team. This team comprises about 20 faculty and staff from different disciplines including the Emerging Pathogens Institute, Florida Sea Grant administration, County Extension Faculty, the Dept. of Family, Youth and Community Sciences and others.

To promote environmentally sound forestry practices, the UF-IFAS offers the voluntary Forest Stewardship Program, which seeks to help private landowners develop a plan to increase the economic value of their forestland while maintaining its environmental integrity. The Extension also works with farmers and property owners across the state to minimize the need for commercial pesticides and fertilizers, through environmentally friendly BMPs.

Riparian Counties Stakeholder Coalition

The Riparian County Stakeholder Coalition (RCSC) was established to advocate for the interests and needs related to the functions supported by the Apalachicola River for the six board of county commissions that border the river. The RCSC was created by resolution in 2007 and later by compact in 2012. It is comprised of Calhoun, Franklin, Gadsden, Gulf, Jackson and Liberty counties.

Apalachicola Riverkeeper

Apalachicola Riverkeeper is a non-profit organization dedicated to protection, restoration, and stewardship of the Apalachicola River and Apalachicola Bay. Its mission is "to provide stewardship and advocacy for the protection of the Apalachicola River and Bay, its tributaries and watersheds, in order to improve and maintain its environmental integrity and to preserve the natural, scenic, recreational, and commercial fishing character of these waterways" (Apalachicola Riverkeeper 2017). Part of the Waterkeeper Alliance, Apalachicola Riverkeeper is a 501(c)3 nonprofit organization.

ACF Stakeholders

The ACF Stakeholders (ACFS) is a diverse group of cities, counties, industries, businesses, fishermen, farmers, historic/cultural, environmental, conservation and recreation groups from Florida, Alabama, and Georgia, working together to achieve "…equitable water-sharing solutions among stakeholders that balance economic, ecological, and social values, while ensuring sustainability for current and future generations" (ACFS 2017). The ACFS was incorporated as a 501(c)3 nonprofit organization in 2009.

Seafood Management Assistance Resource and Recovery Team

To work toward a better future for Apalachicola Bay, seafood industry workers launched a community-based collaborative effort to develop a sustainable and resilient resource management plan to ensure the future of Franklin County's seafood heritage. The Seafood Management Assistance Resource and Recovery Team (SMARRT) includes representatives of different sectors of the local seafood industry. The Team works closely with governmental leaders and community organizations to build local capacity and consensus.

Appendix C Geographic and Physical Characteristics

Overview

The greater ACF rivers basin covers approximately 20,149 square miles (12,895,291 acres) of Georgia, Florida, and Alabama. About 72 percent of this area is within Georgia, with about 14 percent each within Florida and Alabama.

The watershed extends from the Appalachian Mountains and Piedmont in northern Georgia to the Gulf coastal plain. The Chattahoochee and Flint rivers flow through several different geological formations. The Flint River formation (along with its contemporary Suwannee limestone) and the Ocala limestone have the greatest influence on the Apalachicola River (Leitman *et al.* 1984). The Flint River formation consists primarily of sand, gravel and mottled clay. The Ocala limestone consists of calcium carbonate.

There is considerable topographical variation, with the highest elevations in north Georgia, grading to a nearly flat coastal plain in the south. The overall land use coverage includes intensive urban development in north Georgia, as well as substantial agricultural areas, particularly within the Flint River basin. Within Florida, most of the watershed is forest or wetland, with some agricultural uses in the northern extent of the watershed.

Table C-1 Generalized Land Use and Land Cover: ACF Rivers Basin (Tristate Area)

Land Cover	Area **(Square Miles)**	Percent Coverage
Water	373.98	1.9
Developed	2,029.79	10.1
Open Land	73.54	0.4
Upland Forest	10,550.53	52.4
Agriculture	4,941.52	24.6
Wetlands	2,155.23	10.7
Totals	**20,124.60**	**100.0**

The following three figures depict the interstate ACF basin, interstate topography, and generalized land use and land cover.

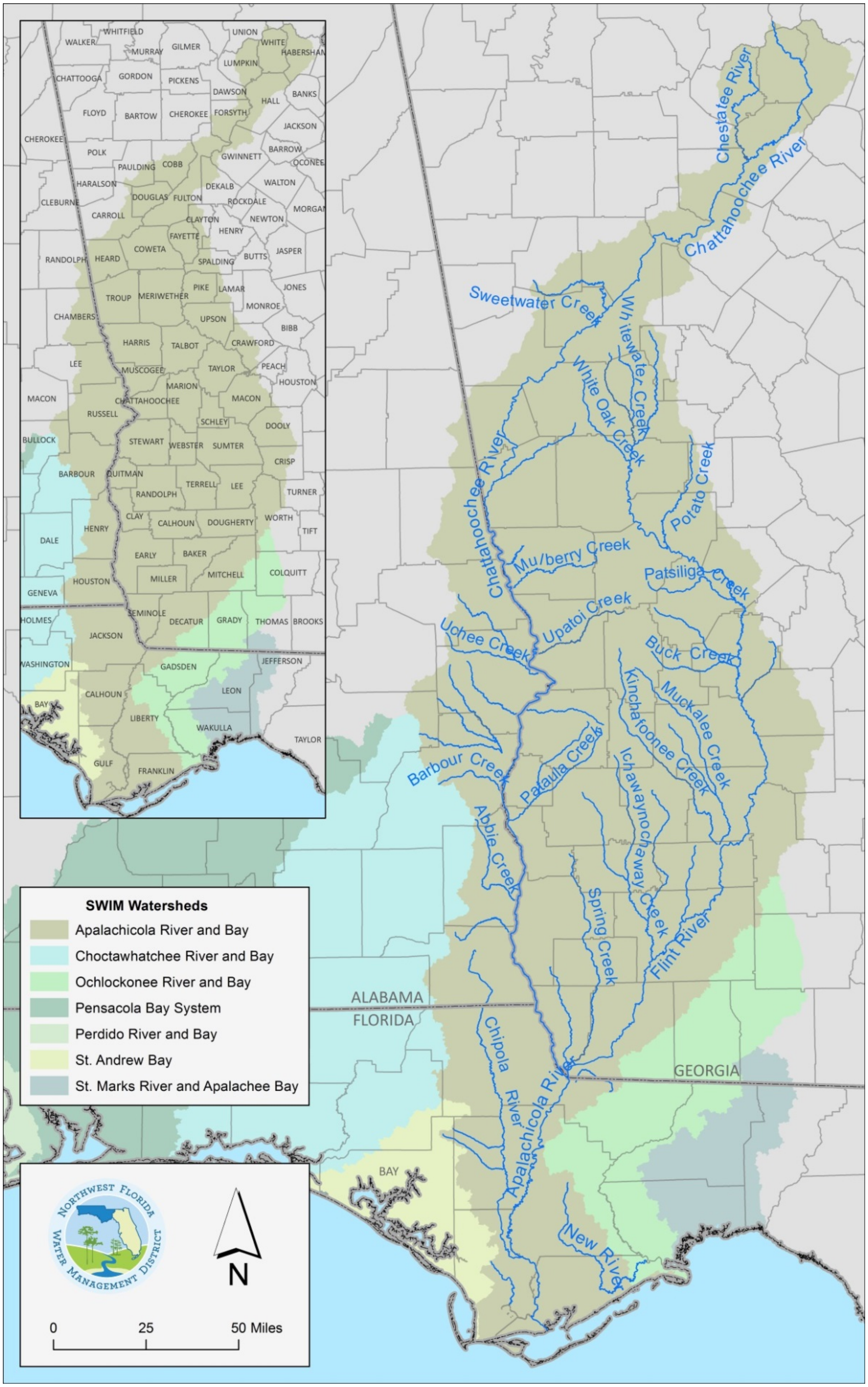


Figure C-1 Interstate Apalachicola River and Bay Watershed

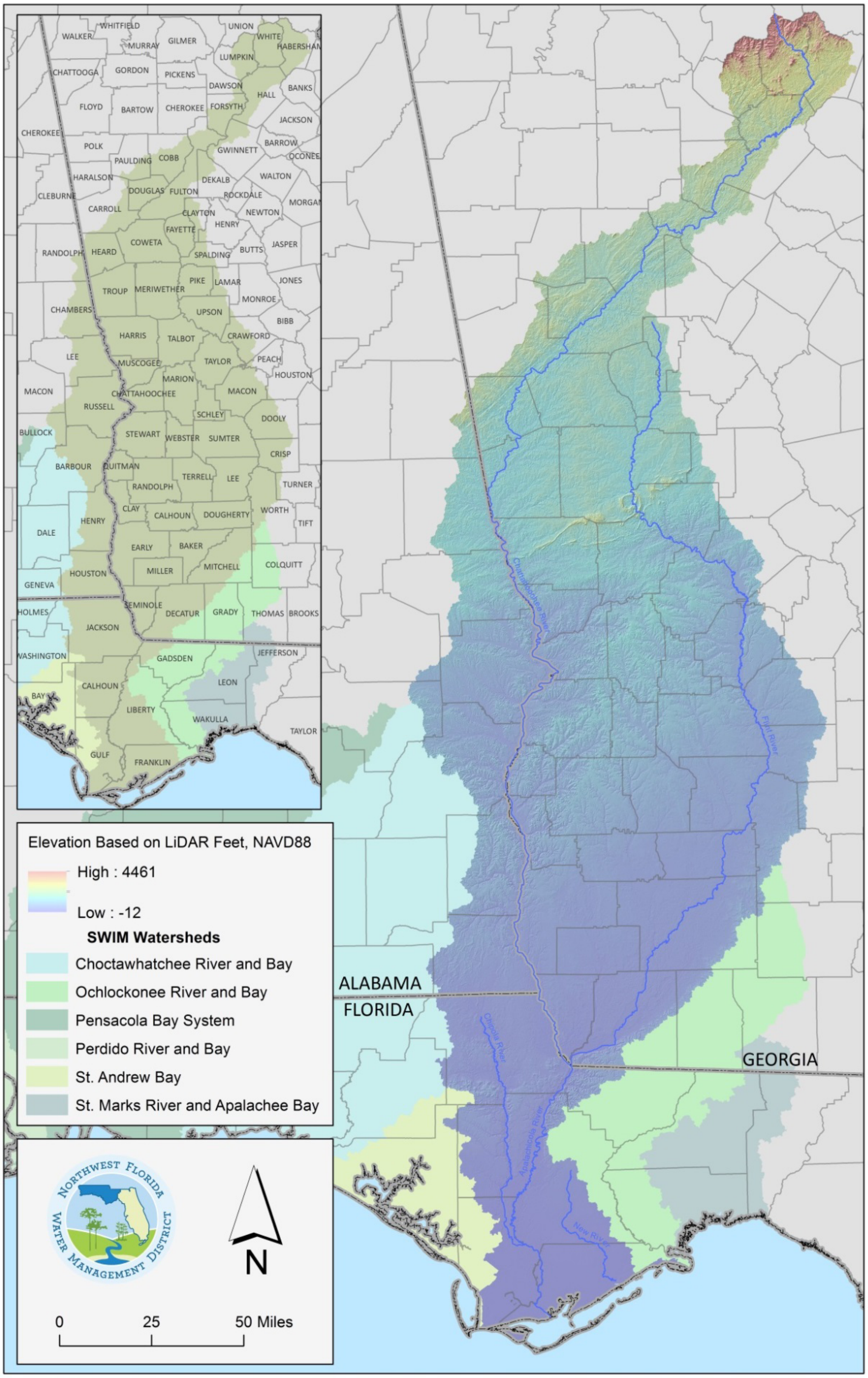


Figure C-2 Interstate Apalachicola River and Bay Watershed Topography and Hydrology

