Ochlockonee River and Bay

Surface Water Improvement and Management Plan

September 2017
Program Development Series 17-02

Northwest Florida Water Management District

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Cover Photograph: Lake Iamonia (NWFWMD)

Executive Summary

The Ochlockonee River and Bay watershed covers approximately 2,476 square miles from the red hills of southern Georgia through the Big Bend of Florida. The watershed includes the Ochlockonee River and Ochlockonee Bay, together with their contributing drainage basin. Among the tributary streams within the watershed are Telogia Creek, the Little River, and the Sopchoppy River. Also prominent within the watershed are a number of lakes, including lakes Jackson, Iamonia, Hall, and Overstreet, as well as Tucker Lake within Bald Point State Park and the Lake Talquin Reservoir on the Ochlockonee River.

The watershed is home to more than 94,000 people. It includes much of the city of Tallahassee, as well as municipalities and unincorporated communities within Gadsden, Wakulla, and Leon counties. It also contains some of northwest Florida's most important farmland, as well as extensive forests and public and private conservation lands that protect and sustain natural resources.

The Ochlockonee River and Bay watershed provides numerous functions critical to our quality of life. Its wetlands and floodplains store and regulate stormwater runoff, protecting water quality, providing flood protection, and recharging groundwater aquifers and potable water supplies. Its lakes, streams, and coastal waters sustain numerous species of fish, shellfish, and wildlife, and tidal marshland on Ochlockonee Bay provides shoreline stability and estuarine habitat.

The purpose of the Ochlockonee River and Bay Surface Water Improvement and Management (SWIM) Plan is to provide a framework for resource management, protection, and restoration using a watershed approach. Protecting and restoring watershed resources is a shared responsibility on the part of numerous watershed stakeholders, including local governments, state and federal agencies, private businesses, and the public. It requires building upon past accomplishments to encompass a wide range of management approaches.

The Lake Jackson Management Plan was approved by the District in 1990 and updated in 1994 and 1997. Since that time, significant progress and noteworthy accomplishments have been achieved. The District, local governments, and other stakeholders advanced ambitious restoration plans to address water quality and habitat impacts. From 1999 to 2001, over 400,000 cubic yards of organic muck were removed to from approximately 140 acres of lake bottom. Coupled with this effort was construction of regional stormwater treatment facilities to address nonpoint source pollution. Other accomplishments included educational initiatives in cooperation with local stakeholders and intergovernmental efforts to evaluate the effects of septic systems and to improve the management of invasive aquatic plants.

Population in the basin has steadily increased over the last several decades: from 72,826 in 1990 to 94,813 in 2010, a 30 percent increase over 20 years. Population over the next twenty years (2010-2030) is projected to increase more slowly at closer to 16 percent within the watershed, but with continuing changes in land use and increasing demands on wastewater and stormwater management systems. These changes require continuing cooperative efforts on the part of government agencies and the communities they serve. The actions taken now serve to both address current problems and continue to build the foundation for future efforts.

Priorities identified in the plan include continuing to address both point and nonpoint source pollution to better protect and restore water quality. There are continuing needs to restore improve conditions within Lake Jackson, Lake Talquin, the Ochlockonee River, and a number of tributaries and waterbody segments within the watershed. Additionally, there are significant needs to improve wastewater management and treatment and management and to protect floodplain and wetland functions.

Addressing these challenges requires a wide range of strategies. These include additional improvements in the treatment and management of stormwater runoff; implementation of best management practices for agriculture, silviculture, and construction activities; and continued advances in wastewater treatment and management. To complement these efforts, long-term protection of critical habitats and associated buffer areas is needed. Public outreach and education, monitoring, and analysis are needed in support of all of these. Priority projects identified in the plan are listed in the table below:

Recommended Projects: Ochlockonee River and Bay SWIM Plan
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 Restoration
Estuarine Habitat Restoration
Strategic Land Conservation
Watershed Stewardship Initiative
Sub-basin Restoration Plans
Lake Jackson Management Plan
Wastewater Treatment and Management Improvements
Interstate Coordination
Analytical Program Support
Comprehensive Monitoring Program

To further implementation of priority projects, the plan outlines a range of available funding resources. Given the fact that funding sources change over time, it is intended to be adaptable to evolving programs and resources.

Addressing the issues outlined in this plan and implementation of the strategies described requires a long-term, comprehensive approach with continuing collaboration between state and federal agencies, local governments, nonprofit initiatives, regional agencies, private businesses, and members of the public. Additionally, while this plan is focused primarily on water quality and associated resources and benefits, it should be recognized that it fits within a wider range of resource management programs, including those focused on aquatic plant management, public access and recreation, fish and wildlife resources, and floodplain management.

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Abbreviations and Acronyms

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
EPD	Georgia Environmental Protection Department
ERP	Environmental Resource Permitting
°F	Degree Fahrenheit (temperature)
F.A.C.	Florida Administrative Code
FDACS	Florida Department of Agriculture and Consumer Services
FDEC	Florida Demographic Estimating Conference
FDEP	Florida Department of Environmental Protection
FDOH	Florida Department of Health
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Agency
FGS	Florida Geological Survey
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
HAB	harmful algal blooms
I-10	Interstate 10
IWR	Impaired Surface Waters Rule
MFLs	minimum flows and levels
mgd	million gallons per day
MS4s	municipal separate storm sewer systems
NFWF	National Fish and Wildlife Foundation
NPL	National Priority List
NPS	nonpoint source
NRC	National Research Council
NRCS	Natural Resources Conservation
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRDA	Natural Resource Damage Assessment
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
STCM	Storage Tank and Petroleum Contamination Monitoring
SWIM	Surface Water Improvement and Management
SWTV	Surface Water Temporal Variability
TMDL	total maximum daily load
TNC	The Nature Conservancy
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
WWTF	wastewater treatment facility

1.0 Introduction

The Ochlockonee River and Bay watershed begins in southern Georgia and includes the Ochlockonee River and Bay and their tributaries, which are located primarily in Gadsden, Liberty, Leon and Wakulla counties, and portions of coastal Franklin County. Although a significant portion of the watershed is located in Georgia, the scope of this plan, for implementation purposes, is limited to the Florida portion.

The Ochlockonee 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 Ochlockonee 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
- The Nature Conservancy
- The National Fish and Wildlife Foundation
- Gadsden, Liberty, Leon, Wakulla, and Franklin counties
- Municipalities, including Tallahassee, Sopchoppy, Bristol, Quincy, Gretna, Greensboro, and Midway
- Several unincorporated communities
- Wakulla Springs Alliance
- Friends of Lake Jackson
- Apalachee Audubon Society
- Friends of St. Marks Wildlife Refuge
- Friends of the Apalachicola National Forest
- Friends of Wakulla Springs
- Tall Timbers Research Station and Land Conservancy
- Georgia citizens, and local and state governments
- And many others

1.1 Purpose and Scope

The Ochlockonee 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 SWIM Program is administered by the Northwest Florida Water Management District (NWFWMD or District) and includes management actions to address water quality, natural systems, and watershed functions and benefits. This plan incorporates and supersedes the Lake Jackson Management Plan last updated in 1997. It also builds upon and supersedes the draft Ochlockonee River and Bay SWIM plan, completed by the District in 2012.

Development of the 2017 Ochlockonee River and Bay SWIM Plan update (hereafter called 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.

In addition to the SWIM Act of 1987, the following Florida Statutes and administrative codes 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 62-302, Florida Administrative Code (F.A.C.): Surface Water Quality Standards
- Chapter 62-43, F.A.C.: Surface Water Improvement and Management Act
- Chapter 62-303, F.A.C.: Identification of Impaired Surface Waters
- Chapter 62-304, F.A.C.: TMDLs

Under the auspices of the SWIM program, the District approved the Lake Jackson Management Plan in 1990 and updated the plan in 1994 and 1997). The plan cited six priority issues for Lake Jackson: water quality, preservation of natural systems, restoration of disturbed or degraded systems, recreation, intergovernmental coordination, and public education and awareness. To address these priorities, the plan included management strategies implemented through four programs: water quality, preservation and restoration, watershed management, and public education and awareness.

This 2017 SWIM Plan reviews progress made toward implementing priorities identified in earlier planning efforts, while also addressing new issues, ongoing challenges, and opportunities for achieving watershed protection and restoration. Further, the 2017 SWIM Plan describes the watershed's physical characteristics and natural resources, provides an assessment of watershed conditions, 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.

1.2 SWIM Program Background, Goals, and Objectives

Surface Water Improvement and Management plans have been 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 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 lands acquisition and management organizations; and other interested stakeholders.

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 more broadly outlined in the District's strategic plan.

2.0 Watershed Description

2.1 Geographic and Geological Characteristics

Ochlockonee River and Bay watershed attributes:

- Two states: Georgia and Florida
- 2,476 square miles
- Five Florida counties
- 216 miles of the Ochlockonee River (116 within Florida)
- 30 distinct natural communities

The Ochlockonee River and Bay watershed covers approximately 1,585,000 acres from the red hills of southern Georgia through the Big Bend of Florida. Approximately 53 percent of the watershed (832,000 acres) is in Florida, with the remainder in Georgia. The Ochlockonee River is approximately 216 miles long, of which 116 miles (including Lake Talquin) flows through the state of Florida. The Ochlockonee Bay estuary covers approximately nine square miles bordering southern Wakulla and Franklin counties with freshwater inflow primarily from the Ochlockonee and Sopchoppy rivers.

The Ochlockonee River enters Florida from Grady County, Georgia. Within Georgia, the watershed spans portions of Worth, Mitchell, Colquitt, Decatur, Grady, and Thomas counties. In Florida, it extends through portions of Gadsden, Leon, and Liberty counties in its upland reaches, as well as coastal Wakulla and Franklin counties (Figures 2-1 and 2-2). The river ultimately discharges into Ochlockonee Bay along the Franklin County and Wakulla County border.

Southwestern Leon County and northwestern Wakulla County include the headwaters of the Sopchoppy River, which also discharges into Ochlockonee Bay. The Crooked River enters the Ochlockonee River from southeastern Franklin County close to its mouth at Ochlockonee Bay.

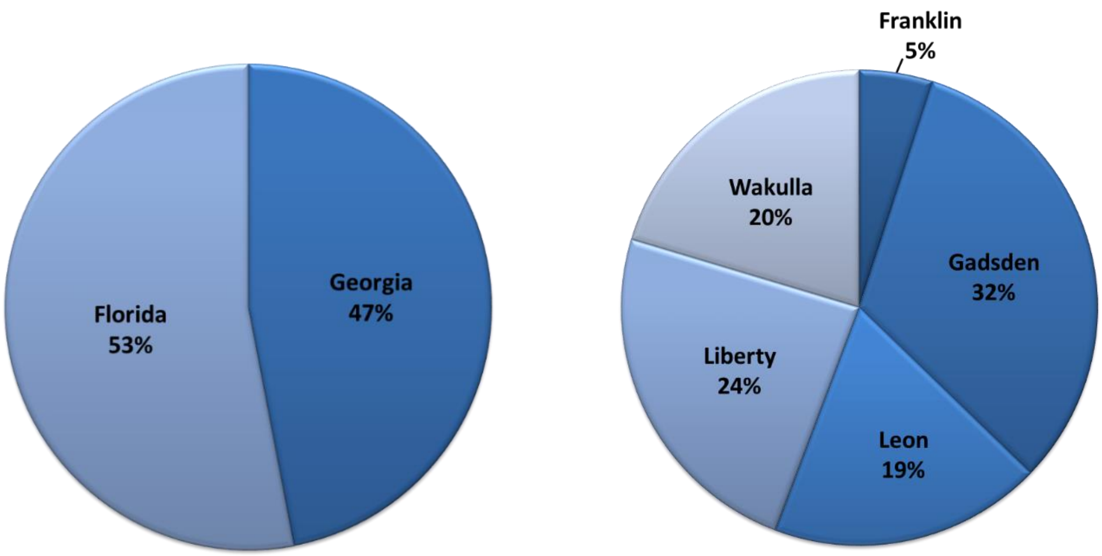


Figure 2-1 Proportion of the Ochlockonee River and Bay Watershed by State and Florida Counties

Figure 2-2 Features of the Ochlockonee River and Bay Watershed within Florida

The greater Ochlockonee River and Bay watershed, including Georgia's portion, is within the Gulf Coastal Plain physiographic region, characterized by gently rolling hills, sharp ridges, wet prairies, and alluvial floodplains underlain by sand, gravel, porous limestone, chalk, marl, and clay. Within this region, the watershed encompasses two localized physiographic regions in Florida separated distinctly by the Cody Scarp: the Tallahassee Hills subdivision of the Northern Highlands and the Gulf Coastal Lowlands. The Northern Highlands and the Tallahassee Hills subdivision are characterized by greater topographic relief (five to twelve percent slopes) and extensive sand and clay deposits overlying limestone bedrock. South of the Cody Scarp, the Gulf Coastal Lowlands form an expansive, gently sloping plain dominated by karst features, which extends to the Gulf of Mexico (USGS 2013).

Geological formations in the watershed follow the general stratigraphy of the Florida Panhandle. Much of the watershed's geologic features are a product of prehistoric marine deposition during periods when the sea level was higher than present. The Miccosukee Formation overlies topographically high areas on the Tifton Upland and lies on the Miocene Hawthorn Group–Torreya Formation. The Tallahassee Hills are immediately underlain by the Miccosukee Formation and the Hawthorn Group (Torak *et al*. 2010) while sediments of the Miccosukee Formation extend eastward from Gadsden County. In the absence of Pleistocene and Holocene (from approximately 2.6 million years ago to present day) deposits, sediments of the Citronelle Formation exist at land surface, capping many of the hills in Gadsden County. Near-surface formations include dolomitic limestones, sandy clayey limestones; and finally, shell beds, clayey sands, and sands. Unconsolidated Holocene siliciclastic sediments (nearly pure quartz sands with minor heavy mineral sands) can be found adjacent to Ochlockonee Bay at Bald Point.