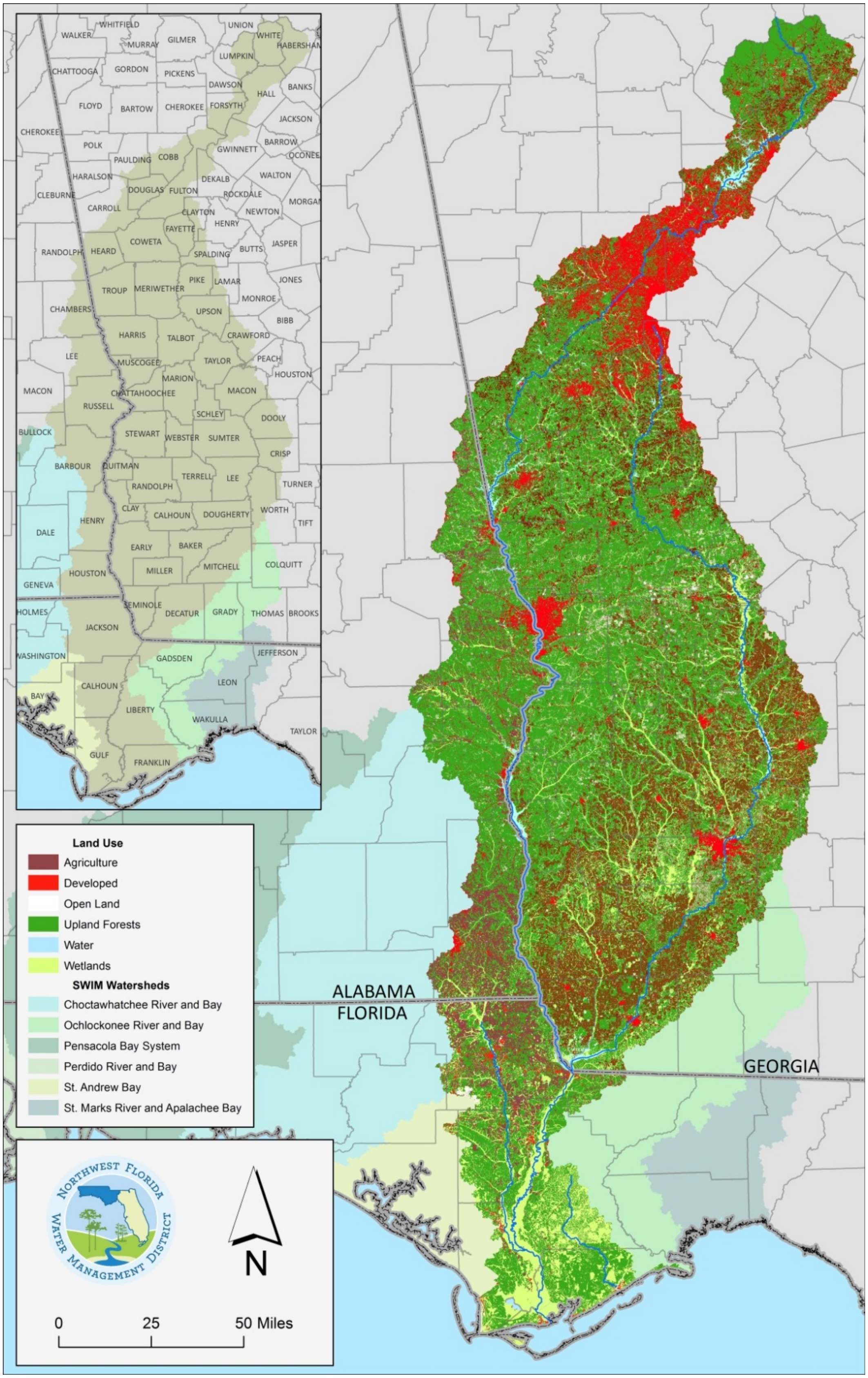


Figure C-1 Land Use in the Interstate Apalachicola River and Bay Watershed

Geology of the Apalachicola River Basin

The geologic formations that underlie the Apalachicola watershed in Florida range in age from late Eocene to Recent. These include the Ocala Limestone, Marianna Limestone, Suwannee Limestone, Chattahoochee Formation, St. Marks Formation, Bruce Creek Limestone, Intracoastal Formation, Chipola Formation, Jackson Bluff Formation, and undifferentiated sands and clays of Pleistocene to Recent age (Schmidt 1984). The predominantly carbonate units collectively comprise the Floridan aquifer system, the major source of ground water in the region. The overlying, predominantly clastic units comprise the intermediate and surficial aquifer systems. Of the three hydrostratigraphic systems present, the Surficial Aquifer System is best connected hydraulically to the Apalachicola River and its floodplain.

The watershed encompasses portions of the Dougherty karst and the Apalachicola embayment hydrogeologic regions (Pratt *et al.* 1996). The Dougherty Karst includes Jackson County, northern Calhoun County, and northwest Gadsden County. The Apalachicola Embayment includes Gulf County, southern Calhoun County, most of Liberty and Gadsden counties, and western Franklin County. Eastern Franklin County extends into the Woodville karst region. The Apalachicola Embayment is characterized by relatively poor connectivity between surface and ground waters (NWFWMD 2014). The Dougherty Karst Region, however, has a dynamic flow system with a strong hydraulic connection between ground and surface waters, with karst features and high recharge rates.

The bed of the Apalachicola River is composed primarily of sand and gravel remnants of Pleistocene deposits. Many of these were deposited in the floodplain over time by earlier actions of the river and have become reincorporated into the river bottom through erosion processes. The larger size particles are predominantly in the upper portion of the river while smaller sized particles tend to be transported out of the upper reaches where the slope is steeper resulting in higher velocity flows. As the gradient is reduced in the lower reaches, velocities slow and smaller particles tend to settle (Leitman *et al.* 1984).

The coast within the region is a classic example of a cuspate foreland and delta with Little St. George and Cape San Blas as the horns in the cuspate outline. The presence of Holocene age (from approximately 2.6 million years ago to present day) alluvial sediments in a 50-mile-wide band extending from Panama City to the present day Ochlockonee River indicate that the Apalachicola delta has migrated between these points in recent geologic time, with the most recent movement being in an easterly direction (Schnable and Goodell 1968). The original source of sands that make up the barrier island system off the Apalachicola River is the Appalachian Piedmont (Schnable 1966). These sands are extensively reworked coastal plain sediments deposited at lower sea levels.

Isphording (1985) estimated that sand represents only about one-percent of the sediment load deposited in the bay by the river. Some clay and some silt-sized materials reach the Gulf, being deposited in a small basin between Cape San Blas and St. Vincent Island. The bulk of the sediment load of the Apalachicola River, both coarse and fine, is believed to have been deposited in the modern prograding, or forward moving, delta front since sea level attained its present position (Schnable 1966). Over time, the delta is believed to have prograded about five to ten miles.

Apalachicola Bay is considered to be less than 10,000 years old, with the general outline of the bay stable over the last 5,000 years with the exception of migration of the delta front southward into the estuary (Tanner 1983). In general, the sedimentary floor of the bay system is formed by quartz sand with a thin cover of clay in the central basin. Oyster reefs have contributed substantial calcareous debris to estuarine sediments. St. George Sound is predominantly sandy, whereas the rest of the bay sediments have varying degrees of clay mixed with sand.

Biological assemblages contribute organic material and calcareous debris to the sediment. Once in the sediment, organic material becomes food for burrowing organisms and is acted upon by bacteria and returned to the water column as inorganic nutrients. Kofoed and Gorsline (1963) found that a correlation exists between bathymetry and organic content of the sediments. Organic carbon values were found to be low in elevated areas where organic material is easily re-suspended from the sediment by current action. In depressions, the organic carbon content tends to increase. Organic carbon and nitrogen are deposited under the same energy conditions as clay, and the percent composition is therefore greater in the finer sediments.

Apalachicola Bay's sedimentary environment is impacted from the long-term influences of submarine topography. Overall, the sediment's is uniform in mean grain size and carbonate content amongst basins and shoals investigated.

Approximately 105 different series of soils are found in the Apalachicola River Basin (USGS 2016a). These series are conglomerated into broader series categories by Couch *et al.* (1996). Soils can generally be divided into hydric and non-hydric. Hydric soils are defined as "formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (NRCS 2016b). Soil orders known as ultisols, entisols, and spodosols, are found in the six primary land-resource areas that are found in the basin.

Much of the Apalachicola watershed is comprised primarily of spodosols. The spodosols here are poorly-to-very poorly drained. These soils correspond with areas that remain saturated such as floodplains where flooding occurs often or the water table is near the surface (USGS 2016a).

During a historical assessment of Apalachicola Bay, Isphording (1985) compared the present bottom sediment types with those in 1825 by dating core samples. There was little difference in St. George Sound sediments; however, in the rest of the bay, there was a considerable shift from silts to clays. Clays, sandy clays, and clayey sands which are so widespread on the present map were formerly silty clays, silty sands, and sand-silt-clay mixtures. Isphording (1985) hypothesized that the present scarcity of silt in the Apalachicola Bay sediments is due to either: a change in the sediment carried by the Apalachicola River due to the upstream reservoirs; events taking place in the bay which have acted to remove or bury silt; or, a combination of both.

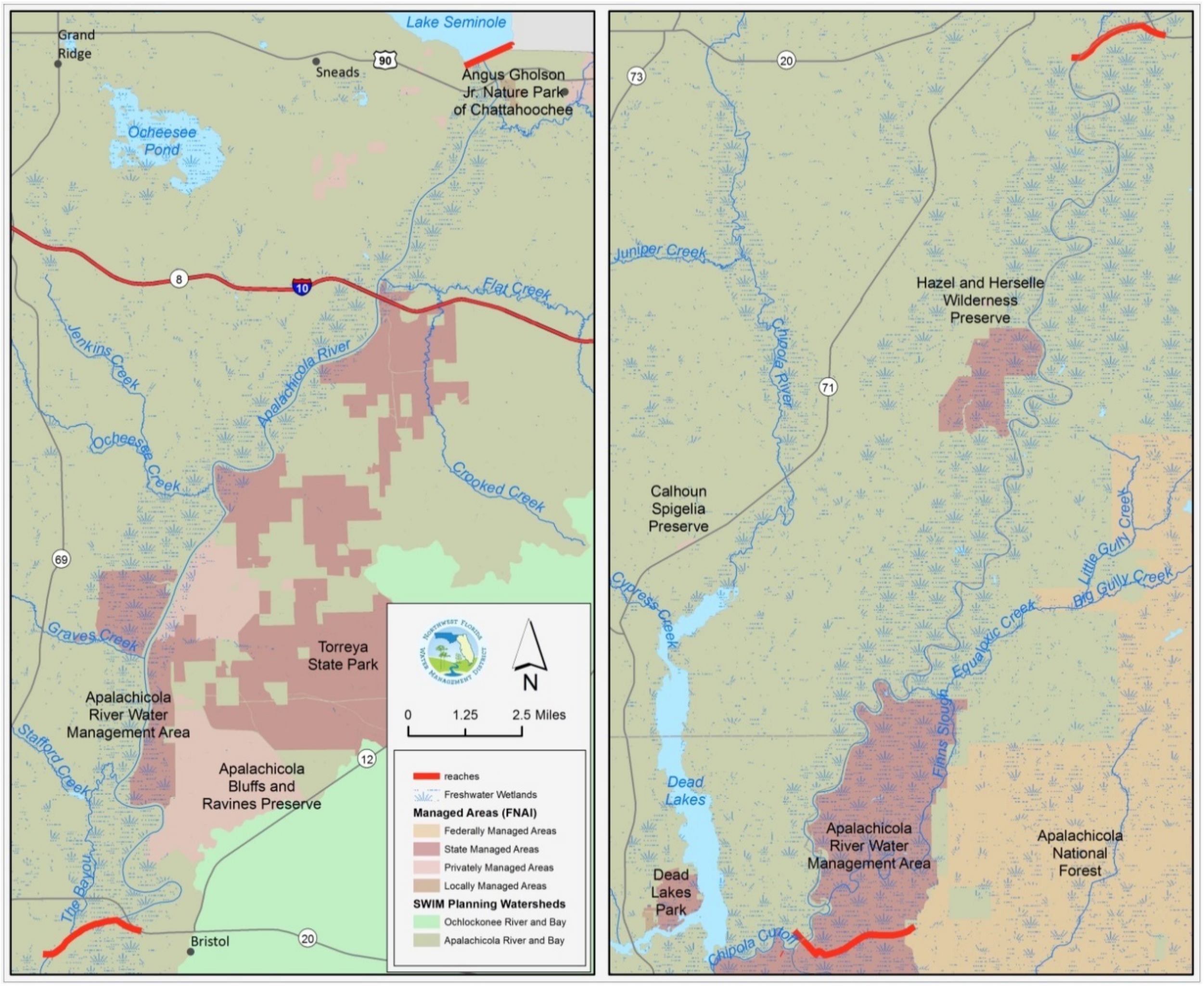
The Florida portion of the Apalachicola River and Bay watershed is comprised of two major land-resource areas. The upper portion of the watershed lies in the southern Coastal Plain land-resource area. This region is dominated by ultisols—highly weathered soils derived from igneous or metamorphic rock with sandy or loamy surfaces and loamy or clayey subsoils. The lower portion of the watershed lies in the Eastern Gulf Coast Flatwoods land-resource area. This area is dominated by entisols and spodisols. Entisols are young soils, and in the present case are composed primarily of sand. Spodisols are distinguished by an organic hardpan, usually located between several inches and four feet below the surface and consisting of sand particles cemented by organic matter and aluminum oxides. Soils in this region tend to be highly acidic and low in fertility. The better drained soils in this region are often used for silviculture, while wetter areas often remain as natural habitat.

A more detailed description of physiography by river reach follows.

Upper River

The upper river corridor from Chattahoochee to Blountstown cuts through sediments of Miocene age. Steep bluffs on the east side of the upper river form the western boundary of the Tallahassee Hills province where elevations are as high as 325 feet (Leitman *et al.* 1984). The land west of the upper river gradually rises from the floodplain to the Grand Ridge province, a gently rolling region which gradually rises to elevations as high as 125 feet. West of the Grand Ridge area, the land drops slightly to the Marianna Lowlands, a karst plain drained by the Chipola River (Leitman *et al.* 1984). The Marianna Lowlands were once highlands but have been substantially eroded by streams and are now a highly fertile area supporting considerable agriculture in the Jackson County area (Edmiston and Tuck 1987).

The floodplain of the upper river is one to two miles wide, and the river itself has long, straight reaches and wide, gentle bends (Leitman et al. 1983). Natural riverbank levees are higher and wider here than the rest of the river ranging up to 15 feet above the surrounding floodplain and from 400 to 600 feet wide.



Middle River

The middle river from Blountstown to Wewahitchka is characterized by deposits from the Holocene and Pleistocene periods. For the first few miles, it is bounded on the east by the Beacon Slope region where altitudes are as high as 150 feet. The Gulf Coastal Lowlands, which are below 100 feet in elevation and generally flat and sandy representing uplifted sea bottom (Edmiston and Tuck 1987), lie to the south and west of the Beacon Slope (Leitman *et al.* 1984).

In this region, the floodplain becomes wider, two to three miles across, and the river meanders with large loops in the Beacon Slope area and many small tight bends further south (Leitman et al. 1983). The natural riverbank levees are smaller than in the upper river ranging from 200 to 400 feet wide in the middle section of the river. Water level fluctuations are less, ranging from 11 to 19 feet above low stage during flood stage (Edmiston and Tuck 1987).

Lower River

The lower river from Wewahitchka to the City of Apalachicola lies completely within the Gulf Coastal Lowlands with surrounding land surface elevations less than 50 feet. The Chipola River joins the Apalachicola River at navigation mile 28 south of Wewahitchka.

The floodplain is the widest in this section, 3 to 5 miles across, and the river is characterized by long, straight reaches with a few small bends (Leitman *et al.* 1984). The natural riverbank levees vary from 2 to 8 feet higher than the surrounding floodplain and are 50 to 150 feet wide on the average.

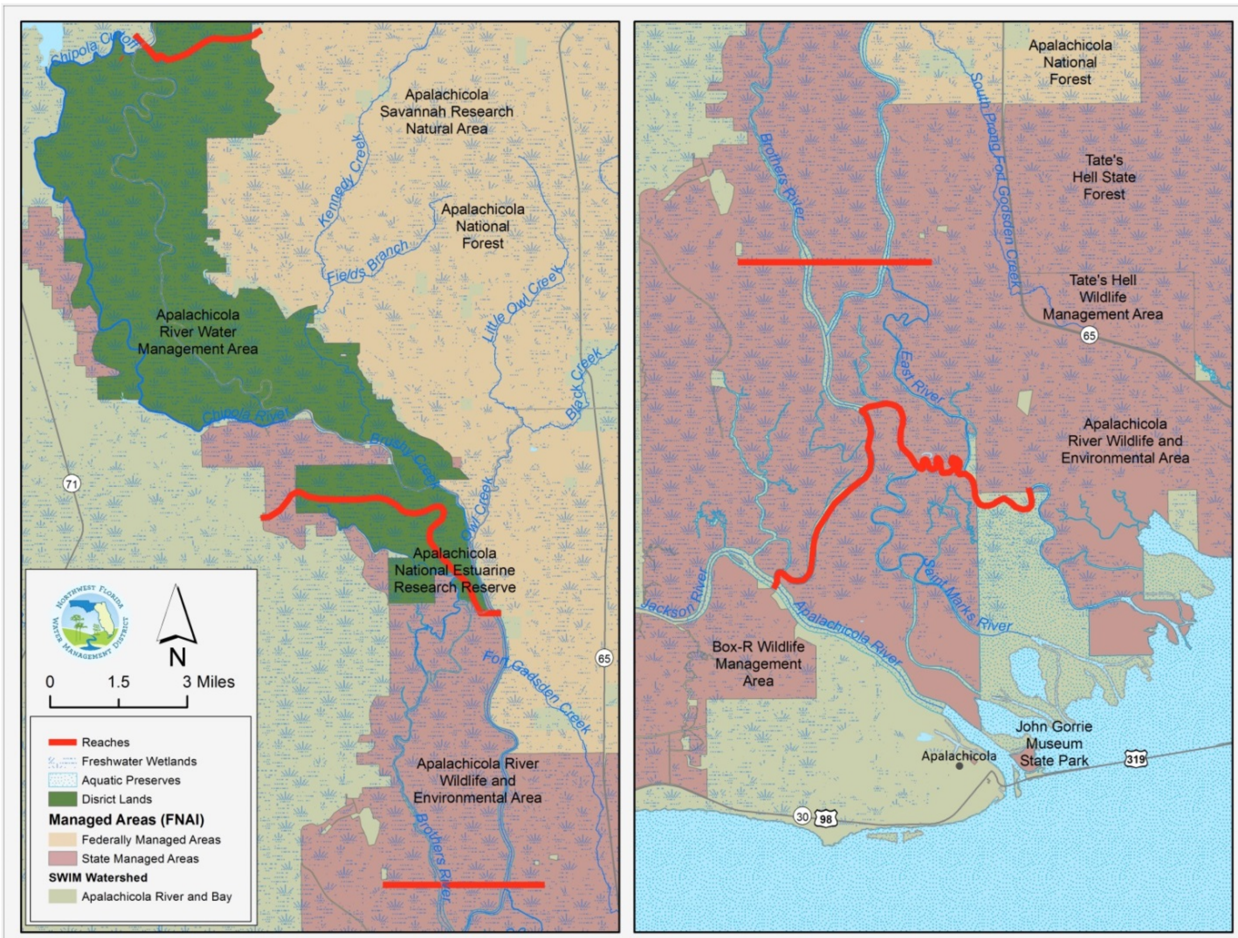


Figure C-4 Apalachicola River Lower River Corridor

Floridan Aquifer Vulnerability Assessment

In 2017, the Florida Geological Survey released the Floridan Aquifer System Contamination Potential (FAVA II) dataset (Figure C-5). This dataset was calculated through the application of the weights of evidence method. This method examines different data layers including point and area data to determine relative vulnerability. These maps were developed to provide FDEP with a ground-water resource management and protection tool to carry out agency responsibilities related to natural resource management and protection regarding the Floridan Aquifer System. The maps are not appropriate for site specific analysis.

As depicted in the figure, those areas where the Floridan Aquifer is most vulnerable to contamination are prevalent throughout the northern and eastern portions of the basin. This region includes the spring recharge areas and most of the populated and agricultural areas, including the eastern coastal barriers. Regions within the planning area classified as more vulnerable are present in a few areas, including along portions of both river corridors. One limited region classified as vulnerable exists in the southwest.

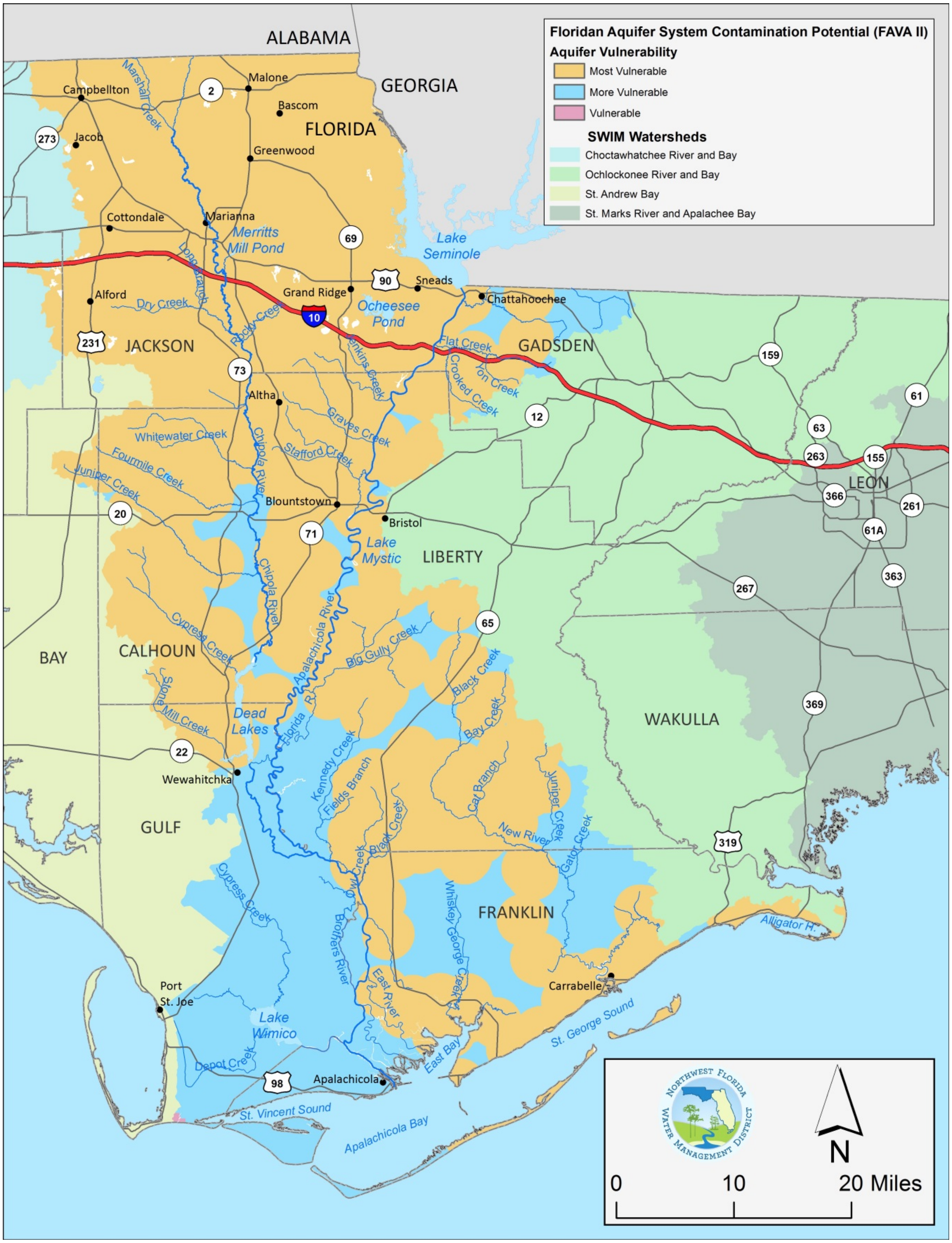


Figure C-5 **Floridan Aquifer System Contamination Potential**

Appendix D Threatened and Endangered Species

The Apalachicola River and Bay support a vast number of species, many of which are imperiled. The following is a list compiled by the U.S. Fish and Wildlife Service (December 2015) of federally listed species existing in the eight member counties of the Florida section of the watershed.

Scientific Name	Common Name	Regulatory Designation			Natural Communities
		FNAI	State	Federal	
Plants					
Actaea pachypoda	White Baneberry	S1	N	E	Terrestrial: mixed pine-hardwood forest on mesic and occasionally xeric slopes of ravines and bluffs; occasional limestone outcrops
Agrimonia incisa	Incised Groove-bur	S2	T	N	Terrestrial Habitat(s): Forest/Woodland, Woodland - Conifer, Woodland - Mixed
Andropogon arctatus	Pinewood Bluestem	S3	T	N	Lacustrine: wet pine flatwoods, seepage wetlands, bogs, wet pine savannas
Arabis canadensis	Sicklepod	S1	E	N	Terrestrial: upland mixed forest, limestone outcrops
Arnica acaulis	Leopard's Bane	S2	E	N	Terrestrial: upland pine, bottomland forest
Arnoglossum diversifolium	Variable-leaved Indian-plantain	S2	T	N	Palustrine Habitat(s): Forested Wetland, Riparian Terrestrial Habitat(s): Forest - Hardwood, Forest/Woodland
Asclepias viridula	Green Milkweed	S2	T	N	Palustrine: wet prairie, seepage slope edges Riverine: seepage stream banks Terrestrial: mesic flatwoods, drainage ditches
Asplenium heteroresiliens	Wagner's Spleenwort	S1	N	N	Terrestrial: rockland hammocks, limestone outcrops, grottoes, and sinkholes
Aster fragilis var. brachypholis	Apalachicola River Aster	S1	N	N	Palustrine: wet prairie, seepage slope edges Riverine: seepage stream banks
Aster hemisphericus	Aster	S1	E	N	Terrestrial: upland mixed forest, on sandstone outcrop
Aster spinulosus	Pinewoods Aster	S1	E	N	Palustrine: seepage slope Terrestrial: sandhill, scrub and mesic flatwoods
Baptisia megacarpa	Apalachicola Wild Indigo	S2	E	N	Palustrine: floodplain forest Terrestrial: upland mixed forest, slope forest

Scientific Name	Common Name	Regulatory Designation			Natural Communities
		FNAI	State	Federal	
Bigelowia nuttallii	Nuttall's Rayless Goldenrod	S1	E	N	Riverine: seepage stream banks Terrestrial: scrub, upland pine forest - sandstone outcrops
Brickellia cordifolia	Flyer's Nemesis	S1	E	N	Terrestrial: upland hardwood forest, near streams
Calamintha dentata	Toothed Savory	S3	T	N	Terrestrial: longleaf pine-deciduous oak sandhills, planted pine plantations, sand, open and abandoned fields, and roadsides
Callirhoe papaver	Poppy Mallow	S2	E	N	Terrestrial: upland mixed forest, roadsides; edge or understory
Callophrys hesseli	Hessel's Hairstreak	S2	N	N	Terrestrial: upland hardwood forest, slope forest, bluffs
Calopogon multiflorus	Man-flowered Grass-pink	S2S3	T	N	Palustrine: mesic and wet flatwoods, wet prairie, depression marsh Terrestrial: mesic flatwoods
Calycanthus floridus	Sweetshrub	S2	E	N	Terrestrial: upland hardwood forest, slope forest, bluffs Palustrine: bottomland forest, stream banks, floodplains
Calystegia catesbaeiana	Catesby's Bindweed	S1	E	N	Terrestrial: Longleaf pine-wiregrass sandhill
Carex baltzellii	Baltzell's Sedge	S3	T	N	Terrestrial: slope forest, moist sandy loam; moist sandy loam
Carex microdonta	Small-toothed Sedge	S1	E	N	Terrestrial: upland mixed forest, shell mound, rockland hammock; on limestone
Carex tenax	Sandhill Sedge	S3	N	N	Terrestrial: pine flatwoods, sandhills
Conradina glabra	Apalchicola Rosemary	S1	E	E	Terrestrial: sandhill dissected by ravines of the Sweetwater Creek system. Light shade to full sunlight; along edges of ravines, pine plantations, and roadsides
Coreopsis integrifolia	Fringeleaf Tickseed	S1	E	N	Lacustrine: forested wetland, riparian
Cornus alternifolia	Pagoda Dogwood	S2	E	N	Palustrine: creek swamps Terrestrial: slope forest, upland hardwood forest, bluffs
Croomia paciflora	Croomia	S2	E	N	Terrestrial: upland hardwood forest, slope forest, bluffs Palustrine: bottomland forest, stream banks, floodplains
Cryptotaenia canadensis	Honewort	S1	E	N	Palustrine: floodplain forest, bottomland forest Riverine: alluvial stream bank