The surficial aquifer within the watershed is generally a thin, unconfined aquifer composed of discontinuous mixtures of Pleistocene and recent alluvium and terrace deposits. Water is recharged through direct infiltration of rainwater and, therefore, fluctuates in elevation due to droughts or seasonal differences in rainfall. The Floridan aquifer system consists of a thick sequence of carbonate sediments of varying permeability, the top of which dips from the northeast to the southwest, with the elevation of the top of the system ranging from approximately 100 feet above sea level to more than 1,200 feet below sea level (NWFWMD 2014). Most of the Ochlockonee River and Bay watershed is within the Apalachicola Embayment and Gulf Trough (Torak *et al.* 2010). Within the Apalachicola Embayment and Gulf Trough, the Floridan aquifer is well-confined and recharge rates are low. However, in northwest Leon County near Lake Jackson and in Wakulla County, the aquifer is semi-confined or unconfined and recharge rates are higher. In this area, features such as karst lakes and swallets provide hydrologic connectivity to the Floridan aquifer.

Upland soils within the northern Ochlockonee River and Bay watershed have formed on beds of clayey and sandy parent materials and are typically well developed, with distinct horizons that exhibit the vertical movement of iron and organic materials (Collins 2010, USDA 2014). In heavily developed areas near Tallahassee and in places where extensive mining has occurred, these deep, well-weathered soils have been removed, eroded, and heavily altered. According to Natural Resources Conservation Service (NRCS) data, many of the soils in the watershed are classified as highly erodible. The central portion of the watershed, which consists largely of the Apalachicola National Forest, is characterized by forest soils, hydric soils, and young, poorly developed soils along stream banks. Younger poorly developed soils can also be found near the Gulf where coastal erosional and depositional processes are still active. Hydric soils (or wet soils that develop anaerobic conditions) occur predominantly along the floodplains of the Ochlockonee River and its tributaries, as well as within tidal marshes along the river's confluence with Ochlockonee Bay.

2.2 Hydrologic Characteristics

2.2.1 Major Streams and Tributaries

Receiving a majority of its water from surface runoff, the Ochlockonee River begins in Worth County, Georgia, crosses into Florida, where it flows through the impounded Lake Talquin, and ultimately discharges into the Ochlockonee Bay (216 miles total, 116 miles within Florida). Baseflow for the river and its tributaries originates from the water table and surficial aquifer, recharged by rainfall. The river flows predominantly southwest until it meets Telogia Creek, at which point it curves toward the southeast and ends in the brackish waters of Ochlockonee Bay (Figure 2-3). At the downstream end of Lake Talquin, the Jackson Bluff Dam regulates Ochlockonee River flows. South of the dam, the river flows through mostly undeveloped conservation land, including the Apalachicola National Forest and Tate's Hell State Forest, before reaching the bay. The Ochlockonee River's main tributaries include the Little River, which enters Lake Talquin from the north; Telogia Creek, which joins the river south of Lake Talquin; and the Crooked River, which joins the Ochlockonee approximately 1.5 miles west of the U.S. Highway 319 Bridge.

Beginning as a blackwater stream in the Apalachicola National Forest, the Sopchoppy River drains approximately 102 square miles of flat sandy terrain, receives water from the Floridan aquifer downstream where the river has eroded through limestone, and is roughly 50 miles in length within Wakulla County (Florida Department of Environmental Regulation 1987; Pascale and Wagner 1982). The Sopchoppy River discharges into Ochlockonee Bay north of the mouth of the Ochlockonee River.

The Crooked River flows through coastal Franklin County and discharges into the Ochlockonee River near its confluence with Ochlockonee Bay. On the west, the Crooked River meets the New River near the City of Carrabelle (Apalachicola watershed) and forms the Carrabelle River which empties into St. George Sound. Together, the Crooked and Carrabelle rivers form St. James Island northwest of Alligator Point. Like the lower Ochlockonee River and lower Sopchoppy River, the Crooked River is tidally influenced up to 12 miles upstream from the mouth of the Ochlockonee River (Wolfe *et al.*, 1988).

The Little River, fed by Hurricane Creek, Quincy Creek, Willacoochee Creek, Attapulgus Creek, and Swamp Creek, discharge into the northern side of Lake Talquin. Bear Creek also discharges into Lake Talquin, west of Little River. Other notable creeks enter the Ochlockonee River north of the Florida border and include Bridge Creek, Little Ochlockonee River, Tired Creek, and Barnett's Creek.

Seepage streams are perennial or intermittent seasonal water courses originating from shallow ground waters. In northern Florida, they occur in regions of deep, sandy, upland soils where topographic relief is pronounced. Seepage streams are readily distinguished from other Florida stream communities by their small magnitude, lack of a deep aquifer water source, and absence of extensive swamp lowlands surrounding their head waters (FNAI 2010). These streams typically flow through deep ravines sheltered by a dense tree canopy, moderating climate extremes and providing habitat for many species of plants and animals. Seepage streams and associated forested communities can be found throughout the northern portion of the watershed, including: on the west side of Lake Talquin along Ocklawaha, Bear, and Rocky Comfort creeks in Gadsden County; on the east side of Lake Talquin in Leon County; within the Telogia Creek drainage in Gadsden and Liberty counties; and within drainages of Lake Jackson.

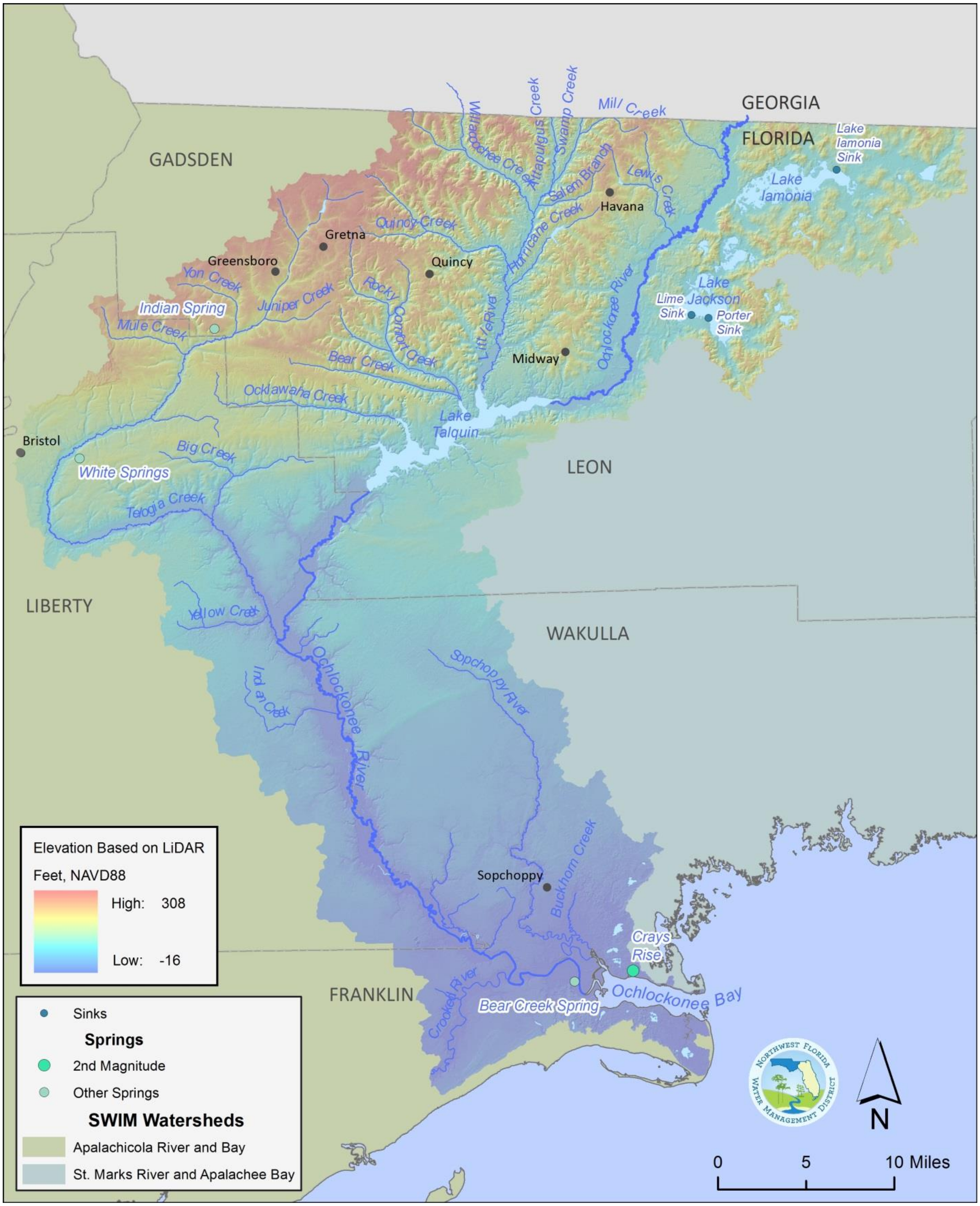


Figure 2-3 General Topography and Hydrology

2.2.2 Lakes

Noteworthy lakes in the watershed include Lake Jackson, Lake Iamonia, Lake Hall, and Lake Overstreet, as well as the Lake Talquin Reservoir on the Ochlockonee River and Tucker Lake located in the coastal portion of the watershed at Bald Point State Park.

Lake Jackson (Figure 2-4) and Lake Iamonia (Figure 2-5) are located north of Tallahassee and east of the Ochlockonee River. These lakes were formed by dissolution and collapse of limestone, causing sinkholes to coalesce and form lakes in the karst topography. Lake Jackson is within a closed surface water basin from which the only outflow is infiltration into the underlying Floridan aquifer. The lake is recharged by rainfall and runoff and continually contributes water to the Floridan aquifer both through the confining unit and, more directly, through sinkholes in the lake bed. During extended dry periods, when rates of infiltration and evapotranspiration exceed rainfall recharge, the lake drains completely. The lake refills when there is enough rainfall in the basin that inflow into the lake exceeds the rate of drainage for a sufficient amount of time. The first documented draining of the lake was in May 1907 (Penson 2002), with subsequent draining events in 1909, 1932, 1935, 1936, 1957, 1982, and 1999-2001. Lake Jackson is influenced by the Megginnis Arm and Ford’s Arm drainages, which receive stormwater runoff from the Tallahassee area. Lake Jackson, inclusive of Lake Carr and Mallard Pond, was designated an Aquatic Preserve in 1974 and an Outstanding Florida Water in 1979 to protect its recreational, biological, and aesthetic value.

Lake Iamonia is located approximately two miles south of the Florida-Georgia border and was once a tributary of the Ochlockonee River. Along with a connection to the underlying Floridan aquifer, Lake Iamonia maintains an intermittent connection to the river during periods of high river flow or lake level. Lake Iamonia is also hydrologically connected to Foshalee Lake, a 1,400-acre waterbody east of the lake that has historically been dominated by marshland (Lake Iamonia Task Force 1991). The lake experienced complete drawdowns in 1931, 1981, and 2000 (McGlynn 2006a; Wolf *et al.* 1988). In 1910, a dam was built to isolate Lake Iamonia from the Ochlockonee River. Sloughs that once connected the two waterbodies were restricted to flowing beneath two small bridges separated by fill. As the region continued to develop, use of the basin shifted from agricultural to recreational use and a dike was built around Lake Iamonia’s sinkhole to keep water in the lake. The dike has since been breached.

Lake Talquin (Figure 2-6), the largest impoundment in the watershed (approximately 8,800 acres), is 15 miles long and approximately one-mile-wide in some places, with a maximum depth of 40 feet (FWC 2016a). Lake Talquin was formed when the Jackson Bluffs Hydroelectric Dam, presently C.H. Corn Hydroelectric Dam, was built across the Ochlockonee River in the 1920s (McGlynn 2006c). The land containing the high bluffs on the south side of the lake and the property where the dam is located was donated to the State of Florida by the Florida Power Corporation in 1970. Although the Florida Park Service originally operated the dam, the City of Tallahassee leases and operates the dam at Lake Talquin Reservoir to provide hydroelectric power and to control the lake for recreational purposes (Florida State Parks 2016). Most of the lake’s shoreline is public property and is, therefore, mostly undeveloped, with Lake Talquin State Forest encompassing much of the southern and southwestern shores.

Lake Jackson and Lake Talquin provide numerous recreational uses, including fishing, boating, hiking, and hunting. Lake Jackson is nationally recognized for its largemouth bass sport fishing (FWC 2016a). Lynch (2016) concluded that, with restoration of its ecosystem, Lake Jackson’s potential annual recreation-related impact for the Leon County economy would be approximately $25.87 million (2015 dollars).