Scientific Name	Common Name	Regulatory Designation			Natural Communities
		FNAI	State	Federal	
Cuphea aspera	Tropical Waxweed	S1	E	N	Palustrine: wet prairie, seepage slope Terrestrial: mesic flatwoods
Dirca palustris	Leatherwood	S2	E	N	Terrestrial: shrub
Drosera filiformis	Threadleaf Sundew	S1	E	N	Lacustrine: exposed lake bottoms
Drosera filiformis	Thread-leaf Sundew	S1	E	N	Lacustrine: sinkhole lake edges Palustrine: seepage slope, wet flatwoods, depression marsh Riverine: seepage stream banks, drainage ditches
Echinacea purpurea	Eastern Purple Coneflower	S1	E	N	Terrestrial: rockland hammocks, limestone outcrops, grottoes, and sinkholes
Epigaea repens	Trailing Arbutus	S2	E	N	Palustrine: floodplain forest Terrestrial: upland mixed forest, slope forest
Eriocaulon nigrobracteatum	Darkheaded Hatpins	S1	E	N	Palustrine: wet boggy seepage slopes, mucky soils
Euphorbia commutata	Wood Spurge	S2	E	N	N/A
Euphorbia telephioides	Telephus Spurge	S1	E	T	Terrestrial: mesic flatwoods; disturbed wiregrass areas, coastal scrub
Forestiera godfreyi	Godfrey's Swamp Privet	S2	E	N	Terrestrial: forest-hardwood, on wooded slopes of lake & river bluffs
Gentiana pennelliana	Wiregrass Gentian	S3	E	N	Palustrine: seepage slope, wet prairie, roadside ditches Terrestrial: mesic flatwoods, planted slash pine
Harperocallis flava	Harper's Beauty	S1	E	E	Palustrine: seepage slope, wet prairie, roadside ditches
Hexastylis arifolia	Heartleaf Wild Ginger	S3	T	N	Riverine: seepage stream bank Terrestrial: slope forest
Hybanthus concolor	Green Violet	S1	E	N	Terrestrial: upland mixed forest
Hydrangea arborescens	Wild Hydrangea	S1	E	N	Terrestrial: rockland hammocks, limestone outcrops
Hymenocallis henryae	Henry's Spiderlilly	S2	E	N	Palustrine: dome swamp edges, wet prairie, wet flatwoods, baygall edges, swamp edges Terrestrial: wet prairies and flatwoods
Ilex amelanchier	Serviceberry Holly	S2	T	N	N/A
Isotria verticillata	Whorled Pogonia	S1	E	N	Terrestrial: sloped forest
Justicia crassifolia	Thickleaved Waterwillow	S2	E	N	Palustrine: dome swamp, seepage slope Terrestrial: mesic flatwoods

Scientific Name	Common Name	Regulatory Designation			Natural Communities
		FNAI	State	Federal	
Kalmia latifolia	Mountain Laurel	S3	T	N	Riverine: seepage stream bank Terrestrial: slope forest, seepage stream banks
Lachnocaulon digynum	Panhandle Bog Buttons	S3	T	N	Riverine: pool Palustrine: bog/fen, forested wetland
Leitneria floridana	Corkwood	S3	T	N	Riverine: seepage stream bank Terrestrial: slope forest, seepage stream banks
Liatris gholsonii	Gholson's Blazing Star	S1	E	N	Terrestrial: mesic flatwoods
Lilium michauxii	Carolina Lily	S2	E	N	N/A
Linum westii	West's Flax	S2	E	N	Palustrine: dome swamp, depression marsh, wet flatwoods, wet prairie, pond margins
Lupinus westianus	Gulf Coast Lupine	S2	T	N	Terrestrial: beach dune, scrub, disturbed areas, roadsides, blowouts in dunes
Macbridea alba	White Birds-in-a-nest	S2	E	T	Palustrine: seepage slope Terrestrial: grassy mesic pine flatwoods, savannahs, roadsides, and similar habitat
Macranthera flammea	Hummingbird Flower	S2	E	N	Palustrine: seepage slope, dome swamp edges, floodplain swamps Riverine: seepage stream banks Terrestrial: seepage slopes
Magnolia ashei	Ashe's Magnolia	S2	E	N	Terrestrial: slope and upland hardwood forest, ravines
Magnolia pyramidata	Pyramid Magnolia	S3	E	N	Terrestrial: slope forest
Malaxis uniflora	Green Addersmouth	S3	E	N	Palustrine: floodplain forest Terrestrial: slope forest, upland mixed forest
Marshallia obovata	Barbara's Buttons	S1	E	N	Terrestrial: sandhill, upland mixed forest
Matelea alabamensis	Alabama Spinypod	S2	E	N	Terrestrial: bluff, slope forest, upland hardwood forest; on slopes
Matelea baldwiniana	Baldwin's Spinypod	S1	E	N	Terrestrial: bluff, upland mixed forest, bottomland forest, roadsides; calcareous soil
Matelea flavidula	Yellowflowered Spinypod	S1	E	N	Terrestrial: moist, nutrient-rich forests , wooded slopes
Myriophyllum laxum	Piedmont Water-milfoil	S3	N	N	Riverine: creek, pool, spring/spring brook Palustrine: riparian, temporary pool
Nyssa ursina	Bog Tupelo	S2	N	N	Open bogs, wet flatwoods, and swamps, often with titi

Scientific Name	Common Name	Regulatory Designation			Natural Communities
		FNAI	State	Federal	
Oxypolis greenmanii	Giant Water-dropwort	S3	E	N	Palustrine: dome swamp, wet flatwoods, ditches: in water
Pachysandra procumbens	Allegheny Spurge	S1	E	N	Terrestrial: upland mixed forest, bluff; calcareous soil
Panicum nudicaule	Naked-stemmed Panicgrass	S3	LT	N	N/A
Paronychia chartacea	Papery Whitlow-wort	S1	E	T	Terrestrial: karst sandhill lake margins
Phoebanthus tenuifolius	Narrowleaf Phoebanthus	S3	LT	N	Terrestrial: sandy pinelands
Physocarpus opulifolius	Ninebark	S1	E	N	Riverine: seepage stream banks
Physostegia godfreyi	Apalachicola Dragon-head	S3	T	N	Palustrine: wet prairie, creek swamps, titi swamps, bogs
Pinguicula ionantha	Godfrey's (violet) Butterwort	S2	E	T	Palustrine: wet flatwoods, wet prarie, bog; in shallow water Riverine: seepage slope; in shallow water. Also, roadside ditches and similar habitat
Pinguicula primuliflora	Primrose-flowered Butterwort	S3	E	N	Palustrine: bogs, pond margins, margins of spring runs
Platanthera clavellata	Little Club-spur Orchid	S1	E	N	Palustrine: wet prairie, seepage slope Terrestrial: mesic flatwoods
Platanthera integra	Yellow Fringeless Orchid	S3	E	N	Palustrine: wet prairie, seepage slope Terrestrial: mesic flatwoods
Podophyllum peltatum	Mayapple	S1	E	N	Terrestrial: mesic hardwood forests, dry-mesic oak-hickory forests
Polygonella macrophylla	Largeleaf jointweed	S2	T	N	Terrestrial: scrub, sand pine/oak scrub ridges
Polymnia laevigata	Tennessee Leaf-cup	S1	E	N	Terrestrial: rich wooded slopes in light to dense shade of mixed mesophytic woods
Quercus arkansana	Arkansas Oak	S3	T	N	Terrestrial: Sandy or sandy clay uplands or upper ravine slopes near heads of streams in deciduous woods
Rhexia parviflora	Apalachicola Meadowbeauty	S2	E	N	Palustrine: dome swamp margin, seepage slope, depression marsh; on slopes; with hypericum
Rhexia salicifolia	Panhandle Meadowbeauty	S2	T	N	Lacustrine: full sun in wet sandy or sandy-peaty areas of sinkhole pond shores, interdunal swales, margins of depression, marshes, flatwoods, ponds and sandhill upland lakes

Scientific Name	Common Name	Regulatory Designation			Natural Communities
		FNAI	State	Federal	
Rhododendron austrinum	Florida Flame Azalea	S3	E	N	Lacustrine: shaded ravines & in wet bottomlands on rises of sandy alluvium or older terraces.
Rhodedendron chapmanii	Chapman's Rhododendron	S1	E	E	Palustrine: seepage slope (titi bog) Terrestrial: mesic flatwoods; ecotone between flatwoods or more xeric longleaf communities and titi bogs
Rhynchospora crinipe	Hairy-peduncled Beakrush	S2	N	N	Riverine: stream and riversides on narrow streamside shelves, sand-clay bars, and occasionally rooted in streambeds
Ruellia noctiflora	Nightflowe-ring Ruellia	S2	E	N	Lacustrine: moist to wet coastal pinelands, bogs, low meadows, open pine savannahs
Salix eriocephala	Hearleaved Willow	S1	E	N	Palustrine: floodplain swamp, alluvial woodlands
Salvia urticifolia	Nettle-leaved Sage	S1	E	N	Terrestrial: upland glade
Schwalbea americana	American Chaffseed		E	E	Palustrine: wet prairie Terrestrial: scrub, sandhill, mesic flatwoods
Scutellaria floridana	Florida Skullcap	S1	E	T	Palustrine: seepage slope, wet flatwoods, grassy openings Terrestrial: mesic flatwoods
Sideroxylon lycioides	Buchthorn	S2	E	N	Palustrine: bottomland forest, dome swamp, floodplain forest Terrestrial: upland hardwood forest
Sideroxylon thornei	Thorne's Buchthorn	S1	E	N	Palustrine: hydric hammock, floodplain swamp
Silene polypetala	Fringed campion	S1	E	E	Terrestrial: upland mixed forest, slope forest, and along utility corridors in appropriate habitats
Spigelia gentianoides	Gentian Pinkroot	S1	E	E	Terrestrial: mixed hardwood forest; rich humus
Stachydeoma graveolens	Mock Pennyroyal	S2	E	N	Palustrine: forested wetland Terrestrial: forest edge, forest/woodland, savanna, woodland - conifer
Stewartia malacodendron	Silky Camelia	S3	E	N	Palustrine: baygall Terrestrial: slope forest, upland mixed forest; acid soils
Taxus floridana	Florida Yew	S2	E	N	Terrestrial: upland mixed forest, slope forest
Thalictrum cooleyi	Cooley's meadowrue		E	E	Palustrine: seepage slope, edges of shrub bogs, disturbed areas; one site on Champion International Corp. land
Thalictrum thalictroides	Rue-anemone	S1	E	N	Terrestrial: slope forest, limestone outcrops

Scientific Name	Common Name	Regulatory Designation			Natural Communities
		FNAI	State	Federal	
Torreya taxifolia	Florida torreya	S1	E	E	Terrestrial: slope forest, upland mixed forest, and ravines
Trillium lancifolium	Narrowleaf Trillium	S2	E	N	Palustrine: bottomland forest Terrestrial: upland mixed forest, slope forest
Uvularia floridana	Florida Merrybells	S1	E	N	Palustrine Habitat(s): Forested Wetland, Riparian Terrestrial Habitat(s): Forest - Hardwood, Forest/Woodland
Xanthorhiza simplicissima	Yellowroot	S1	E	N	Riverine: seepage stream; sandy banks
Xyris isoetifolia	Quillwort Yelloweyed Grass	S1	E	N	Lacustrine: sandhill upland lake margins Palustrine: wet flatwoods, wet prairie
Xyris scabrifolia	Harper's Yelloweyed Grass	S3	T	N	Palustrine: seepage slope, wet prairie, bogs
Xyris stricta obscura	Kral's Yelloweyed Grass	S2	E	N	Lacustrine: sandhill upland lake margins
Invertebrates					
Amblema neislerii	Fat threeridge	S1	E	E(CH)	Riverine: main channels of small to large rivers in slow to moderate currents; fine to medium silty sand, also mixtures of sand, clay, and gravel. Panhandle drainages: Chipola and Apalachicola Rivers
Elliptio chipolaensis	Chipola slabshell	S1	T	T(CH)	Riverine: main channel of the Chipola River and its larger tributaries in substrate combinations of silt, clay, sand and occasionally gravel. Panhandle drainages: Chipola River
Elliptoideus sloatianus	Purple bankclimber	S1S2	T	T(CH)	Riverine: small to large rivers in sand, sand mixed with mud, or gravel substrates with slow to moderate currents. Panhandle drainages: Chipola, Apalachicola, and Ochlockonee Rivers
Hamiota (=Lampsilis) subangulata	Shinyrayed pocketbook	S1S2	E	E(CH)	Riverine: medium-sized creeks to mainstem rivers in a range of substrates including sand, clay, and gravel with slow to moderate current. Panhandle drainages: Econfina (Creek), Chipola, and Ochlockonee (upstream of Lake Talquin) Rivers
Medionidus penincillatus	Gulf Moccasinshell	S2	FE	E(CH)	Riverine: medium-sized creeks to large rivers with sand and gravel substrates in slow to moderated currents