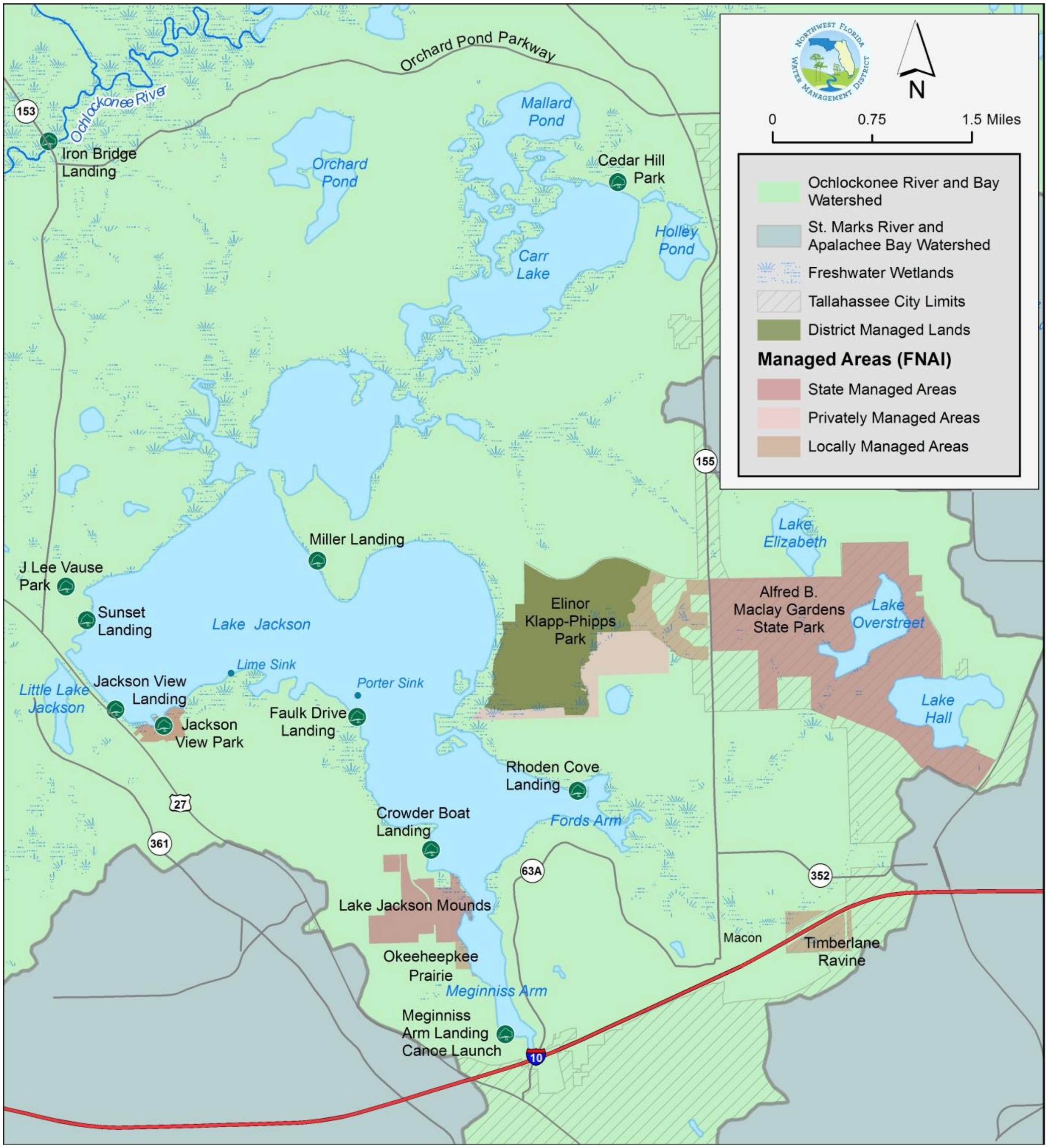


Figure 2-4 Lake Jackson and Vicinity

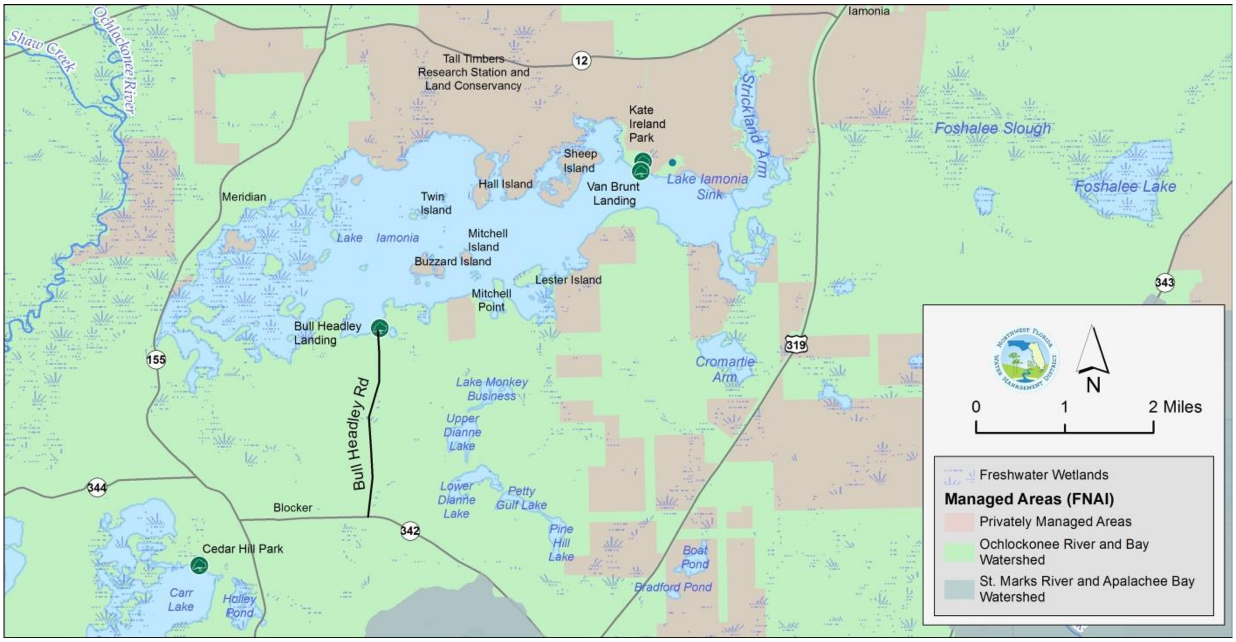


Figure 2-5 Lake Iamonia Vicinity

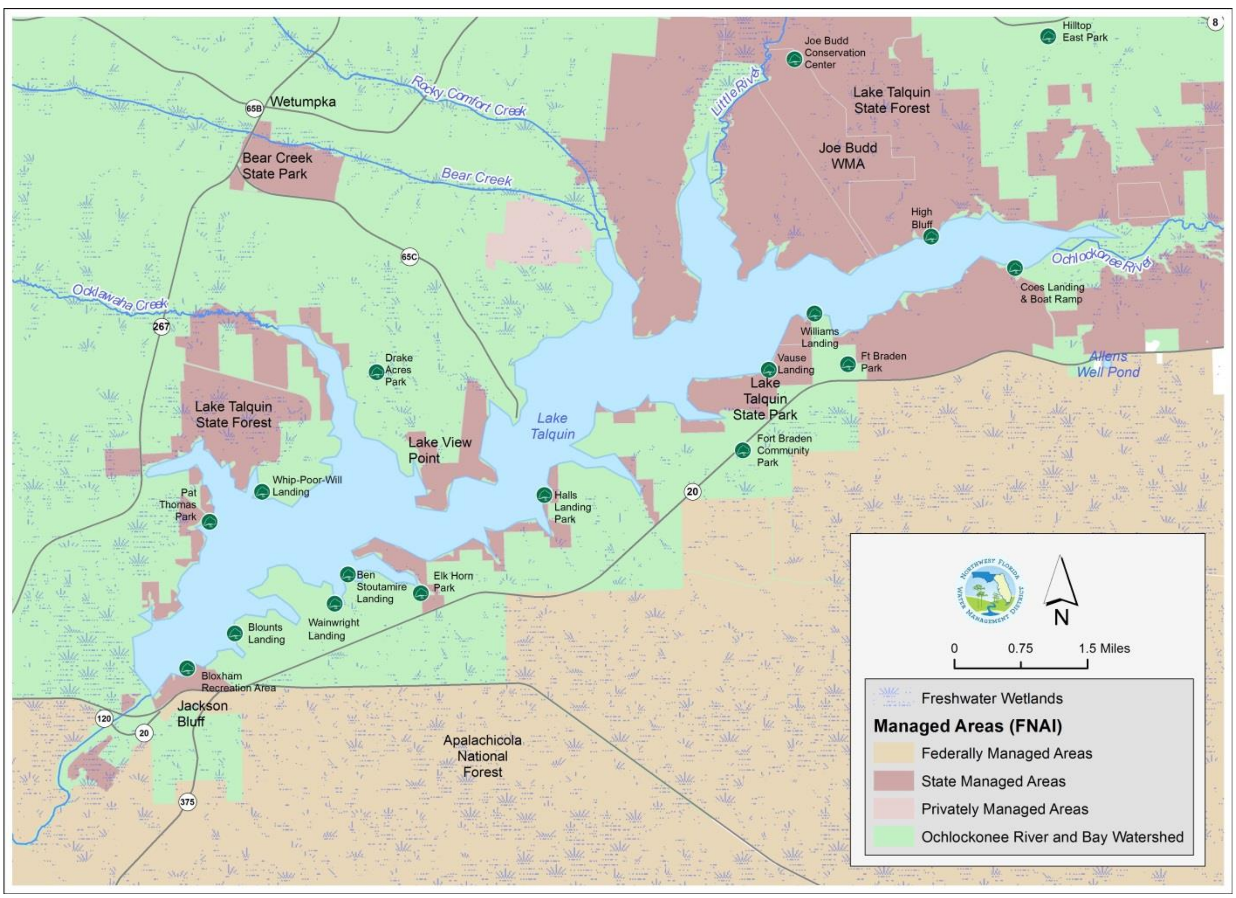


Figure 2-6 Lake Talquin

2.2.3 Springs

Springs in the Ochlockonee River and Bay watershed are predominantly seepage springs that may be associated with first-order streams (Copeland 2003). Among these are White Springs, located east of Bristol, and Indian Spring, located about 2.5 miles southwest of Greensboro. Other documented springs in the watershed include vents in the tidally influenced terminus, Bear Creek Rise in Franklin County and Cray's Rise in Wakulla County. While Bear Creek Rise is located on Bear Creek, a tributary of the Ochlockonee River, Cray's Rise discharges directly into Ochlockonee Bay. Cray's Rise is a submarine, second magnitude spring.

2.2.4 Palustrine Wetland, Riparian, and Floodplain Habitats

A major portion of the watershed, particularly in its southern reaches, consists of wetlands and floodplains (Figure 2-7). These areas provide critical water storage, flood protection, and water quality protection functions, as well as providing productive fish and wildlife habitats. Leitman *et al.* (1991) indicated that fluctuating hydrologic conditions within the river-floodplain system, along with alluvial features and tree communities, contribute to diversity in the fish community. During flood events, fish typically confined to permanently inundated areas gain access to a larger floodplain area which contain diverse foraging habitats. The highest terraces flood on average two to three weeks per year, while low terraces normally flood for two to four months per year. Depressions which trap water long after floods recede typically flood for three to five months per year.

2.2.5 Coastal Waterbodies

Located in the western extent of Florida's Big Bend coastline, Apalachee Bay opens to the Gulf of Mexico and includes the smaller, more isolated embayments including Ochlockonee, Dickerson, and Oyster Bays. Apalachee Bay includes thousands of acres of seagrass beds and many miles of coastline consisting of nearshore marshes (Figure 2-8). These natural communities serve as nursery and foraging grounds for sea turtles, birds, mahi-mahi (*Coryphaena hippurus*), red snapper (*Lutjanus campechanus*), Spanish mackerel (*Scomberomorus maculatus*), amberjack (*Seriola* spp.), and other important commercial and recreational fish and shellfish species.

Ochlockonee Bay represents a drowned river valley that was cut during lower stands of sea level in the Pleistocene. The bay is narrow, spanning approximately nine square miles that adjoins Apalachee Bay and the Gulf of Mexico. The mouth of Ochlockonee Bay is between Mashes Island and Bald Point. Because both the Ochlockonee and Sopchoppy rivers discharge a significant amount of freshwater into the western portion of the Ochlockonee Bay, salinity within the bay tends to be variable and stratified (Ichiye *et al.* 1961).

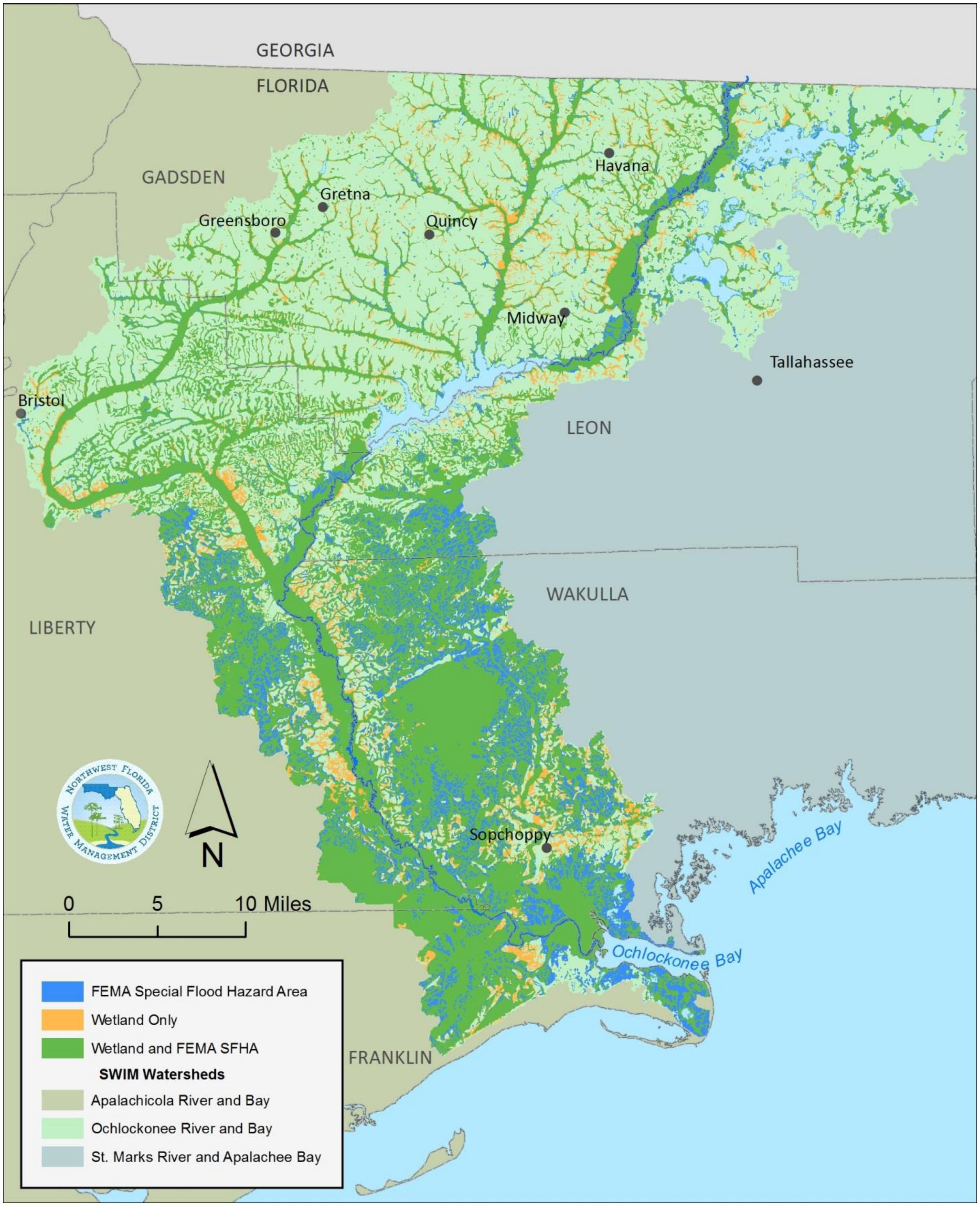


Figure 2-7 Wetlands and Floodplains

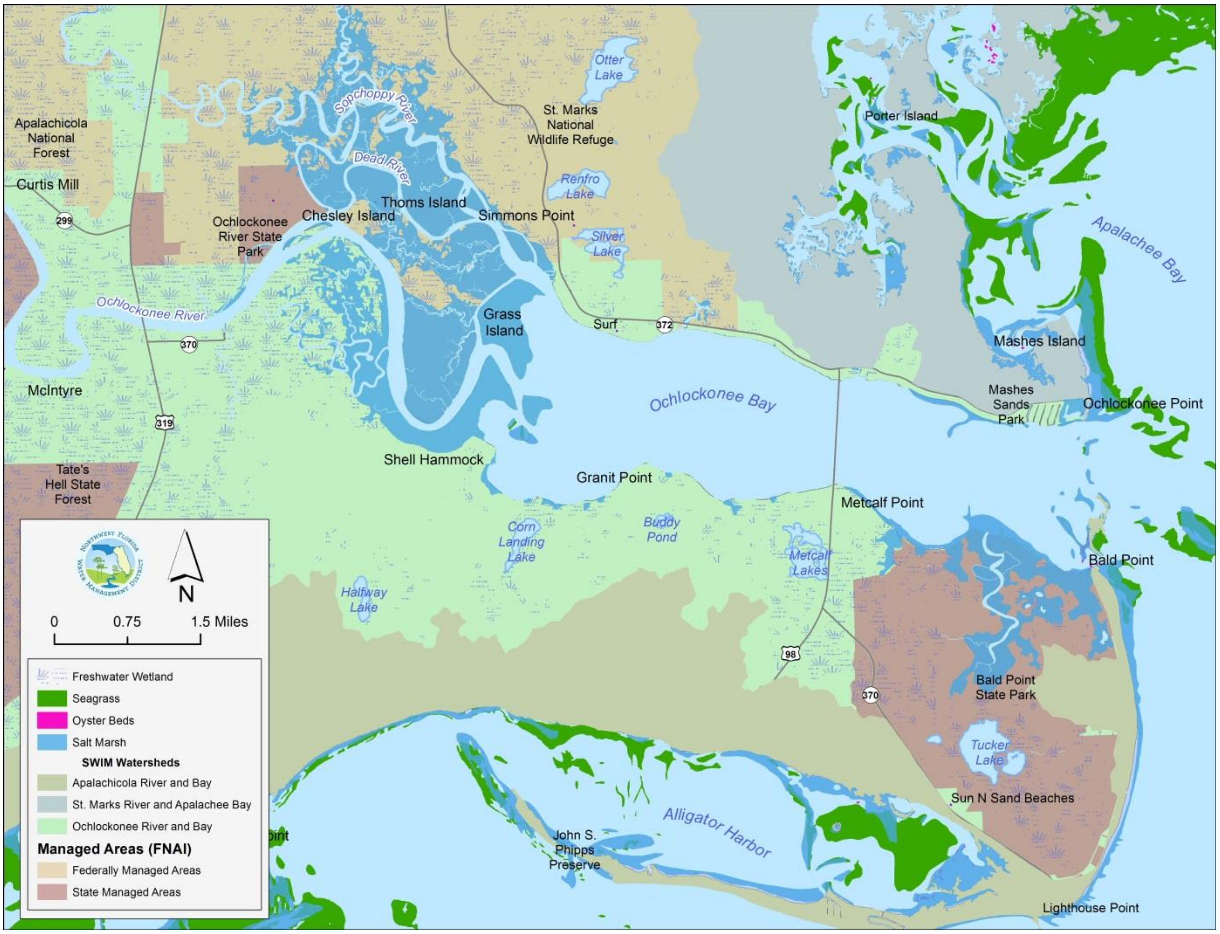


Figure 2-8 Coastal Natural Features

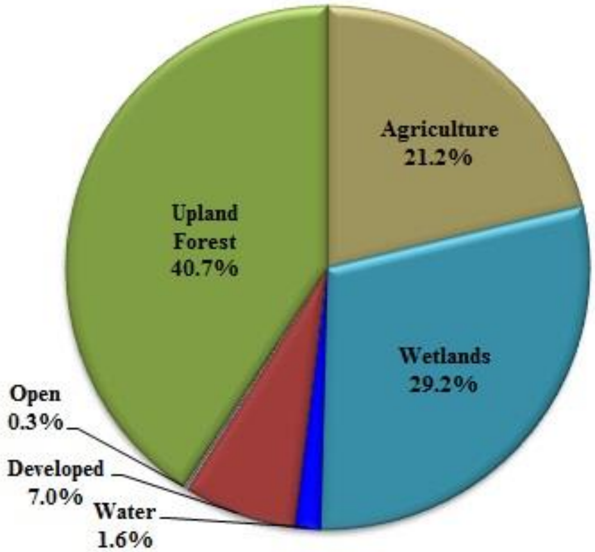
2.3 Land Use and Population

Land uses in the northernmost watershed consist primarily of silvicultural, agricultural, and residential uses (Figures 2-9 and 2-10; Table 2-1). Upland forests, many managed for silviculture, occur throughout the watershed. Agriculture is prominent within Gadsden County, particularly in the Telogia Creek basin. Wetlands are concentrated within the floodplains of the Ochlockonee River and its tributaries; around large lakes, including Jackson and Iamonia; and within the Bradwell Bay area of the Apalachicola National Forest in Wakulla County. The southeastern portion of the watershed consists substantially of silviculture and conservation lands.

Table 2-1 2015-2016 Land Use and Land Cover in the Ochlockonee River and Bay Watershed (within Florida)

Land Use Category	Square Miles	Percent of Basin
Agriculture	75.7	5.8
Developed	96.9	7.5
Open Land	4.6	0.4
Upland Forests	626.4	48.2
Water	31.5	2.4
Wetlands	465.7	35.8

Source: FDEP 2017b.



Source: FDEP 2017b

Figure 2-9 Land Use and Land Cover in the Greater Ochlockonee River and Bay Watershed (including Georgia)

Conservation lands account for nearly 44 percent, or 366,000 acres, of the land area within the Florida portion of the Ochlockonee River and Bay watershed. The Apalachicola National Forest comprises more than 225,000 acres within the watershed. Additionally, the watershed contains portions of Tate's Hell State Forest and Lake Talquin State Forest, as well as several state parks, altogether encompassing more than 50,000 acres (Figure 2-11). Approximately 18,816 acres of conservation lands are owned and managed by the Tall Timbers Research Station and Land Conservancy, notably in the Lake Iamonia and Ochlockonee River basins. State parks include Bald Point, Ochlockonee River, and Alfred B. Maclay Gardens state parks. The NWFWMD manages approximately 3,675 acres within the watershed, and it jointly manages Elinor Klapp-Phipps Park on the eastern shore of Lake Jackson with the City of Tallahassee. The watershed also includes local and county parks managed by Leon and Wakulla counties and the cities of Tallahassee and Quincy. Additionally, the watershed includes portions of the St. Marks National Wildlife Refuge. Conservation lands are described further in Appendix G.

Population is concentrated primarily within Leon and Gadsden counties, a substantial portion of which is in or adjacent to the northwestern portion of the city of Tallahassee. Other municipalities in the watershed include the cities of Quincy, Gretna, Greensboro, Midway, and Sopchoppy, and the eastern portion of Bristol. Table 2-2 displays population estimates for the watershed, based on spatial analysis of 2010 U.S. Census data, together with population projections to 2030 calculated based on countywide population growth projections from the University of Florida's Bureau of Economic and Business Research.

Table 2-2 Watershed Population Estimates: 2010-2030 (Florida Only)

County	2010	2020	2030
Leon	47,187	51,694	56,953
Gadsden	39,263	41,642	42,996
Liberty	5,694	6,262	6,875
Wakulla	2,568	2,779	3,096
Franklin	101	104	105
Total	**94,813**	**102,481**	**110,025**

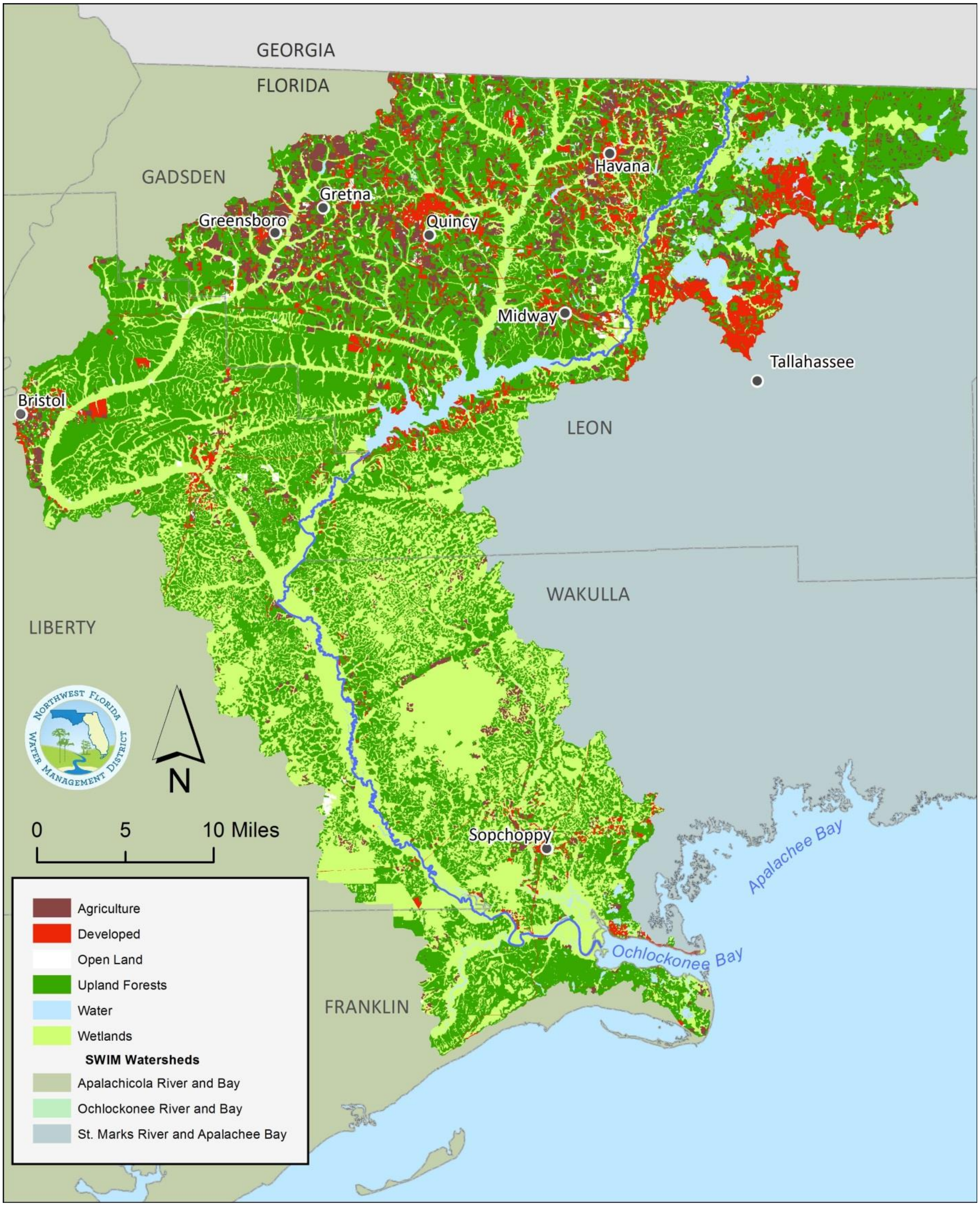


Figure 2-10 2015-2016 Land Use and Land Cover

Figure 2-11 Conservation Lands within the Ochlockonee River and Bay Watershed

2.4 Natural Communities

The Ochlockonee River and Bay watershed supports a diversity of natural habitats, including upland, coastal, transitional, wetland, aquatic, estuarine, and marine communities. Based on Geographic Information Systems (GIS) analysis of the Ochlockonee River and Bay watershed, there are 29 unique natural communities within 15 broader ecological community categories recognized by the FNAI (FNAI 2010, 2016a, 2016b).