Scientific Name	Common Name	Regulatory Designation			Natural Communities
		FNAI	State	Federal	
Pleurobema pyriforme	Oval Pigtoe	S2	FE	E(CH)	Riverine: medium-sized creeks to small rivers; various substrates; slow to moderate currents
Fish					
Acipenser oxyrhyncus desotoi	Gulf Sturgeon	S2	FT	T(CH)	Estuarine: various Marine: various habitats Riverine: alluvial and blackwater streams
Alosa alabamae	Alabama Shad	S2	N	SC	Main channel of the Apalachicola River
Ameiurus brunneus	Snail Bullhead	S3	N	N	Riverine: alluvial and blackwater streams
Ameiurus serracanthus	Spotted Bullhead	S3	N	N	Riverine: alluvial and blackwater streams
Amphibians					
Ambystoma bishopi	Reticulated Flatwoods Salamander	S2	FE	E(CH)	Terrestrial: slash and longleaf pine flatwoods that have a wiregrass floor and scattered wetlands
Ambystoma cinglataum	Frosted Flatwoods Salamander	S2	FT	T(CH)	Palustrine: wet flatwoods, dome swamp, basin swamp, Terrestrial: mesic flatwoods (reproduces in ephemeral wetlands within this community)
Amphiuma pholeter	One-toed Amphiuma	S3	N	N	Palustrine: wet flatwoods, dome swamp, basin swamp, Terrestrial: mesic flatwoods
Notophthalmus perstriatus	Striped newt	S2S3	C	SSC	Lacustrine Habitat(s): Shallow water Palustrine Habitat(s): Forested Wetland, Herbaceous Wetland, Riparian, Temporary Pool Terrestrial Habitat(s): Woodland - Conifer, Woodland - Mixed
Reptiles					
Agkistrodon contortrix	Eastern Copperhead	S2	N	N	Palustrine Habitat(s): Riparian Terrestrial Habitat(s): Bare rock/talus/scree, Cliff, Desert, Forest - Hardwood, Forest - Mixed, Old field, Savanna, Woodland - Hardwood, Woodland - Mixed
Alligator mississippiensis	American Alligator	S4	FT (S/A)	SAT	Estuarine: herbaceous wetland Riverine: big river, creek, low gradient, medium river, pool, spring/spring brook Lacustrine: shallow water Palustrine: forested wetland, herbaceous wetland, riparian, scrub-shrub wetland

Scientific Name	Common Name	Regulatory Designation			Natural Communities
		FNAI	State	Federal	
Caretta caretta	Loggerhead Sea Turtle	S3	FT	T(CH)	Terrestrial: sandy beaches; nesting
Chelonia mydas	Green Sea Turtle	S2	E	E	Estuarine: bays, inlets Terrestrial: sandy beaches; nesting
Crotalus adamanteus	Eastern Diamondback Rattlesnake	S3	N	N	Palustrine: riparian Terrestrial: grassland/herbaceous, old field, savanna, shrubland/ chaparral, woodland - conifer, woodland - hardwood, woodland - mixed
Dermochelys coriacea	Leatherback Sea Turtle	S2	FT	E	Terrestrial: sandy beaches; nesting
Drymarchon couperi	Eastern Indigo Snake	S3	FT	T	Estuarine: tidal swamp Palustrine: hydric hammock, wet flatwoods Terrestrial: mesic flatwoods, upland pine forest, sandhills, scrub, scrubby flatwoods, rockland hammock, ruderal
Eretmochelys imbricata	Hawksbill Sea Turtle	S1	E	E	Terrestrial: sandy beaches; nesting
Gopherus polyphemus	Gopher Tortoise	S3	ST	C	Terrestrial: sandhills, scrub, scrubby flatwoods, xeric hammocks, coastal strand, ruderal
Graptemys barbouri	Barbour's Map Turtle	S2	SSC	N	Palustrine: floodplain stream, floodplain swamp Riverine: alluvial stream
Lepidochelys kempii	Kemp's Ridley Sea Turtle	S1	E	E	Terrestrial: sandy beaches; nesting
Macrochelys apalachicolae	Alligator Snapping Turtle	S2	N	N	Estuarine: tidal marsh Lacustrine: river floodplain lake, swamp lake Riverine: alluvial stream, blackwater stream
Nerodiaclarkii clarkii	Gulf Salt Marsh Snake	S2	N	N	Estuarine: herbaceous wetland, scrub-shrub wetland
Pituophis melanoleucas mugitus	Florida Pine Snake	S3	ST	N	Lacustrine: ruderal, sandhill upland lake Terrestrial: sandhill, scrubby flatwoods, xeric hammock, ruderal
Birds					
Ammodramus maritimus peninsulae	Scott’s Seaside Sparrow	S3	SSC	N	Estuarine: bays, tidal flats, salt marshes Terrestrial: sandy beaches Marine: aerial, near shore
Calidris canutus rufa	Red knot	S2	N	T	Estuarine: bays, tidal flats, salt marshes Terrestrial: sandy beaches Marine: aerial, near shore

Scientific Name	Common Name	Regulatory Designation			Natural Communities
		FNAI	State	Federal	
Charadrius melodus	Piping Plover	S2	FT	T(CH)	Estuarine: exposed unconsolidated substrate Marine: exposed unconsolidated substrate Terrestrial: dunes, sandy beaches, and inlet areas. Mostly wintering and migrants
Falco peregrins	Peregrine Falcon	S2	N	N	Estuarine: aerial, bay/sound, herbaceous wetland, lagoon, river mouth/tidal river, tidal flat/shore Palustrine: aerial, herbaceous wetland, riparian Terrestrial: cliff, shrubland/chaparral, urban/edificarian, woodland - conifer, woodland - hardwood, woodland - mixed
Haematopus palliatus	American Oystercatcher	S2	SSC	N	Estuarine: tidal flat/shore Terrestrial: bare rock/talus/scree, sand/dune
Haliaeetus leucocephala	Bald Eagle	S3	N	BGEPA	Estuarine: marsh edges, tidal swamp, open water Lacustrine: swamp lakes, edges Palustrine: swamp, floodplain Riverine: shoreline, open water Terrestrial: pine and hardwood forests
Picoides borealis	Red-cockaded Woodpecker	S2	FE	E	Terrestrial: mature pine forests
Mycteria americana	Wood Stork	S2	FT	E	Estuarine: marshes Lacustrine: floodplain lakes, marshes (feeding), various Palustrine: marshes, swamps, various
Sternula antillarum	Least Tern	S3	ST	N	Estuarine: various Lacustrine various Riverine: various Terrestrial: beach dune, ruderal. Nests common on rooftops
Mammals					
Mustela frenata olivacea	Southeastern Weasel	S3	N	N	Palustrine: forested wetland, riparian Terrestrial: forest - hardwood, old field, woodland - conifer, woodland - hardwood, woodland - mixed
Myotis grisescens	Gray Bat	S1	FE	E	Palustrine: caves, various Terrestrial: caves, various
Myotis sodalis	Indiana bat	SA	FE	E	Palustrine: various Terrestrial: various
Peromyscus polionotus peninsularis	St. Andrew Beach Mouse	S1	FE	E(CH)	Terrestrial: beach dune, coastal scrub

Scientific Name	Common Name	Regulatory Designation			Natural Communities
		FNAI	State	Federal	
Sciuris niger shermani	Sherman's Fox Squirrel	S3	SSC	N	Terrestrial: woodland - conifer, woodland - mixed
Trichechus manatus latirostris	West Indian Manatee	S2	FE	E	Estuarine: submerged vegetation, open water Marine: open water, submerged vegetation
Ursus americanus floridanus	Florida Black Bear	S2	N	N	Palustrine: forested wetland, riparian Terrestrial: forest - hardwood, forest - mixed

Sources: FNAI 2010; USFWS 2016.

Key:
FNAI STATE ELEMENT RANK
S1 = Critically imperiled in Florida because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or man-made factor.
S2 = Imperiled in Florida because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.
S3 = Either very rare and local in Florida (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.
S4 = Apparently secure in Florida (may be rare in parts of range).
S5 = Demonstrably secure in Florida.
SH = Of historical occurrence in Florida, possibly extirpated, but may be rediscovered (e.g., ivory-billed woodpecker).
SX = Believed to be extirpated throughout Florida.
SU = Unrankable; due to a lack of information no rank or range can be assigned.
SNA = State ranking is not applicable because the element is not a suitable target for conservation (e.g. a hybrid species).
SNR = Element not yet ranked (temporary).

FEDERAL LEGAL STATUS
BGEPA = Protected by Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act
C = Candidate species for which federal listing agencies have sufficient information on biological vulnerability and threats to support proposing to list the species as Endangered or Threatened.
E(CH) = Endangered critical habitat
E = Endangered: species in danger of extinction throughout all or a significant portion of its range.
E, T = Species currently listed endangered in a portion of its range but only listed as threatened in other areas
E, PDL = Species currently listed endangered but has been proposed for delisting.
E, PT = Species currently listed endangered but has been proposed for listing as threatened.
E, XN = Species currently listed endangered but tracked population is a non-essential experimental population.
N = None
T = Threatened: species likely to become Endangered within the foreseeable future throughout all or a significant portion of its range.
T(CH) = Threatened critical habitat
PE = Species proposed for listing as endangered
PS = Partial status: some but not all of the species' infraspecific taxa have federal status
PT = Species proposed for listing as threatened
SAT = Treated as threatened due to similarity of appearance to a species which is federally listed such that enforcement personnel have difficulty in attempting to differentiate between the listed and unlisted species.
SC = Not currently listed, but considered a "species of concern" to USFWS.

STATE LEGAL STATUS
C = Candidate for listing at the Federal level by the U. S. Fish and Wildlife Service
FE = Listed as Endangered Species at the Federal level by the U. S. Fish and Wildlife Service
FT = Listed as Threatened Species at the Federal level by the U. S. Fish and Wildlife Service
FXN = Federal listed as an experimental population in Florida
FT(S/A) = Federal Threatened due to similarity of appearance

ST = State population listed as Threatened by the FWC. Defined as a species, subspecies, or isolated population which is acutely vulnerable to environmental alteration, declining in number at a rapid rate, or whose range or habitat is decreasing in area at a rapid rate and as a consequence is destined or very likely to become an endangered species within the foreseeable future.
SSC = Listed as Species of Special Concern by the FWC. Defined as a population which warrants special protection, recognition, or consideration because it has an inherent significant vulnerability to habitat modification, environmental alteration, human disturbance, or substantial human exploitation which, in the foreseeable future, may result in its becoming a threatened species. (SSC* for *Pandion haliaetus* (Osprey) indicates that this status applies in Monroe county only.)
N = Not currently listed, nor currently being considered for listing.
Plants: Definitions derived from Sections 581.011 and 581.185(2), Florida Statutes, and the Preservation of Native Flora of Florida Act, 5B-40.001. FNAI does not track all state-regulated plant species; for a complete list of state-regulated plant species, call Florida Division of Plant Industry, 352-372-3505 or see: http://www.doacs.state.fl.us/pi/.
E = Endangered: species of plants native to Florida that are in imminent danger of extinction within the state, the survival of which is unlikely if the causes of a decline in the number of plants continue; includes all species determined to be endangered or threatened pursuant to the U.S. Endangered Species Act.
T = Threatened: species native to the state that are in rapid decline in the number of plants within the state, but which have not so decreased in number as to cause them to be Endangered.
N = Not currently listed, nor currently being considered for listing.

Appendix E Habitats and Natural Communities

The FNAI defines a natural community as a distinct and recurring assemblage of populations of plants, animals, fungi, and microorganisms naturally associated with each other and their physical environment. Habitats and Natural Communities were identified using the 2010 Florida Land Use, Cover and Forms Classification System (FLUCFS) data from the NWFWMD, as well as the 2004-2013 Statewide Land Use Land Cover datasets created by the five Water Management Districts in Florida. Data were modified and refined based on aerial photograph signatures and field observations. Below are community descriptions (excerpts from FNAI 2010) with some site-specific information about many of the communities in the watershed.

Upland Communities	
Mesic Flatwoods	Mesic flatwoods can be found on the flat sandy terraces left behind by Plio-Pleistocene high sea level stands. Mesic flatwoods consist of an open canopy of tall pines (commonly longleaf pine or slash pine) and a dense, low ground layer of shrubs, grasses (commonly wiregrass), and forbs. The most widespread natural community in Florida, mesic flatwoods are home to many rare plants and animals such as the frosted flatwoods salamander (*Ambystoma cingulatum*), the reticulated flatwoods salamander (*Ambystoma bishopi*), the Red-cockaded woodpecker (*Leuconotopicus borealis*), and many others. Mesic flatwoods require frequent fire (two to four years) and all of its constituent plant species recover rapidly from fire, including many rare and endemic plants. In the Panhandle north of the Cody Scarp, mesic flatwoods occupy relatively small, low-lying areas (FNAI 2010). Within the Apalachicola River and Bay watershed, healthy mesic flatwoods occur in the Apalachicola National Forest.
Sandhill	Sandhill communities are characterized by broadly-spaced pine trees with a deciduous oak understory sparse midstory of deciduous oaks and a moderate to dense groundcover of grasses, herbs, and low shrubs. Species typical of sandhill communities include longleaf pine (*Pinus palustris*), turkey oak (*Quercus laevis*), and wiregrass (*Aristida stricta var. beyrichiana*). Sandhill is observed on crests and slopes of rolling hills and ridges with steep or gentle topography. Sandhill communities are important for aquifer recharge, as sandy soils allow water to infiltrate rapidly, resulting in sandy, dry soil, with little runoff evaporation. Fire is a dominant environmental factor in sandhill ecology and is essential for the conservation of native sandhill flora and fauna (FNAI 2010). Within the Apalachicola River and Bay watershed, exemplary sandhill communities can be found extensively throughout the Apalachicola National Forest.
Scrub	Scrub is a community composed of evergreen shrubs, with or without a canopy of pines, and is found on well-drained, infertile, narrow sandy ridges distributed parallel to the coastline. Signature scrub species include three species of shrubby oaks, Florida rosemary (*Ceratiola ericoides*), and sand pine (*Pinus clausa*), which may occur with or without a canopy of pines. Scrub is characterized by burn intervals of five to 40 years, depending on the dominant vegetation.
Scrubby Flatwoods	Scrubby flatwoods have an open canopy of widely-spaced pine trees (commonly longleaf or slash pines) and a low, shrubby understory which differ structurally from scrub communities in the respect that scrub flatwoods lack continuous shrubby oak cover. Understory vegetation consists largely of scrub oaks and saw palmetto, often interspersed with barren areas of exposed sand. Scrubby flatwoods occur on slight rises within mesic flatwoods and in transitional areas between scrub and mesic flatwoods. Scrubby flatwoods are inhabited by several rare plant and animal species including the Florida mouse (*Podomys floridanus*), gopher tortoise (*Gopherus polyphemus*), the Florida gopher frog (*Rana capito*), goldenaster (*Chrysopsis floridana*) and large-plumed beaksedge (*Rhynchospora megaplumosa*) (FNAI 2010).