Aquatic habitats include forested floodplains and floodplain swamps, alluvial streams, baygall, blackwater streams, clastic upland lakes, depression marshes, dome swamps, and others. A 1989 study of the Ochlockonee River and floodplain documented 48 fish species from 15 different families in floodplain, backwater, and main channel habitats (Leitman *et al.* 1991).

Riparian habitats include those areas along waterbodies that serve as an interface between terrestrial and aquatic ecosystems. They provide fish and wildlife habitat and assist in mitigating or controlling nonpoint source (NPS) pollution. Riparian vegetation also shade streams to optimize light and temperature conditions for aquatic plants and animals. Vegetation, especially trees, are also effective in stabilizing streambanks and slowing flood flows, resulting in reduced downstream flood peaks. Floodplain swamps, alluvial forest, and bottomland forest are the primary types of riparian habitat within the watershed.

The Ochlockonee River and Bay watershed contains a number of rare, endemic, federally and state-protected species, and/or species of special concern listed under the Endangered Species Act (ESA). The watershed includes designated critical habitat for a variety of protected species, including the threatened piping plover (*Charadrius melodus*), the endangered red-cockaded woodpecker (*Picoides borealis*), and the threatened frosted flatwoods salamander (*Ambystoma cingulatum*). Large sections of the river and some of its tributaries are federally designated critical habitat for four listed mussel species, the Ochlockonee moccasinshell (*Medionidus simpsonianus*), oval pigtoe, shinyrayed pocketbook (*Hamiota subangulata*), and the purple bankclimber (*Elliptoideus sloatianus*) (USFWS 2003; 2007). Additionally, the river provides important habitat for the threatened Gulf sturgeon (*Acipenser oxyrinchus desotoi*). Upland forest communities provide habitat for the listed gopher tortoise (*Gopherus polyphemus*) and eastern indigo snake (*Drymarchon corais couperi*).

The watershed is home to a number of threatened and endangered plant species (Weaver and Anderson 2010). Gadsden and Liberty counties are home to one of the only two core populations of Chapman's Rhododendron (*Rhododendron chapmanii*), a federally listed plant species that is found in only three Florida Panhandle counties. Listed species and natural communities are described in more detail in appendices D and E, respectively.

Prominent habitats associated with Ochlockonee Bay include tidal marshes, tidal creeks, and tidal flats. The undeveloped shorelines (southern and western sides) of Ochlockonee Bay are nearly continuous salt marsh, while freshwater marsh and brackish marsh line the Ochlockonee River. Marsh species composition is influenced by a combination of salinity tolerance and differences in soil type, elevations and competitive interactions. Salt marshes are similar to brackish marshes in that they serve as a transition between terrestrial and marine systems. Generally, salt marshes are intertidal and develop along relatively low energy shorelines. Unlike brackish marshes, they may be found under significantly more saline conditions. 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. True salt marshes appear limited to the higher salinity regions of the Ochlockonee/Apalachee Bay complex with an expansive area noted all along the coastal region.

Among the more abundant species found in salt marshes are mussels (*Mytilidae*), oysters, fiddler crabs (*Uca sp*.), marsh periwinkles (*Littoraria irrorata*), crown conchs (*Melogena corona*), mullet, and blue crabs. Freshwater and brackish marshes are dominated by sawgrass, maidencane (*Panicum hemitomon*), giant cutgrass (*Zizaniopsis miliacea*), and cattail (*Typha spp*.). In contrast with more coastal salt marshes, these sites lack the extensive salt flats of salt grass (*Distichlis spicata*), glasswort (*Salicornia spp.*), and salt barrens.

Seagrasses are sparse within Ochlockonee Bay; however, nearby areas of Apalachee Bay support extensive seagrass beds. Shallow waters proximate to Ochlockonee Bay are dominated by shoal grass (*Halodule wrightii*) and turtle grass (*Thalassia testudinum*). In deeper waters, manatee grass (*Syringodium filiforme*) tends to dominate.

3.0 Watershed Assessment and Water Resource Issues

3.1 Water Quality

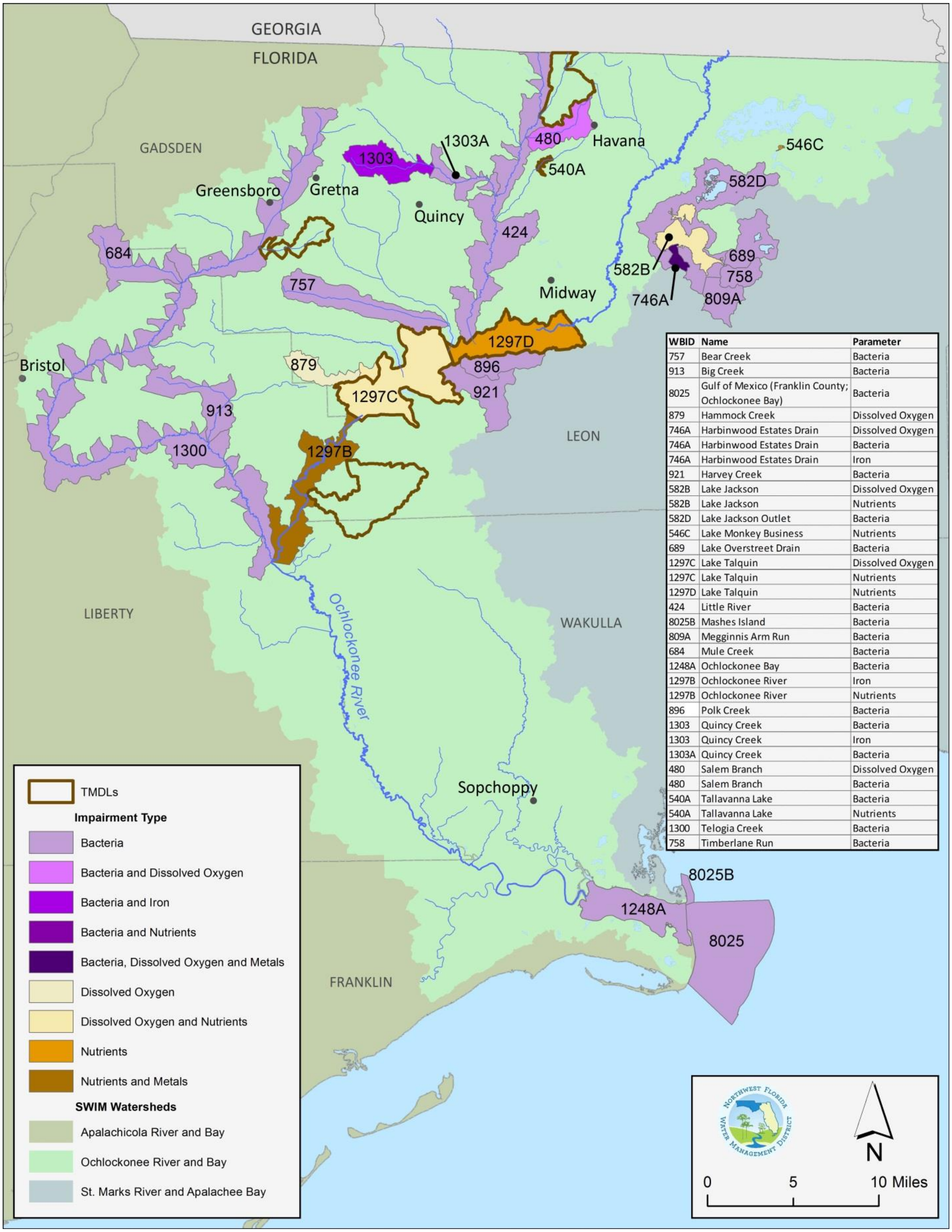
The Ochlockonee River and Bay watershed experiences water quality challenges across both states. Pollution sources are concentrated in the upper watershed, corresponding to agricultural activities, mining, and urban land uses. Agricultural runoff is a significant contributor of nonpoint source (NPS) pollution, particularly in parts of Gadsden County and much of Georgia's portion of the watershed. Urban runoff and NPS pollution are long-term challenges, especially in the Tallahassee area. Surface mining, construction sites, landscape erosion, and unpaved roads are among other sources of NPS pollution variably distributed within the watershed.

Surface water quality in the Ochlockonee River and Bay watershed varies by stream reach and contributing land uses. The Ochlockonee and Little rivers have historically received poor quality water from Georgia (Georgia Conservancy *et al.*, 2005). Tributaries in both states are affected by NPS pollution and alterations associated with land use practices within their contributing sub-watersheds.

3.1.1 Impaired Waters

The FDEP (2014b) identified 25 of the watershed's 252 segments as impaired. These include 34 separate impairments: 20 segments for bacteria (fecal coliforms, beach advisories, or shellfish harvesting classification); five segments for dissolved oxygen (DO); six for nutrients; and three for iron. Since some of the segments are impaired for more than one pollutant, the number of impairments exceeds the number of impaired segments. A full list of FDEP-verified impaired waterbodies is available in Appendix F.

Impairments are particularly concentrated within the upper reaches of the Ochlockonee River basin (Figure 3-1), including for bacteria throughout Telogia Creek and within the Little River basin. Lake Jackson has continuing impairments for nutrients, low dissolved oxygen, and bacteria. Nutrient and dissolved oxygen impairments have also been identified for Lake Talquin, and Lake Tallavana has impairments identified for nutrients and bacteria. In the lower portion of the watershed, bacteria impairments have been identified for Ochlockonee Bay.



WBID	Name	Parameter
757	Bear Creek	Bacteria
913	Big Creek	Bacteria
8025	Gulf of Mexico (Franklin County; Ochlockonee Bay)	Bacteria
879	Hammock Creek	Dissolved Oxygen
746A	Harbinwood Estates Drain	Dissolved Oxygen
746A	Harbinwood Estates Drain	Bacteria
746A	Harbinwood Estates Drain	Iron
921	Harvey Creek	Bacteria
582B	Lake Jackson	Dissolved Oxygen
582B	Lake Jackson	Nutrients
582D	Lake Jackson Outlet	Bacteria
546C	Lake Monkey Business	Nutrients
689	Lake Overstreet Drain	Bacteria
1297C	Lake Talquin	Dissolved Oxygen
1297C	Lake Talquin	Nutrients
1297D	Lake Talquin	Nutrients
424	Little River	Bacteria
8025B	Mashes Island	Bacteria
809A	Megginnis Arm Run	Bacteria
684	Mule Creek	Bacteria
1248A	Ochlockonee Bay	Bacteria
1297B	Ochlockonee River	Iron
1297B	Ochlockonee River	Nutrients
896	Polk Creek	Bacteria
1303	Quincy Creek	Bacteria
1303	Quincy Creek	Iron
1303A	Quincy Creek	Bacteria
480	Salem Branch	Dissolved Oxygen
480	Salem Branch	Bacteria
540A	Tallavanna Lake	Bacteria
540A	Tallavanna Lake	Nutrients
1300	Telogia Creek	Bacteria
758	Timberlane Run	Bacteria

Figure 3-1 Currently Listed Impaired Waterbody Segments, Excepting Mercury

Table 3-1 depicts total maximum daily loads (TMDLs) established for the Ochlockonee River and Bay watershed (FDEP 2016a). A TMDL represents the maximum amount of a given pollutant a waterbody can receive and still meet water quality standards, including its applicable water quality criteria and designated uses. In addition to those listed, draft nutrient TMDLs have been established for Lake Talquin and Lake Tallavana. The U.S. EPA has also established a total phosphorus TMDL for the Harbinwood Estates drain (EPA 2016e).

Table 3-1 TMDLs Adopted by the FDEP

Waterbody Name	WBID(s)
Fecal Coliform	
Black Creek	1024
Juniper Creek	682
Swamp Creek	427
Dissolved Oxygen	
Juniper Creek	682
Mercury	
Sopchoppy River (West Branch)	1038
Sopchoppy River (East Branch)	1038B
Crooked River	1241
Ochlockonee Bay	1248A
Ochlockonee River Mouth	1248B
Sopchoppy River (Estuarine Portion)	1248C
Chaires Creek	1255
Ochlockonee River	1297A
Ochlockonee River	1297B
Lake Talquin at Dam	1297C
Lake Talquin	1297D
Ochlockonee River	1297E
Ochlockonee River	1297F
Ochlockonee River	1297G
Lake Iamonia	442
Gulf of Mexico (Franklin County; Ochlockonee Bay)	8025
Sopchoppy River	998

Source: FDEP 2014a

Total maximum daily loads are implemented through development and adoption of Basin Management Action Plans (BMAPs) that identify the management actions necessary to reduce the pollutant loads (FDEP 2016b). A BMAP for the upper Wakulla River and Wakulla Springs basin has been established by FDEP within the adjacent St. Marks River watershed. Given regional-scale connections between surface and groundwater, protection of Wakulla Spring is an important consideration for management of the Ochlockonee River and Bay watershed. The groundwater contribution area for Wakulla Spring extends across much of the northern portion of the Ochlockonee River watershed, into Gadsden County and southwest Georgia (Figure 3-2).