Slope Forest	Slope forest is a well-developed, closed canopy forest of upland hardwoods on steep slopes, bluffs, and in sheltered ravines within the Apalachicola River drainage. Slope forests have extremely high tree and shrub diversity, largely because of their mixture of cold temperate and warm temperate elements. Tree density is relatively high, inducing much competition for space, water, sunlight and nutrients. The combination of densely shaded slopes and cool, moist microclimates produces conditions that are conducive for the growth of many plant species that are more typical of the Piedmont and Southern Appalachian Mountains. These include mountain laurel, black walnut (Juglans nigra), wild hydrangea (Hydrangea arborescens), sweet-shrub (Calycanthus floridus), burningbush (Euonymus atropurpureus), heartleaf (Hexastylis arifolia), common maidenhair fern (Adiantum capillus-veneris), smooth Solomon's seal (Polygonatum biflorum), liverleaf (Hepatica nobilis), white baneberry (Actaea pachypoda), perfoliate bellwort (Uvularia perfoliata), bloodroot (Sanguinaria canadensis), false hellebore (Veratrum woodii), Canadian lousewort (Pedicularis canadensis), wild comfrey (Cynoglossum virginianum), downy rattlesnake plantain (Goodyera pubescens), American bladdernut (Staphylea trifolia), and eastern leatherwood (Dirca palustris). Slope forest occurs in areas with substantial topographic relief. Soils are generally composed of sands, sandy-clays, or clayey-sands with substantial organics and occasionally calcareous components. The Cody Scarp crosses the range of slope forest near its southern extent along the Big Sweetwater Creek. The Apalachicola Bluffs and Ravines Preserve and Torreya State Park in Liberty County are exemplary sites for slope forest (FNAI 2010).
Terrestrial Caves	Terrestrial caves are cavities below the surface that lack standing water. These caves develop in areas of karst topography; water moves through underlying limestone, dissolving it and creating fissures and caverns. Most caves have stable internal environments with temperature and humidity levels remaining fairly constant. In areas where light is present, some plants may exist, although these are mostly limited to mosses, liverworts, ferns, and algae. Subterranean natural communities such as terrestrial caves are extremely fragile because the fauna they support are adapted to stable environments and do not tolerate environmental changes (FNAI 2010).
Upland Hardwood Forests	Upland hardwood forests are described as having a well-developed, closed-canopy dominated by deciduous hardwood trees such as southern magnolia (*Magnolia grandiflora*), pignut hickory (*Carya glabra*), sweetgum (*Liquidambar styraciflua*), Florida maple (*Acer saccharum ssp. floridanum*), live oak (*Quercus virginiana*), American beech (*Fagus grandifolia*), white oak (*Q. alba*), spruce pine (*Pinus glabra*), and others. This community occurs on mesic soils in areas sheltered from fire, on slopes above river floodplains, in smaller areas on the sides of sinkholes, and occasionally on rises within floodplains. It typically supports a diversity of shade-tolerant shrubs, and a sparse groundcover. Upland hardwoods occur throughout the Florida Panhandle and can be found in upland portions of the watershed (FNAI 2010).
Wet Flatwoods	Wet flatwoods are pine forests with a sparse or absent midstory. The typically dense groundcover of hydrophytic grasses, herbs, and low shrubs occurring in wet flatwoods can vary depending on the fire history of the system. Wet flatwoods occur in the ecotones between mesic flatwoods and shrub bogs, wet prairies, dome swamps, or strand swamps and are common throughout most of Florida. Wet flatwoods also occur in broad, low flatlands, frequently within a mosaic of other communities. Wet Flatwoods often occupy large areas of relatively inaccessible land, providing suitable habitat for the Florida black bear (*Ursus americanus floridanus*), as well as a host of rare and endemic plant species (FNAI 2010). This community type is found interspersed throughout the Apalachicola National Forest (FDEP 2008).

Coastal Communities	
Beach	The beach is the immediate shoreline area of the Gulf of Mexico and consists of white quartz sand. It has few plants, except along the extreme inner edge at the base of the dunes. Organic marine debris, including seaweed and driftwood, typically form a wrack line on the shore. The upper beach area at the base of the foredune is an unstable habitat and is continually re-colonized by annuals, trailing species, and salt-tolerant grasses (FNAI 2010). Beach habitat is found along St. James Island, particularly at Bald Point State Park.
Beach Dune	The beach dune community includes seaward dunes that have been shaped by wind and water movement. This community is composed primarily of herbaceous plants such as pioneer grasses and forbs, many of which are coastal specialists. The vegetated upper beach and foredune are often sparsely covered by plants adapted to withstand the stresses of wind, water, and salt spray, or to rapidly recolonize after destruction. Many rare shorebirds use the Florida Panhandle's beach dunes for nesting. This community is also a major nesting area for loggerhead, green, Kemp's Ridley, and leatherback sea turtles. Beach dune communities can be found along the coastal portion of St. James Island, particularly at Bald Point State Park.
Coastal Grasslands	Coastal grassland, found primarily on broad barrier islands and capes, is a predominantly herbaceous community found in the drier portion of the transition zone between the beach dune and coastal strand or maritime hammock communities. Several rare animals use coastal grasslands for foraging and nesting, including neo-tropical migratory birds. Coastal grassland can form from two major processes: the seaward build-up of a barrier island, which protects inland ridges from sand burial and salt spray, or the development of a new foredune ridge, which protects the previously overwashed area behind it (FNAI 2010). This community type can be found throughout the coastal portion of St. James Island.
Coastal Strand	Coastal strand is an evergreen shrub community growing on stabilized coastal dunes, often with a smooth canopy due to pruning by wind and salt spray. It usually develops as a band between dunes dominated by sea oats along the immediate coast, and maritime hammock, scrub, or mangrove swamp (in peninsular Florida) communities further inland. This community is very rare on the Florida Panhandle coast where the transition zone is occupied by scrub or coastal grassland communities (FNAI 2010). This community type can be found throughout the coastal portion of St. James Island.
Shell Mounds	Shell mounds are a relic of generations of Native Americans who lived along the Florida coast and discarded clams, oysters, whelks, and other shells in small hills. These mounds of shell support an assemblage of calciphilic plant species. Originally, there were many such shell mounds along coastal lagoons and near the mouths of rivers, however presently many are surrounded by marshes (FNAI 2010). Artifacts found throughout the watershed provide evidence of habitation by Native Americans for at least 10,000 years (Tall Timbers n.d.). Native Americans once inhabited the watershed's productive coastal regions. Consequently, the coastline is spotted with shell-mounds and associated ecological communities.

Transitional and Wetland Communities	
Basin Marsh	Basin marshes, unlike depression marshes, are marshes that lack a fire-maintained matrix community and rather, occur in relative isolation as larger landscape features. Basin marshes are regularly inundated freshwater from local rainfall, as they occur around fluctuating shorelines, on former "disappearing" lake bottoms, and at the bead of broad, low basins marking former embayments of the last high-sea level stand. Species composition is heterogeneous both within and between marshes and generally includes submerged, floating, and emergent vegetation with intermittent shrubby patches. Common species include maidencane (*Panicum hemitomon*), sawgrass (*Cladium sp.*), bulltongue arrowhead (*Sagittaria lancifolia*), pickerelweed (*Pontederia cordata*), and cordgrass (*Spartina sp.*) (FNAI 2010).
Basin Swamp	Basin swamp is a wetland vegetated with hydrophytic trees, commonly including pond cypress (*Taxodium ascendens*) and swamp tupelo (*Nyssa sylvatica var. biflora*) and shrubs that can withstand an extended hydro-period. Basin swamps are characterized by highly variable species composition and are expressed in a variety of shapes and sizes due to their occurrence in a variety of landscape positions including old lake beds or river basins, or ancient coastal swales and lagoons that existed during higher sea levels. Basin swamps can also exist around lakes and are sometimes headwater sources for major rivers. Many basin swamps have been heavily harvested and undergone significant hydrological changes due to the conversion of adjacent uplands to agricultural and silvicultural lands (FNAI 2010).
Baygall	Baygall is an evergreen-forested wetland dominated by bay species including loblolly bay (*Gordonia lasianthus*), sweetbay (*Magnolia virginiana*), and/or swamp bay (*Persea palustris*). This community can be found on wet soils at the base of slopes or in depressions; on the edges of floodplains; and in stagnant drainages. Baygalls are not generally influenced by flowing water, but may be drained by small blackwater streams. Most baygalls are small; however, some form large, mature forests, called "bay swamps." The dominance of evergreen bay trees rather than a mixture of deciduous and evergreen species can be used to distinguish baygall from other forested wetlands (FNAI 2010). This community type can be found in the Lake Talquin State Forest.
Coastal Interdunal Swales	Coastal interdunal swales are marshes, moist grasslands, dense shrublands, or damp flats in linear depressions that occur between successive dune ridges as sandy barrier islands, capes, or beach plains. Dominant species tend to vary based on local hydrology, substrate, and the age of the swale, but common species include sawgrass (*Cladium sp.*), hairawn muhly (*Muhlenbergia capillaris*), broomsedge (*Andropogon virginicus*), seashore paspalum (*Paspalum vaginatum*), sand cordgrass (*Spartina bakeri*), and saltmeadow cordgrass (*Spartina patens*). For example, hurricanes and large storm events can flood swales with salt water, after which they become colonized, often temporarily, by more salt-tolerant species. Salt water intrusion and increased sand movement after storm events can reset successional processes of interdunal swale communities. Within the Apalachicola River and Bay watershed coastal interdunal swale can be found at St. George Island State Park (FNAI 2010).

Dome Swamp	Dome swamp is an isolated, forested, and usually small depression wetland consisting of predominantly pond cypress (*Taxodium ascendens*) and/or swamp tupelo (*Nyssa sylvatica var. biflora*). This community occurs within a fire-maintained community such as mesic flatwoods and commonly occupies depressions over a perched water table. Smaller trees grow on the outer edge of the swamp where the water is shallow, while taller trees grow deeper in the swamp interior creating the characteristic dome shape. Shrubs are typically sparse to moderate, but dome swamps with high fire frequencies or fire exclusion, the shrub layer may be absent. Many dome swamps form when poor surface drainage causes the dissolution of limestone bedrock, creating depressions which fill in with peat or marl. Surficial runoff from the surrounding uplands supplies much of the water within dome swamps. Consequently, water levels in these communities fluctuate naturally with seasonal rainfall changes. Dome swamps may also be connected directly to the aquifer, where groundwater influences the hydrological regime. Thus dome swamps can function as reservoirs that recharge the aquifer. Logging, nutrient enrichment, pollution from agricultural runoff, ditching, impoundment, and invasive exotic species invasion have degraded dome swamps. Some dome swamps have been used as treatment areas for secondarily-treated wastewater (FNAI 2010). Dome swamp community can be found at the St. Marks National Wildlife Refuge.
Floodplain Swamp	Floodplain swamp is a closed-canopy forest community of hydrophytic trees such as bald cypress (*Taxodium distichum*), water tupelo (*Nyssa aquatica*), swamp tupelo (*N. sylvatica var. biflora*), or ogeechee tupelo (*N. ogeche*). Floodplain swamp occurs on frequently- or permanently-flooded hydric soils adjacent to stream and river channels and in depressions and oxbows within the floodplain. The understory and groundcover are sparse in floodplain swamps, which can also occur within a complex mosaic of communities including alluvial forest, bottomland forest, and baygall. As rivers meander, they create oxbows and back swamps that are important breeding grounds for fish when high water connects them to the river. Floodplain swamp communities provide important wildlife habitat, contribute to flood attenuation, and help protect the overall water quality of streams and rivers. These communities may also transform nutrients or act as a nutrient sink depending on local conditions. This makes floodplain swamps useful for the disposal of partially-treated wastewater. Artificial impoundments on rivers can severely limit the seasonal flooding effects that maintain healthy floodplain systems; particularly, the stabilization of alluvial deposits and the flushing of detritus (FNAI 2010). Floodplain swamp communities are distributed along most creeks and streams within the watershed, particularly along the Apalachicola River and Lake Wimico.
Hardwood-Alluvial Forest	Alluvial forest is a hardwood forest found in river floodplains on low levees along channels, ridges and terraces that are slightly elevated above floodplain swamp, and expansive flats associated with higher floodplain regions. They are regularly flooded for a portion of the growing season, inundated seasonally from river bank overflow for one to four months of the year during the growing season. Hydroperiod is the primary physical feature of alluvial forest, which is inundated by flood waters nearly every year for at least a portion of the growing season. This factor is critical to species composition, since many trees that can withstand frequent flooding are nonetheless sensitive to prolonged growing season inundation. Although flooding may be extensive, alluvial forest usually does not contain standing water during the dry season. Primary trees found include overcup oak (Quercus lyrata), swamp laurel oak (Q. laurifolia), water hickory (Carya aquatica), American elm (Ulmus americana), green ash (Fraxinus pennsylvanica), water locust (Gleditsia aquatica), river birch (Betula nigra), and red maple (Acer rubrum). Exemplary sites include Torreya State Park and the Florida River section of the Apalachicola River Water Management Area in Liberty County.

Seepage Slope	Seepage slope is an open, grass sedge-dominated community consisting of wiregrass (Aristida stricta), toothache grass (Ctenium aromaticum), pitcherplants, plumed beaksedge (Rhynchospora plumose), flattened pipewort (Eriocaulon compressum), and woolly huckleberry (Gaylussacia mosieri). Seepage slopes are kept continuously moist by groundwater seepage. This community occurs in topographically variable areas, with 30- to 50-foot elevational gradients, frequently bordered by well-drained sandhill or upland pine communities. In the absence of fire, shrubs and trees begin to invade seepage slopes and shade out the light-loving herbaceous species. A further indication of their dependence on fire is the requirement for fire to stimulate flowering of many herbs haracteristic of seepage slopes, including the dominant wiregrass.
Wet Prairie	Wet prairie is an herbaceous community usually occurring on acidic, continuously wet, but not inundated, soils. This community can be found on somewhat flat or gentle slopes between lower lying depression marshes, shrub bogs, or dome swamps or on slightly higher wet or mesic flatwoods. Wet prairies in northern Florida are some of the most diverse communities in the U.S., with an average of over 20 species per square meter in some places and over 100 total species in any given stand. The Panhandle is a hotspot for rare plants of the wet prairie community with 25 out of the 30 rare species found in this community; 12 of these are endemic to the Panhandle (FNAI 2010). This community type is found throughout the Apalachicola National Forest.
Aquatic Communities	
Blackwater Streams	Blackwater streams are perennial or intermittent seasonal watercourses laden with tannins (natural organic chemicals), particulates, and dissolved organic matter and iron. These dissolved materials result from the streams' origins in extensive wetlands with organic soils that collect rainfall and discharge it slowly to the stream. The dark-colored water reduces light penetration, inhibits photosynthesis, and prevents the growth of submerged aquatic plants. Blackwater streams are frequently underlain by limestones and have sandy bottoms overlain by organics that have settled out of suspension. Blackwater streams are the most widely distributed and numerous riverine systems in the southeast Coastal Plain (FNAI 2010) and found draining into most creeks, streams and bayous in the watershed.
Seepage Streams	Seepage streams may be perennial or intermittent seasonal as they originate from shallow groundwater percolating through sandy upland soils. Seepage streams are small magnitude features, and unlike other stream communities in Florida, they lack a deep aquifer water source and extensive swamp lowlands surrounding their head waters. Seepage streams are generally sheltered by a dense overstory of broad-leaved hardwoods which block out most sunlight. Filamentous green algae occur sporadically within the stream, while vegetation at the water's edge may include mosses, ferns and liverworts. Seepage streams are often associated with seepage slope and slope forest communities near their head waters, and bottomland forest, alluvial forest and floodplain swamp communities near their mouths. The waters of seepage streams is filtered by percolation through deep soils which slows the release of rainwater and buffers temperature extremes, creating low flow rates of clear, cool, unpolluted water. Seepage streams are generally confined to areas where topographic relief is pronounced such as northern Florida (FNAI 2010).
Spring-run Streams	Spring-run streams generally have sandy or limestone bottoms and derive most of their water from artesian openings to the underlying aquifer, making their waters clear, circumneutral, mineral-rich, and cool. These conditions are highly conducive for plant growth, thus, spring-run streams are extremely productive aquatic habitats. Good examples in the watershed are listed and described in Section 2.3. Agricultural, residential, and industrial pollutants that enter the groundwater may infiltrate the deep aquifer that feeds a Spring-run stream. Herbicides applied to control aquatic plant growth are particularly detrimental because they can induce eutrophication in spring run streams. Overuse and misuse of spring-run streams from recreation is also a threat to this unique community (FNAI 2010). Examples of spring run streams include those associated with the major springs in the north of the basin.

Estuarine and Marine Communities	
Salt Marsh	Salt marsh is a largely herbaceous tidal zone community commonly consisting of saltmarsh cordgrass (*Spartina alterniflora*), which dominates the seaward edge, and needle rush (*Juncus roemerianus*), which dominates higher, less frequently flooded areas. Salt marshes form where the coastal zone is protected from large waves, either by the topography of the shoreline, a barrier island, or by location along a bay or estuary. Salt marshes support a number of rare animals and plants, and provide nesting habitat for migratory and endemic bird species. Many of Florida's extensive salt marshes are protected in aquatic preserves, but the loss of marshes and adjacent seagrass beds due to human impacts such as shoreline development, ditching, and pollution and natural stressors, such as sea level rise, have vastly reduced their numbers. Salt marshes are instrumental in attenuating wave energy and protecting shorelines from erosion (FNAI 2010) and are found in the coastal/ estuarine portion of the watershed. Salt marsh communities are common throughout the Apalachicola Bay.
Seagrass Beds	Seagrass beds consist of expansive stands of submerged aquatic vascular plants including turtlegrass (*Thalassia testudinum*), manateegrass (*Syringodium filiforme*), and shoalgrass (*Halodule wrightii*), which occur predominantly in subtidal zones in clear low-energy coastal waters. Seagrass beds occur on unconsolidated substrates and are highly susceptible to changes in water temperature, salinity, wave-energy, tidal activity, and available light. This natural community supports a wide variety of animal life including manatees, marine turtles, and many fish, particularly spotted sea trout (*Cynoscion nebulosus*), spot (*Micropogonias undulates*), sheepshead, (*Archosargus probatocephalus*), and redfish *(Sciaenops ocellatus*). Pollution, particularly sedimentation and wastewater/sewage, have led to the widespread loss of seagrasses in nearly every bay in the Florida Panhandle (FNAI 2010).
Oyster/Mollusk Reef	Oyster/Mollusk reef consists of expansive concentrations of sessile mollusks, which settle and develop on consolidated substrates including rock, limestone, wood, and other mollusk shells. These communities occur in both the intertidal and subtidal zones to a depth of 40 feet. In Florida, the American oyster (*Crassostrea virginica*) dominates mollusk reef communities, but other organisms including species of sponge, anemones, mussels, the burrowing sponge anemones, mussels, clams, barnacles, crabs, amphipods, and starfish live among or within the reef itself. Mollusks are filter-feeders that remove toxins from polluted waters and improve overall water quality (FNAI 2010). However, higher levels of toxins and bacteria can contaminate and close areas for commercial harvest and human consumption. Oyster/mollusk reefs can be found in Apalachicola Bay and associated sounds.
Unconsolidated (Marine) Substrate	Unconsolidated (marine) substrate consists of coralgal, marl, mud, mud/sand, sand or shell deposited in expansive, open areas of subtidal, intertidal, and supratidal zones. Unconsolidated substrates support large populations of tube worms, sand dollars, mollusks, isopods, amphipods, burrowing shrimp, and an assortment of crabs, but lack dense populations of sessile plant and animal species. Unconsolidated substrates are an important feeding ground for bottom-feeding fish, shorebirds, and invertebrates. These areas also grade into a variety of other natural communities, making them the foundation for the development of other marine and estuarine habitats. Unconsolidated substrate communities are found throughout the estuarine and riverine portions of the watershed. They are susceptible to many types of disturbances including vehicle traffic, low DO levels, as well as the accumulation of metals, oils, and pesticides in the sediment (FNAI 2010).

Sources: FNAI 2010

Appendix F Impaired Waterbody Segments in the Apalachicola River and Bay Watershed

All states are required to submit lists of impaired waters that are too polluted or degraded to meet water quality standards and their designated use (potable, recreational, shellfish harvesting) to the EPA under section 303(d) of the CWA (US EPA 2016a). The following table provides lists FDEP designated impaired waters in the Apalachicola River and Bay watershed (FDEP 2009).

WBID	Water Segment Name	County	Waterbody Class[1]	Parameters Assessed Using the Impaired Waters Rule (IWR)
1256	Alligator Harbor	Franklin	3M	Bacteria (in Shellfish)
8024A	Alligator Point	Franklin	3M	Bacteria (Beach Advisories)
1274	Apalachicola Bay	Franklin	2	Bacteria (in Shellfish), Fecal Coliform, Fecal Coliform (3)
1274B	Apalachicola Bay	Franklin	2	Bacteria (in Shellfish), Nutrients (Chlorophyll-a)
375A	Apalachicola River	Franklin	3F	Bacteria (in Shellfish)
1283	Blounts Bay	Franklin	3M	Bacteria (in Shellfish)
1266A	Carrabelle Beach	Franklin	3M	Bacteria (Beach Advisories)
1273	Cash Creek	Franklin	3F	Bacteria (in Shellfish)
51E	Chipola River	Jackson	3F	Fecal Coliform
52	Cowarts Creek	Jackson	3F	Fecal Coliform
1274C	Direct Runoff to Bay	Franklin	2	Bacteria (in Shellfish)
1289	Direct Runoff to Bay	Gulf	3M	Bacteria (in Shellfish)
1292	Direct Runoff to Bay	Franklin	2	Bacteria (in Shellfish)
1268	Doyle Creek	Franklin	3F	Bacteria (in Shellfish)
1274A	East Bay	Franklin	2	Bacteria (in Shellfish), Fecal Coliform, Fecal Coliform (3)
1278	East Bayou	Franklin	3M	Bacteria (in Shellfish)
1275A	East River	Franklin	3F	Bacteria (in Shellfish)
487	Flat Creek	Gadsden	3F	Fecal Coliform
1286	Huckleberry Creek	Franklin	3F	Dissolved Oxygen, Nutrients (Macrophytes)
1291	Indian Lagoon	Gulf	3M	Bacteria (in Shellfish)
180Z	Jackson Blue	Jackson	3F	Nutrients (Algal Mats)
57	Jordan Bay Drain	Jackson	3F	Fecal Coliform
749	Juniper Creek	Bay, Calhoun	3F	Fecal Coliform

WBID	Water Segment Name	County	Waterbody Class[1]	Parameters Assessed Using the Impaired Waters Rule (IWR)
60	Lake Seminole	Jackson	3F	Nutrients (TSI)
1039	Little Gully Creek	Liberty	3F	Dissolved Oxygen, Nutrients (Chlorophyll-a)
180A	Merritts Mill Pond	Jackson	3F	Nutrients (Algal Mats)
1288	Money Bayou	Gulf	3M	Bacteria (in Shellfish)
376A	Mosquito Creek Lower Segment	Gadsden	3F	Fecal Coliform
175	Muddy Branch	Jackson	3F	Dissolved Oxygen
819	Otter Creek	Calhoun	3F	Fecal Coliform
393	South Mosquito Creek	Gadsden	3F	Fecal Coliform
1266	St George Sound	Franklin	2	Bacteria (in Shellfish)
8021B	St. George Island 11th St. E	Franklin	3M	Bacteria (Beach Advisories)
8020A	St. George Island 11th St. W	Franklin	3M	Bacteria (Beach Advisories)
8021A	St. George Island Franklin Blvd	Franklin	3M	Bacteria (Beach Advisories)
8022A	St. George Island State Park	Franklin	3M	Bacteria (Beach Advisories)
723	Stafford Creek	Calhoun	3F	Fecal Coliform
822	Sutton Creek	Calhoun	3F	Fecal Coliform
728	Sweetwater Creek	Liberty	3F	Fecal Coliform
569	Tenmile Creek	Calhoun, Jackson	3F	Fecal Coliform
272	Thompson Pond	Jackson	3F	Nutrients (TSI)
1279	West Bayou	Franklin	3M	Bacteria (in Shellfish)
1236	Whiskey George Creek	Franklin	3F	Bacteria (in Shellfish)
512	Wilson Creek	Calhoun, Jackson	3F	Fecal Coliform

Notes:
[1] Florida's waterbody classifications:
1 - Potable water supplies
2 - Shellfish propagation or harvesting
3F - Recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife in fresh water
3M - Recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife in marine water
4 - Agricultural water supplies
5 - Navigation, utility, and industrial use

The following table provides a list of EPA established TMDLs in the Apalachicola River and Bay watershed.

WBID	Water Segment Name	County	Waterbody Class[1]	Pollutant
375A	Apalachicola River	Franklin	3F	Total and Fecal Coliform
375B	Apalachicola River	Franklin	3F	Total Coliform
1274	Apalachicola Bay	Franklin	2	Total and Fecal Coliform
1274B	Apalachicola Bay	Franklin	2	Total Coliform
1286	Huckleberry Creek	Franklin	3F	Total Coliform
175	Muddy Branch (Chipola River)	Jackson	3F	Dissolved Oxygen, Fecal Coliform, Total Coliform, Total Nitrogen, Total Phosphorus
272	Thompson Pond (Chipola River)	Jackson	3F	Total Coliform

Source: US EPA 2016c

Appendix G Conservation Lands within the Apalachicola River and Bay Watershed

Within the Apalachicola River and Bay watershed there are approximately 610,571 acres of conservation lands, including 254,531 acres of federally managed lands, 344,374 acres state-managed, 1,117 acres of locally managed lands, 10,549 acres of privately managed lands. Nine conservation lands within the Apalachicola River and Bay watershed span multiple counties, and several extend into other watersheds. The details of these conservation lands are presented in the following table.