The FDEP adopted a statewide TMDL for reducing human health risks associated with consuming fish taken from waters impaired for mercury. The primary source of mercury depositions in the environment is atmospheric deposition. It is estimated that about 70 percent of deposited mercury comes from anthropogenic sources (FDEP 2013). Approximately 0.5 percent of the mercury load in Florida waters has been identified as being discharged directly to surface waters by permitted industrial and domestic wastewater facilities (FDEP 2013). Only a small part of mercury in the environment is in the form of methylated mercury, which is biologically available to the food chain. The statewide TMDL 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).

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, metals, pesticides, and other contaminants. Typical categories of NPS pollution include stormwater runoff from urban and agricultural lands and erosion and sedimentation from construction sites, unpaved roads, and destabilized stream banks. Atmospheric deposition of nitrogen, sulfur, mercury, and other toxic substances via fossil fuel combustion also contribute to NPS pollution.

Stormwater runoff, closely associated with land use, is the main contributor to NPS pollution. Urban land use, especially medium- to high-density residential, commercial, and industrial uses have the highest NPS pollution per acre (EPA 2016c). In urban areas, lawns, roadways, buildings, commercial, and institutional properties all contribute to NPS pollution (EPA 2016c). Potential pollutants associated with stormwater include solids, oxygen-demanding substances, nutrients such as nitrogen and phosphorus, pathogens, petroleum hydrocarbons, metals, and synthetic organics (EPA 2016c).

Urban and suburban land use in the Ochlockonee River and Bay watershed is concentrated around the Tallahassee metropolitan area, with additional development occurring around Quincy, Greensboro, Havana, Bristol, Sopchoppy, and unincorporated communities, particularly in the northern reaches of the basin. While these areas contribute significantly to NPS pollution, the urban-rural fringe, which hosts new development and construction sites, introduces new NPS and expands the extent of impervious surfaces in the watershed.

In the Ochlockonee River and Bay watershed, two entities (Leon County and the City of Tallahassee) currently hold Municipal Separate Storm Sewer System (MS4) NPDES Stormwater permits for stormwater conveyance (not combined with sewer) that discharges to waters of the state (FDEP 2017a). Very few developed areas generating stormwater runoff are in close proximity to Ochlockonee Bay. However, tributaries and rivers that discharge to the bay are vulnerable to NPS pollution associated with stormwater. Major stormwater retrofit facilities have been completed as part of the ongoing effort to restore Lake Jackson, including regional facilities in the Megginnis Creek and Okeeheepkee basins.

Agricultural uses are concentrated in the northern portions of the watershed, particularly within the upper Telogia Creek basin. In 1989, the NWFWMD designated the northern Telogia Creek watershed as a Water Resource Caution Area due to limited availability of surface and groundwater. The natural stream flow regime along the upper reach of the Telogia Creek has been affected by historical withdrawals and impoundments (NWFWMD 2014).

Silviculture is a prominent land use across most of the watershed. Practices such as ditching, landscape alteration, road construction, fertilizer application, and harvesting can result in effects such as habitat fragmentation, stream channelization, erosion, sedimentation, nutrient enrichment, discharge of untreated runoff, as well as effects on water temperature, DO, and pH (EPA 2016d; Stanhope *et al.* 2008).

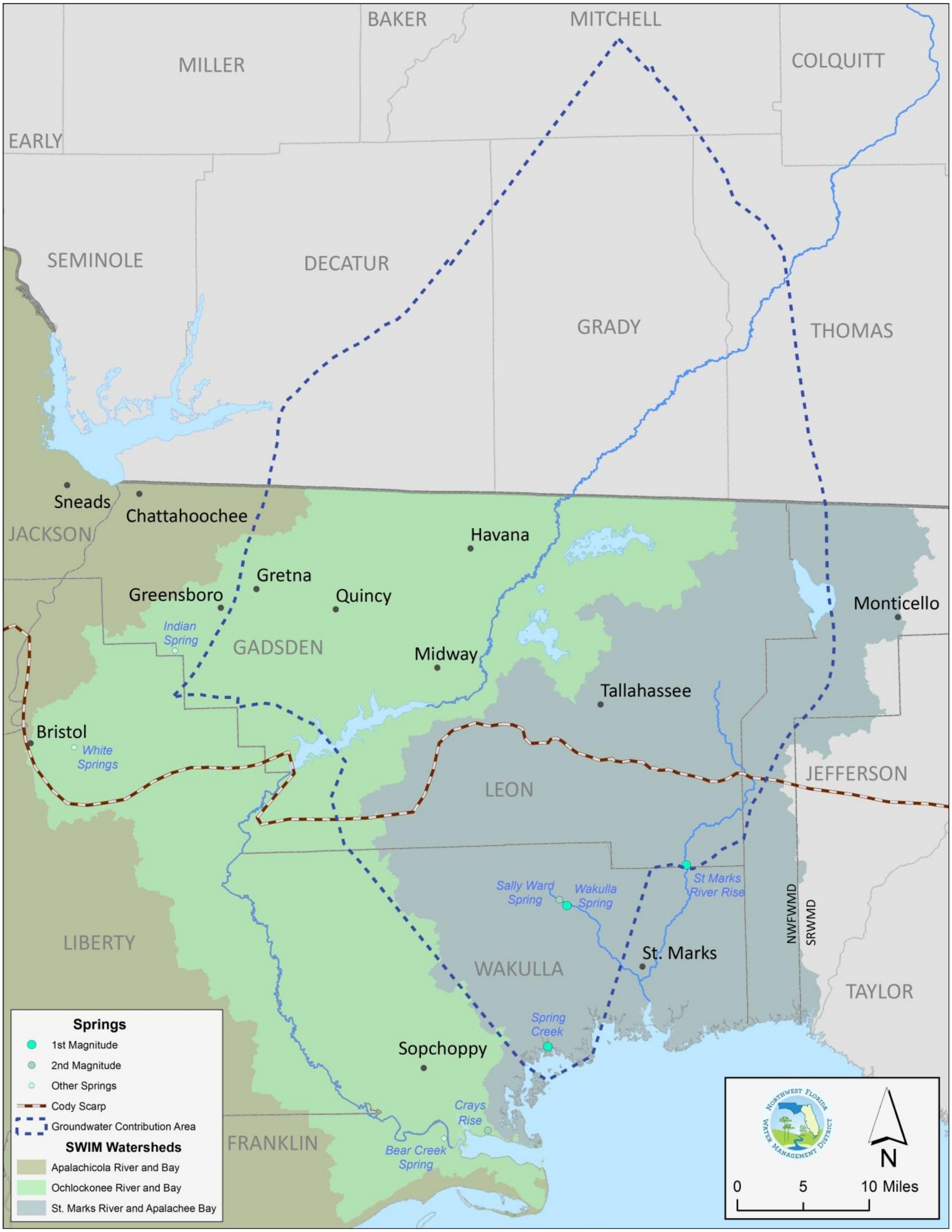


Figure 3-2 Wakulla Spring Groundwater Contribution Area

On-site sewage treatment and disposal systems (OSTDS) are widespread sources of nutrients and other pollutants. Significant concentrations of OSTDS can degrade water quality in groundwater and proximate surface waters. While a well-maintained OSTDS is effective for containing pathogens, surfactants, metals, and phosphorus, conventional OSTDS do not effectively treat and remove nitrogen. Dissolved nitrogen is frequently exported from drainfields through the groundwater (National Research Council 2000). Additionally, OSTDS in areas with high water tables or soil limitations may not effectively treat other pollutants, including microbial pathogens. These pollutants can enter surface waters as seepage into drainage ditches, streams, lakes, and estuaries (NRC 2000; EPA 2015).

In the Ochlockonee River and Bay watershed, most rural and unincorporated communities and a number of suburban communities and subdivisions near Tallahassee rely on OSTDS for wastewater treatment (Figure 3-3). These areas include the northern reaches of the watershed, where most development has occurred, particularly near Lake Talquin, Havana, Midway, Quincy, and eastern Gadsden County. Concentrations of septic systems are also in the Lake Jackson basin and within the Lake Iamonia drainage.

The Florida Water Management Inventory data reported approximately 23,000 known or likely septic systems in the watershed (FDOH 2016). Known septic systems are based on permit data combined with inspection records. Likely septic systems are based on results of the review of nine criteria, but without inspection verification.

By the mid-1990s, Leon County began to see a decline in new septic installations, as did Franklin and Liberty counties (FDOH 2015). Wakulla and Gadsden counties saw a peak of new installations in 2005 (FDOH 2015). However, Wakulla County also added 8,200 linear feet of sewer lines in the same year, as well as 5,700 linear feet of sewer in 2004, which likely contributed to the decrease in new installations in years to follow (Wakulla County 2005).

Erosion and sedimentation are natural phenomena that can be accelerated by human activities, with resulting undesirable 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 clay pits, and agricultural and silvicultural practices lacking proper BMPs are common sources of sedimentation. Accelerated stream bank erosion, caused by increased runoff associated with impervious surfaces, can also be a significant source of sedimentation into receiving waters. The NRCS has calculated rates of erosion for various land use types including cropland (8.3 tons/acre/year), pasture/hayland (0.5 tons/acre/year), and forest land (0.8 tons/acre/year).

Since the 1950s, sediment loads have increased in the Ochlockonee River drainage, due to conversion of timberlands to agricultural lands and mining operations (FDEP 2008). As of 2008, an estimated 1.5 million metric tons of soil was eroding into the Ochlockonee basin from croplands in Georgia and 160,000 metric tons was eroding from croplands in Florida (FDEP 2008).

Sedimentation has the potential to smother submerged aquatic vegetation and other benthic habitats, to impact shellfish beds, accumulate sediment in riffle pools, and increase turbidity in the water column. Sedimentation has been implicated in the elimination of freshwater mussels from much of their historic range, including within the Ochlockonee River (USFWS 2003). Increased sediment accumulation in surface waters can also change the hydrology and holding capacity of waterbodies by reducing channel depth and accommodation space, thus altering channel morphology and exacerbating flooding issues.

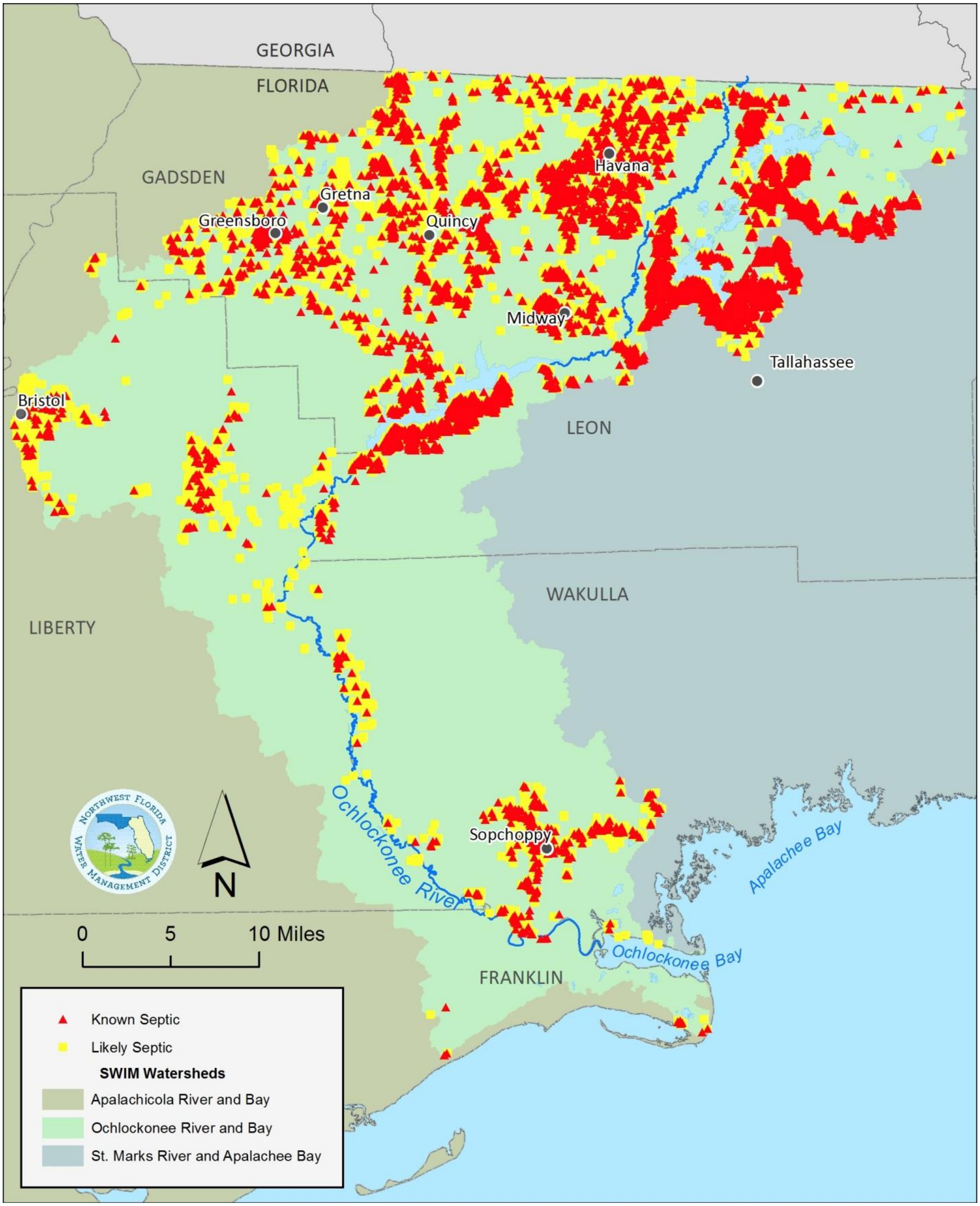


Figure 3-3 Septic Tank Locations in the Ochlockonee River and Bay Watershed

Pollution from marinas can depend on the availability of pump-out facilities and the level and consistency of marina BMP implementation (FDEP 2015b, 2016c). The Florida Clean Marina Program and Florida Clean Boatyard Program are voluntary designation programs for implementing environmental practices to protect Florida's waterways. There is currently one major marina located on Ochlockonee Bay in Panacea; however, there are currently no pump-out facilities or Clean Marina designations in the watershed (FDEP 2015c). There may be opportunity for improvement in smaller marinas and docking facilities, which can contribute to water quality issues, but which may go unaddressed because of their size and remote locations.

There are 13 permitted domestic Wastewater Treatment Facilities (WWTFs) and 14 industrial WWTFs within the watershed (FDEP 2017a) (Figure 3-4). Domestic WWTFs, flows and discharge type are included in Table 3-2 below. The Liberty County Correctional Institution is permitted as both a domestic wastewater treatment facility and a residual application facility. The Wakulla County – Otter Creek facility is undergoing major upgrades to advanced wastewater treatment standards, with the ability to provide reclaimed water to customers, scheduled to be completed by 2019.

Table 3-2 Domestic Wastewater Facilities

Facility Name	County	Permitted Flow (mgd)	2015 Flow (mgd)	Discharge Type*
Gadsden East WWTF	Gadsden	0.25	0.15	RIB
Greensboro High School WWTP	Gadsden	0.01	**	RIB
City of Gretna WWTP	Gadsden	0.40	0.28	Sprayfield
Town of Havana WWTF	Gadsden	0.40	0.16	Sprayfield; reuse at WWTP
Havana Middle School WWTP	Gadsden	0.02	0.00	RIB
City of Quincy WWTP	Gadsden	1.50	0.92	Surface water to Quincy Creek; reuse at WWTP
Rentz MHP WWTP	Gadsden	0.01	**	RIB
Fort Braden Elementary School WWTP	Leon	0.01	**	Absorption field
Lake Jackson WWTP	Leon	0.50	0.25	RIB
Killearn Lakes WWTP	Leon	0.70	0.65	RIB
Liberty Correctional Institution WWTP	Liberty	0.28	0.17	RIB
City of Bristol WWTF	Liberty	0.25	0.12	RIB
Wakulla County - Otter Creek WWTF	Wakulla	0.60	0.57	Sprayfield

Source: FDEP 2016h, 2017a.
*See Parts II-VII of Chapter 62-610, F.A.C. for more information.
** Annual flow information not compiled by FDEP

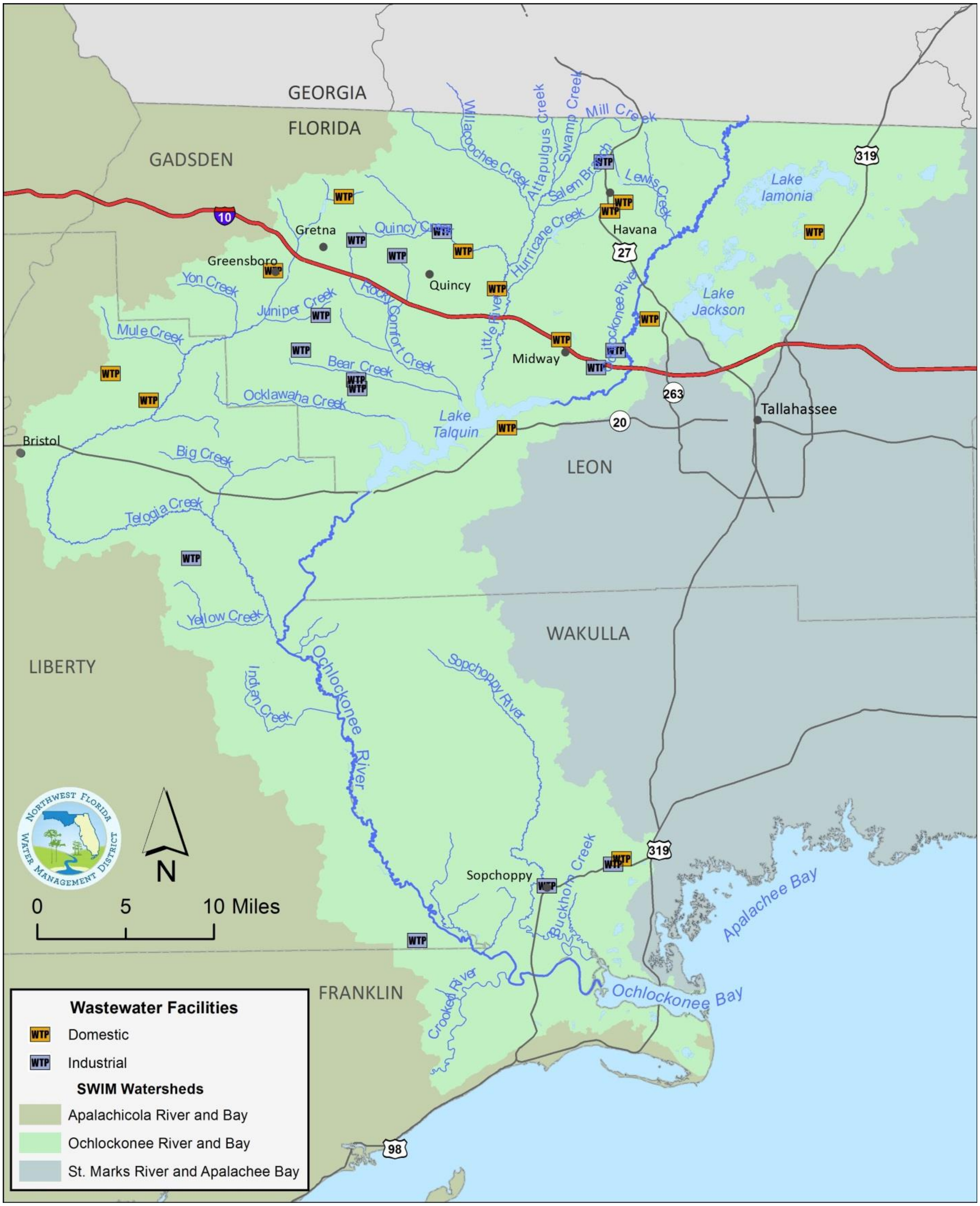


Figure 3-4 Permitted Wastewater Facilities within the Ochlockonee River and Bay Watershed

A significant amount of intensive surface mining is ongoing in Gadsden County and in southern Georgia (Figure 3-5). Materials mined in the watershed are sand and fill material, Fuller's earth, limestone, and crushed stone (FDEP 2014c; Georgia Environmental Protection Department [EPD] 2002). Fuller's earth, a type of clay, is removed through strip mining. Mining and extraction are estimated to cover approximately 936 acres of the watershed within Florida (FDEP 2015a). The Gadsden County Future

Land Use Map allows mining on approximately 11,779 acres (Gadsden County 2015). The USGS recognizes four major mining operations within the Ochlockonee River and Bay watershed, all located in Gadsden County:

- Crowder Sand Processing Plant (Sand and Gravel);
- Quincy Plant (Perlite);
- Engelhard Corporation (Fuller's Earth); and
- McCall Pit (Fuller's Earth).

Discharge from clay mine operations and fertilizer production in Attapulgus, Georgia, has been affecting Attapulgus Creek just north of the state border in Georgia, the Little River in Florida, and ultimately Lake Talquin, since the early 1990s. BASF reported discharge of nearly 3.5 million pounds of ammonia and more than 2 million pounds of nitrate compounds in 2014 (EPA 2014). In the same year, BASF also generated approximately 5.6 million pounds of production-related waste, of which zero percent was treated and only four percent was recycled (EPA 2014). Georgia EPD granted an indefinite NPDES permit extension in 2001 for the discharge to Little Attapulgus Creek. Monitoring and assessment conducted in 2006 on behalf of Leon County concluded that 37 to 87 percent of the total nitrate-nitrite load in the Little River watershed and 12 to 68 percent of the load in upper Lake Talquin were attributable to industrial discharge at the Attapulgus plant (Applied Technology and Management 2008).

As of 2014, there were three Toxics Release Inventory sites in the watershed, two in Gadsden County and one in Liberty County (EPA 2017). There is also one hazardous waste facility located in Tallahassee registered as an EPA Biennial Reporter facility (EPA 2016b).

Additionally, 283 closed, two abandoned, and 212 active petroleum contamination tracking sites within the watershed are registered with the Storage Tank and Petroleum Contamination Monitoring (STCM) database. There are three contaminated dry-cleaning sites eligible for the state-funded Dry-cleaning Solvent Cleanup Program. The majority of STCM and dry-cleaning sites are located in historically developed areas in the northern portion of the watershed including Tallahassee, Quincy, and Havana. Several sites are also located in Gretna, Bristol, and Greensboro.

There are currently no EPA National Priority List (NPL) Superfund sites within the Ochlockonee River and Bay watershed. However, two non-NPL Superfund sites, Post & Lumber Preserving Company, Inc., and the Quincy Landfill in Gadsden County, are located within the watershed. Post & Lumber Preserving is also a state-funded cleanup site that is contaminated with wood preserving waste. A non-NPL site is a site that has not been placed on the NPL list through the EPA's formal process for assessing hazardous waste sites. However, the EPA can take short-term cleanup actions on non-NPL sites under the emergency removal program.

Atmospheric deposition contributes nitrogen and mercury to the system. The draft TMDL for Lake Talquin (FDEP 2016a) lists atmospheric deposition as a measurable source of both nitrate and ammonium. Similarly, the final basin management action plan for the Lower Wakulla River (FDEP 2016a) indicates that atmospheric deposition is the source of approximately 13 percent of the nitrogen loading to the spring basin. Florida's geographic setting and meteorology prompt mercury deposition from the atmosphere. Biochemical conditions in Florida waters and sediments are conducive to conversion of mercury originating from atmospheric deposition to the more toxic and bio-accumulative methyl-mercury form (EPA 1997). Methyl-mercury biomagnifies as it moves through the aquatic food chain (EPA 1997).

The four designated waterbody segments in the Ochlockonee River and Bay watershed were removed from the impaired waters list for mercury in fish in 2014 due to the adoption of TMDLs for mercury (FDEP 2014b). Mercury levels in seafood are addressed through consumption advisories issued by the Florida Department of Health.