Conservation Land	Managing Agency	County(ies)	Description	Website	Acres Within Watershed
Federally Managed					
Apalachicola National Forest	US Dept. of Agriculture, Forest Service	Franklin, Leon, Liberty, Wakulla	The Apalachicola National Forest is the largest forest in Florida, with an abundance of fresh water streams, rivers, lakes, and natural springs.	https://www.fs.usda.gov/apalachicola	241,272
Apalachicola Savannah Research Natural Area	US Dept. of Agriculture, Forest Service	Liberty	High quality wet prairie grading into longleaf pine savanna and cypress dome swamp. Chapman's crownbeard occurs on ecotone. This research natural area is part of the Apalachicola National Forest.	https://www.srs.fs.usda.gov/rna/estrnas/apalachicola.php	481
Chipola Experimental Forest	US Dept. of Agriculture, Forest Service	Calhoun	Located in the sandhills of the Florida Panhandle, the Chipola Experimental Forest (Chipola) was established in 1952 on privately owned land under a 99-year lease to the Southern Forest Experiment Station (now SRS), International Paper Company, and Hardaway Contracting Company.	https://www.srs.fs.usda.gov/compass/2014/06/12/the-chipola-experimental-forest/	911
St. Vincent National Wildlife Refuge	US Dept. of the Interior, Fish and Wildlife Service	Franklin, Gulf	St. Vincent National Wildlife Refuge is an undeveloped barrier island east of Cape San Blas, with an extensive beach dune and swale system. The island supports coastal grassland and scrub, slash pine flatwoods, freshwater lakes, and tidal marsh. The refuge hosted an experimental introduction of the red wolf.	http://www.fws.gov/southeast	11,868
State Managed					
Apalachee Wildlife Management Area	FWC	Jackson	On the west shore of Lake Seminole.	http://myfwc.com	7,840

Conservation Land	Managing Agency	County(ies)	Description	Website	Acres Within Watershed
Apalachicola National Estuarine Research Reserve	FL Dept. of Environmental Protection, Florida Coastal Office	Franklin	The ANERR encompasses the lower 52 miles of the Apalachicola River and floodplain, as well as most of Apalachicola Bay. It includes Apalachicola River Wildlife and Environmental Area, Apalachicola River Water Management Area, Apalachicola Bay Aquatic Preserve, St. Vincent National Wildlife Refuge, St. George Island State Park, Cape St. George State Reserve, and additional land and water areas.	http://www.dep.state.fl.us/coastal	9,195
Apalachicola River Water Management Area	Northwest Florida Water Management District	Gulf, Liberty	These floodplain forests along more than 20 miles of the Apalachicola River contain more reptile and amphibian species than any comparably sized area in the U.S. The southern tract of the water management area is included in the Apalachicola National Estuarine Research Reserve.	http://www.nwfwater.com/	37,628
Apalachicola River Wildlife and Environmental Area	FL Fish and Wildlife Conservation Commission	Franklin, Gulf	These lands surround eleven miles of the Apalachicola River, the majority of the Brothers River, and the junction of the Jackson and Apalachicola Rivers. These lands are within the ANERR.	http://myfwc.com	59,983
Bald Point State Park	FL Dept. of Environmental Protection, Div. of Recreation and Parks	Franklin	Bald Point State Park is a coastal peninsula with Gulf beach and shoreline, dunes, mesic and scrubby flatwoods, maritime hammock, and depression marshes. This site is important for migratory shorebirds and songbirds.	http://www.floridastateparks.org/	845
Box-R Wildlife Management Area	FL Fish and Wildlife Conservation Commission	Franklin, Gulf	This conservation area's tidal marshes, creeks, floodplain swamps, hammocks and pine uplands are essential components of a complex ecological system that contributes to the productivity of the Apalachicola Bay. The tract also includes 6,000 feet of front	http://myfwc.com	11,187
Cape St. George State Reserve	FL Dept. of Environmental Protection, Florida Coastal Office	Franklin	Barrier island. Natural communities include pine flatwoods, tidal swamp, tidal marsh, and beach dune. The state reserve is included in the Apalachicola National Estuarine Research Reserve.	http://www.dep.state.fl.us/coastal	2,137

Conservation Land	Managing Agency	County(ies)	Description	Website	Acres Within Watershed
Corbin-Tucker Conservation Easement	FL Dept. of Environmental Protection, Div. of State Lands	Calhoun	All less-than-fee.	http://www.dep.state.fl.us/lands	2,143
Dr. Julian G. Bruce St. George Island State Park	FL Dept. of Environmental Protection, Div. of Recreation and Parks	Franklin	A barrier island with more than 9 miles of beaches and dunes. Other natural communities include slash pine forests, oak-magnolia hammocks, freshwater ponds, sloughs, and salt marsh. Its location on a bird migration route makes the island an important stop-over for many passerine and shorebird species. The state park is included in the Apalachicola National Estuarine Research Reserve.	http://www.floridastateparks.org/	1,939
Florida Caverns State Park	FL Dept. of Environmental Protection, Div. of Recreation and Parks	Jackson	Known for its network of calcite caverns with various formations, rare cavernicolous animals, and plant refugia from the glacial period, this park also contains high quality floodplain forests, bottomland forests, and upland hardwood forests.	http://www.floridastateparks.org/	1,268
Gaskin et al. Conservation Easement	Northwest Florida Water Management District	Gulf	All less-than-fee.	http://www.nwfwater.com/	780
Hatcher Family Sweetwater Creek Conservation Easement	FL Dept. of Environmental Protection, Div. of State Lands	Liberty	All less-than-fee. Conservation easement on east bank of Apalachicola River. Includes lower valley of Sweetwater Creek, one of the largest steephead streams in Florida. The property contains hardwood forests that harbor many rare plants and animals.	http://www.dep.state.fl.us/lands	644
John Gorrie Museum State Park	FL Dept. of Environmental Protection, Div. of Recreation and Parks	Franklin	This park contains a museum to commemorate the life of John Gorrie, a physician who moved to Apalachicola in the early 1800s and became a pioneer in the field of air conditioning and refrigeration. A replica of his 1851 ice-making machine is on display a t the museum, as well as exhibits chronicling the colorful history of Apalachicola, which played an important role in Florida's economic development.	http://www.floridastateparks.org/	1

Conservation Land	Managing Agency	County(ies)	Description	Website	Acres Within Watershed
Judges Cave Wildlife and Environmental Area	FL Fish and Wildlife Conservation Commission	Jackson	Contains karst cave formations. Some caves are maternity roost sites for the federally endangered gray bat.	http://myfwc.com	36
Orman House Historic State Park	FL Dept. of Environmental Protection, Div. of Recreation and Parks	Franklin	This park contains the antebellum home of Thomas Orman that overlooks the Apalachicola River. Orman was a cotton merchant and businessman in Apalachicola from 1840 to the 1870s. He helped the tiny town become one of the Gulf Coast's most important cotton exporting ports during the mid-19th century.	http://www.floridastateparks.org/	10
St. Joseph Bay State Buffer Preserve	FL Dept. of Environmental Protection, Florida Coastal Office	Gulf	The property lies along the east and southwest coasts of St. Joseph Bay and consists of 3 tracts. Highway 30 bisects the southeastern tract. West of Highway 30 the land is mostly slash pine flatwoods and black needlerush marsh, while east of the highway the land rises onto old dunes with sandhill and scrub, lower areas are occupied by cypress swamps and bogs. Many rare plants are found on the preserve including telephus spurge, panhandle spiderlily, thick-leaved water-willow, and bog tupelo.	http://www.dep.state.fl.us/coastal	2,216
Tate's Hell State Forest	FL Dept. of Agriculture and Consumer Services, Florida Forest Service	Franklin, Liberty	This land was purchased as forested watershed protection for Apalachicola Bay and for rare species protection, particularly the Florida black bear. Twenty-nine active red-cockaded woodpecker clusters have been found on site since purchase, in addition to several rare plant populations. The majority of the land was drained, and planted to slash pine in the 1960's and 70's and is now undergoing restoration to a more natural condition. Contains some native slash and longleaf pine forests, excellent quality	http://www.floridaforestservice.com/index.html	178,987
Tate's Hell Wildlife Management Area	FL Fish and Wildlife Conservation Commission	Franklin	Mesic and wet flatwoods with large tracts in planted pine.	http://myfwc.com	2,760

Conservation Land	Managing Agency	County(ies)	Description	Website	Acres Within Watershed
Three Rivers State Park	FL Dept. of Environmental Protection, Div. of Recreation and Parks	Jackson	The park contains high pineland, hardwood hammock, mixed pine-hardwood forests, and harbors several rare plants and animals.	http://www.floridastateparks.org/	668
Torreya State Park	FL Dept. of Environmental Protection, Div. of Recreation and Parks	Gadsden, Liberty	High quality, extensive upland hardwood forests, with some high pineland, hardwood hammock, and river floodplain forests. The park is known for its steep ravines, calcareous bluffs, and unusual calcareous forests that support numerous extremely rare and unusual plant species, most notably the Federally endangered Florida torreya.	http://www.floridastateparks.org/	13,606
Trammell Conservation Easement	Northwest Florida Water Management District	Calhoun	All less-than-fee.	http://www.nwfwater.com/	1,542
Upper Chipola River Water Management Area	Northwest Florida Water Management District	Calhoun, Jackson	Encompasses numerous creeks between the Alabama border and Florida Caverns State Park that converge to form the Chipola River. Carbonate-rich waters originating in the piedmont make this river system especially rich in mollusk species.	http://www.nwfwater.com/	8,958
Locally Managed					
Angus Gholson Jr. Nature Park of Chattahoochee	City of Chattahoochee	Gadsden	High quality slope forests with springs and many rare plants. Invasive exotic species are a threat here.		124
Eastshore Property	Jackson County	Jackson	Hardwood dominated forest adjoining Jackson County Blue Spring run. Potential habitat for Aquilegia canadensis.	http://www.jacksoncountyfl.com/parks_and_recreation.htm	36
Jackson County Blue Springs and Merritts Mill Pond	Jackson County	Jackson	Located ca. 4 miles east of Marianna, the site includes property adjacent to Merritt's Mill Pond and several of the springs that feed this reservoir.	http://www.jacksoncountyfl.com/parks_and_recreation.htm	262
John David Patton Wildlife Park	City of Carrabelle	Franklin	This site consists of pine flatwoods and planted slash pine with scattered wetlands.	http://carrabelle.org/things-to-do/parks/john-david-patton-wildlife-park/789/	53

Conservation Land	Managing Agency	County(ies)	Description	Website	Acres Within Watershed
Dead Lakes Park	Gulf County	Gulf	The Dead Lakes were formed when the Apalachicola River blocked the Chipola River downstream, flooding river swamp and eventually killing trees. The park also contains areas of longleaf pine.	http://www.gulfcounty-fl.gov/	83
Chipola River Greenway	Jackson County	Jackson	This 7.5-mile long linear corridor, which ranges from 700 feet to 6400 feet in width, extends along both sides of the Chipola River and traverses an ecosystem dominated by bottomland hardwood forest.	http://www.jacksoncountyfl.com/parks_and_recreation.htm	292
Marianna Greenway	City of Marianna	Jackson	One of several publicly owned parcels that buffer the floodplain of the Chipola River as it passes through Marianna. Upland area consists of planted pine, remainder of parcel is floodplain forest.	http://www.cityofmarianna.com/	35
Hinson Conservation and Recreation Area	City of Marianna	Jackson	Natural communities on this site include hardwood hammock, mixed hardwood/pine forest, grassland, freshwater marsh and cypress swamp that support several rare plant species. The property also contains sinks, and a terrestrial cave and "ovens."	http://www.cityofmarianna.com/	232
Privately Managed					
Apalachee Correctional Institution	PRIDE Enterprises, Inc.	Gadsden, Jackson	Apalachee Correctional Institution was established in 1949 as a Youthful Offender facility. In 1959, the name was changed to East Unit when the Prison Labor Camp was acquired from the Division of Mental Health and the new property was designated as West Unit. In 1990 the profile was changed to adult males.	http://www.dc.state.fl.us/facilities/region1/102.html	2,109
Anglin Properties Conservation Easement	Tall Timbers Research, Inc.	Jackson			870

Conservation Land	Managing Agency	County(ies)	Description	Website	Acres Within Watershed
Apalachicola Bluffs and Ravines Preserve	The Nature Conservancy	Liberty	Apalachicola Bluffs and Ravines Preserve protects one of the rarest of habitats: steephead ravines and streams. The Apalachicola River and Bay region is one of five biological hotspots in North America; it is unique to Florida and home to a disproportionate number of imperiled species.	https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/florida/placesweprotect/apalachicola-bluffs-and-ravines-preserve.xml	5,786
Bristol Conservation Easement	The Nature Conservancy	Liberty	All less-than-fee.	http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/florida/index.htm	71
Calhoun Spigelia Preserve	The Nature Conservancy	Calhoun	Calhoun Spigelia Preserve	http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/florida/index.htm	32
Eastpoint Preserve	The Nature Conservancy	Franklin	Eastpoint Preserve	http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/florida/index.htm	45
Hazel and Herselle Wilderness Preserve	Bay County Conservancy	Calhoun	This preserve is a hardwood forest with a creek running through it. There is a historic cemetery on the property.	http://www.baycountyconservancy.org	21
Jeff Lewis Wilderness Preserve	The Nature Conservancy	Franklin	Encompasses 60% of Dog Island, a small barrier island off the coast of Carrabelle.	http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/florida/index.htm	1,365
John S. Phipps Preserve	The Nature Conservancy	Franklin	Located on the west end of a small, rapidly changing peninsula known as Alligator Point, this preserve includes marsh, pine forest, and beach dune. It is an important stop-over point for migrating birds.	http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/florida/index.htm	48
Juniper Headwaters Preserve	Bay County Conservancy	Bay	This preserve consists of mixed uplands and wetlands acquired through mitigation. NWFWMD holds a conservation easement on 30 acres, and Bay County Audubon Society holds a conservation easement on the remaining 10 acres.	http://www.baycountyconservancy.org	40

Conservation Land	Managing Agency	County(ies)	Description	Website	Acres Within Watershed
Montgomery Conservation Easement	The Nature Conservancy	Liberty	All less-than-fee.	http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/florida/index.htm	69
Rock Hill Preserve	The Nature Conservancy	Washington	Well-known by botanists and geologists, the sandstone outcroppings on this preserve are the only ones known in Florida. They support plants and lichens typically found in more northern areas and that are unusual or endemic to Florida.	http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/florida/index.htm	12
Sumatra Property	Coastal Plains Institute	Liberty	An inholding in the Apalachicola National Forest, this tract is surrounded by the best stand of second-growth longleaf pine/wiregrass left on the national forest. Although the uplands were converted to slash pine plantation around 1980, the property contains three small seepage bogs, adjoins a 150-acres wet flat, and has a blackwater stream running through it.	http://www.coastalplains.org	81