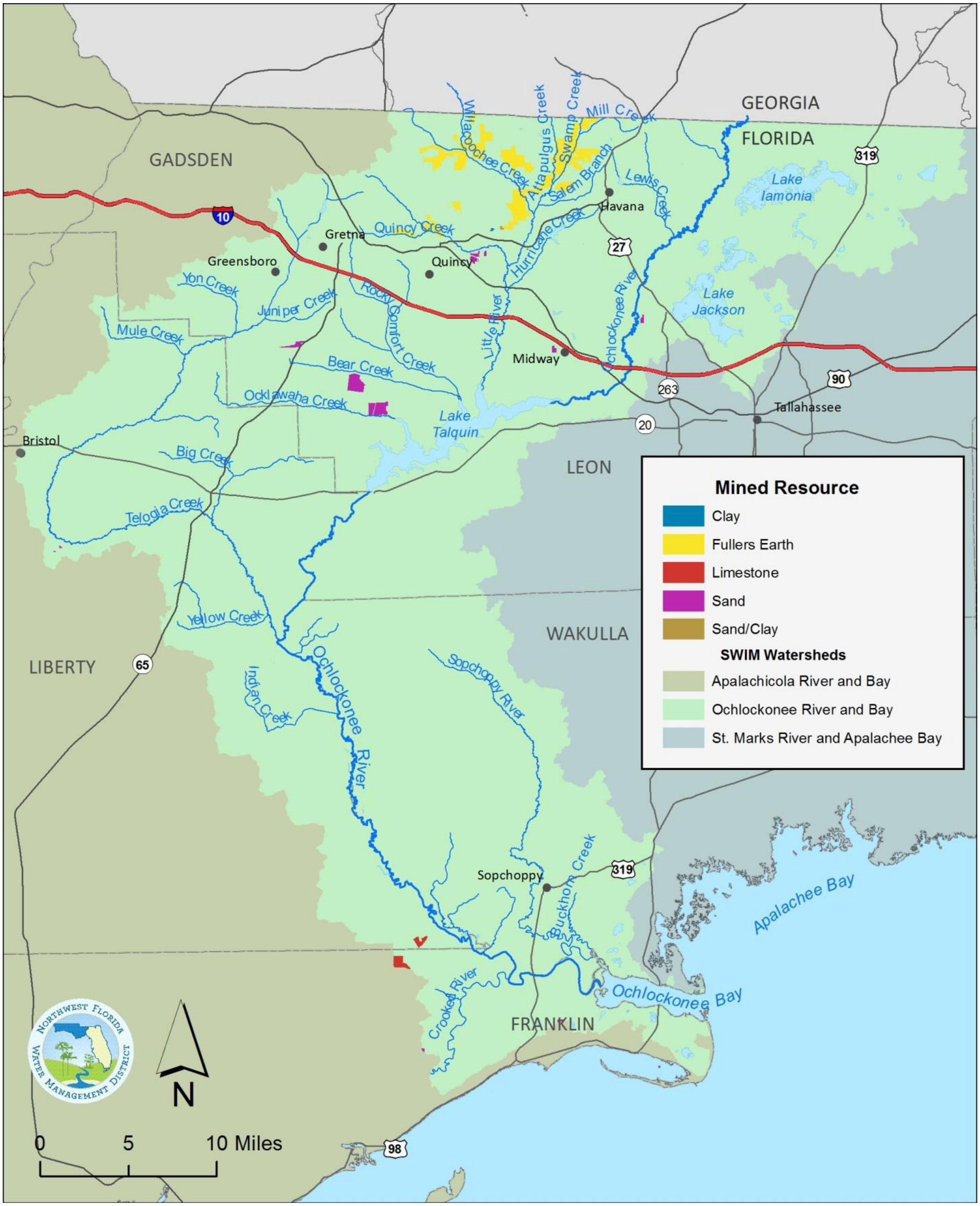


Figure 3-5 Mines Located in the Ochlockonee River and Bay Watershed

3.2 Natural Systems

Aquatic habitats and fish and wildlife resources may be degraded or lost due to the water quality problems discussed above, as well as due to sedimentation and sediment quality changes. The Ochlockonee River provides important habitat for the Gulf sturgeon. Additionally, freshwater mussels are particularly vulnerable to anthropogenic impacts, and their sustainability may be indicative of other species and resources dependent on benthic conditions and water quality. Four species (Ochlockonee moccasinshell, oval pigtoe, shinyrayed pocketbook, and purple bankclimber) have had dramatic declines in population in the Ochlockonee River system and are at risk of extinction (USFWS 2003). As filter feeders, mussels are sensitive to heavy metals, ammonia, algae on substrates, low dissolved oxygen, pesticides, and possibly microorganisms from discharged wastewater. They require permanently flowing water of good quality (USFWS 2007). Impoundments and other physical changes also affect habitat conditions for mussels, as well as for other aquatic species (USFWS 2007). Bank erosion and sedimentation from erosive land uses and unpaved roads also impact benthic habitat and water quality.

Many of the watershed's upland lakes have undergone hydrologic alteration and have suffered impacts from point and NPS pollution, particularly in the Tallahassee metropolitan area. Lake Jackson and Lake Iamonia have experienced extensive growth of non-native aquatic plants. This has diminished native plant cover and stressed aquatic species. Invasive plant species include hydrilla (*Hydrilla verticillata*), water hyacinth (*Eichhomia crassipes*), alligatorweed (*Alternanthera philoxeroides*), burhead sedge (*Oxycaryum cubense*), Cuban bulrush (*Oxycaryum cubense*), and water lettuce (*Pistia stratiotes*). Management of aquatic vegetation, including invasive species, is an ongoing challenge in fresh waters across the state – including within lakes Jackson, Iamonia, Carr, and Hall (FWC 2016c). Much of the management challenge includes addressing public access and use, as well as environmental conditions.

The periodic draining and refilling of lakes, such as Lake Jackson and Lake Iamonia, controls and defines the consistency of plant and animal communities within the lakes. During drawdowns, aquatic vegetation dies and decomposes, exposing more of the lake bottom and improved habitat for some fish species (McGlynn 2006a, 2006b).

Environmental conditions in the Ochlockonee estuary are generally undescribed except for relatively limited information on water quality. Few studies have examined the ecological communities and their interactions. General habitat features (e.g., fresh and salt marshes, oyster reefs) have been mapped for the most conspicuous communities; however, no site-specific studies have examined the faunal assemblages inhabiting these areas. Community-level data (e.g., species composition, abundance) can only be surmised based on studies in adjacent areas. Based on this lack of information, a comprehensive biological and water quality monitoring program would be needed to assess estuarine conditions.

In the coastal lowland region of the watershed, most intertidal communities are in relatively good condition. Little research has been conducted on the status and quality of salt marsh habitat in Ochlockonee Bay. The effects of sea level rise on the adjacent Apalachee Bay and the St. Marks National Wildlife Refuge, however, have been assessed since the late 1990s. Recent investigations at the Refuge by USFWS using the Sea Level Affecting Marshes Model indicate tidal fresh marsh communities would transition to salt marsh with rising sea levels (USFWS 2012). Impacts observed in Apalachee Bay are likely to be observed in Ochlockonee Bay as well, due to proximity and similarities in near-shore elevation, offshore gradient, and species composition.

Conservation lands, which help to protect both water and habitat quality in riverine and coastal areas, account for nearly 44 percent, or 366,000 acres, of the land area within the Florida portion of the Ochlockonee River and Bay watershed. Due to the number of contiguous conservation lands in the Ochlockonee River and Bay watershed, and relatively limited coastal development, significant portions of the watershed support a diversity of habitats and wildlife.

Some of the largest tracts of protected lands in the watershed include portions of the Apalachicola National Forest and Tate's Hell State Forest. Together, the Apalachicola National Forest and Tate's Hell State Forest buffer the Apalachicola and Ochlockonee bays and protect floodplains along the New, Ochlockonee, and Crooked rivers. Conservation lands in the watershed are summarized in Appendix G.

3.3 Floodplains and Floodplain Management

Floodplains provide important functions for water resources, as well as for the human community. Properly functioning floodplains protect water quality by allowing storage of floodwaters, reducing runoff velocity and preventing erosion and sedimentation. Floodplains attenuate potential flood effects, while also providing an ecological link between aquatic and upland ecosystems. They also provide important habitat for many terrestrial and aquatic species. In addition to impacting water resources, development and encroachment into flood-prone areas can place residents and property at risk. Floodplain encroachment reduces flood-carrying capacity, increases flood heights and velocities, and degrades natural systems in areas beyond the encroachment itself.

Maintaining the hydrological integrity of the floodplain can benefit surface water systems in drought conditions, as well as flood conditions. Floodplain vegetation reduces evaporation and increases soil water storage capacity. Riparian wetlands, marshes, and floodplain forests help to slow stormwater runoff, protecting water quality and regulating the release of water into streams and aquifers.

Riverine floods are common along major rivers and their tributaries. Within the Ochlockonee River and Bay watershed, the Ochlockonee, Sopchoppy, and Crooked Rivers; tributary streams; wetlands, low-lying areas; coastal areas; and closed basins are subject to significant flooding. Flooding is particularly problematic in high-growth and densely populated areas. Flooding impacts can be aggravated by inadequate public awareness of the potential for flooding events and associated consequences.

Federal Emergency Management Agency digital flood maps indicate that 400,625 acres (approximately 48 percent) of the Ochlockonee River and Bay watershed are delineated as Special Flood Hazard Area (Figure 2-7). Lands prone to flooding are predominantly in the lower portion of the watershed in the coastal lowlands where extensive wetlands, old submerged beaches, and seagrass meadows have a wave dampening effect. Most of this region is public conservation land, so risks to private property are limited.

The Crooked River, much of St. James Island, the lower Sopchoppy River, and the Ochlockonee River from the coast to about 30 miles upstream, are also vulnerable to storm surges (FEMA 2014). This area has little development within the watershed boundary and is mostly public land or private timberland.

The coastline within the Ochlockonee River and Bay watershed is an extensive low-energy area, with a gently sloping continental shelf, no offshore barrier islands, and several rivers, creeks, and marshes discharging directly into the Gulf of Mexico. The coastline is also in a generally upwind direction, resulting in limited sand transport and wave heights that are commonly 3-4 centimeters or less. During storm events, Franklin and Wakulla counties are susceptible to tide wave amplification. A 2014 Wakulla County Flood Insurance Study identified seven hurricanes since the 1830s that have resulted in damage to the region, including extensive shoreline erosion and inundation depths of up to 10 feet (FEMA 2014).

Flood protection needs within the Ochlockonee River and Bay watershed are closely related to stormwater management, as well as land use planning and land development regulation. Thus, for both retrofit and new development, flood protection and water quality treatment efforts must be closely coordinated.

4.0 Watershed Protection and Restoration

4.1 Management Practices

Watershed management 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 for surface water improvement and management are described below.

4.1.1 Nonpoint Source Pollution Abatement

Addressing NPS pollution is a vital part of watershed management in the Ochlockonee 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 reduce NPS pollution and protect and improve water quality and watershed resources.

Stormwater Retrofit

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. Stormwater retrofit efforts have proven particularly important in the Lake Jackson basin, where both Leon County and the city of Tallahassee have improved and built upon existing stormwater systems to protect and restore water quality and to improve local flood protection.

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, bioretention, vegetated swales and buffers, pervious pavement, 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 Ochlockonee River and Bay watershed, the greatest need and potential for stormwater retrofit efforts is within municipal and fringe areas with relatively dense development and significant areas of impervious surface. Examples include the Tallahassee area, Quincy, Midway, and the vicinity of Ochlockonee Bay. Local governments normally take the lead in planning and implementing stormwater retrofit projects, as they most commonly own, operate, and maintain the affected stormwater management systems.

Agricultural Best Management Practices

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 FDACS has developed, evaluated, and approved BMPs that are specific to individual agricultural operations within Florida watersheds. As of August 2017, the FDACS 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 Ochlockonee River and Bay watershed, the most extensive and concentrated areas of agricultural land use are within Gadsden County, notably including the Telogia Creek and Little River sub-basins (Figure 2-10). Within these areas in particular, application of agricultural BMPs have significant potential to further protect and improve water quality and aquatic habitat conditions.

<u>Silviculture Best Management Practices</u>

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 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 Ochlockonee River and Bay watershed is predominantly forested (Table 2-1; Figure 2-10), 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 (Figure 2-3) suggests application of SMZs may be particularly useful for protecting downstream aquatic habitats from further impacts.

<u>Low Impact Development</u>

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 structural alteration of low-lying, flood-prone lands; reserving such areas for passive public uses
- Minimized effective impervious area
- Vegetated swales
- Bioretention cells
- Rain gardens
- Infiltration and exfiltration systems
- Riparian buffers
- Greenways
- 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.

<u>Riparian Buffers</u>

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, 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 included 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	💧	💧	💧	💧	💧	💧
Maintain Stream Temperature	🐟	🐟	🐟	🐟	🐟	🐟
Nitrogen Removal		💧	💧	💧	💧	💧
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 can also cause progressive erosion that smothers streams, severely damaging or destroying habitats and diminishing water quality. Risks are most pronounced in the upper portion of the Ochlockonee River and Bay watershed, given the slopes and prevalent soils.

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 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.

In addition to addressing unpaved roads and gully 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 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, proven approaches to improving water quality and aquatic habitat conditions, as well as public uses and benefits. Evaluation of resource vulnerability, as well as facilities and engineering planning conducted by local governments and utilities, will guide implementation

Extending sewer service to areas that currently rely on conventional onsite treatment and disposal systems for wastewater treatment and disposal is effective in reducing nutrient loading to ground and surface water source. As outlined in Section 3.2.4, there are over 23,000 known or likely conventional septic systems in the Ochlockonee River and Bay watershed. As illustrated by Figure 3-7, these are particularly concentrated within the basins of lakes Jackson, Iamonia, and Talquin, as well as within the vicinities of Telogia Creek and the Sopchoppy River. Connecting residences and businesses in these areas to centralized wastewater treatment systems has the potential to substantially improve wastewater treatment and reduce the export 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 potential for installation of advanced onsite systems. These systems achieve water quality treatment that significantly exceeds that provided by conventional systems. In particular, 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). Pilot projects are underway in different areas to expand implementation of these systems statewide.

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 2016h). 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 is a significant need 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 expensive and difficult, given the need to retrofit existing systems in often highly developed areas. Upon completion, however, notable improvements can be achieved for water quality, public recreational uses, and fisheries.

4.1.3 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, and stream restoration are discussed further below.

Wetland, Hydrologic and Floodplain Restoration

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

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

Hydrologic restoration is important for altered flow-ways and waterbodies in urban areas, such as the Tallahassee urban area, as well as for riverine systems and for larger wetland systems, including Tate's Hell State Forest. Wetland restoration, including habitat enhancements and vegetation restoration, is broadly applicable at both large and smaller scales throughout the watershed.

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.

Shoreline restoration in this context may be particularly applicable as a potential strategy along altered and/or eroding shorelines of Ochlockonee Bay.

Stream Restoration

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

Watershed topography (Figure 2-3), as well as land use, suggests that stream restoration may be a particularly appropriate strategy within the upper watershed. Additionally, Telogia Creek and the Little River basin have been substantially altered with in-stream impoundments, suggesting additional opportunities for stream restoration.

Lake Restoration

Lake restoration most frequently encompasses restoration actions described above, including NPS pollution abatement actions, conversion of conventional septic systems to central sewer or advanced onsite systems, and restoration of wetlands and tributary streams. Additionally, lake drawdowns and natural drydown events can be used as opportunities to remove contaminated and/or enriched sediments, thus removing legacy pollutants, as well as to promote oxidation of organic sediments and to improve vegetation conditions.

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.

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, protect marsh habitat, and buffer upland areas against wind and wave activity that expedite erosion. Each oyster can filter vast quantities of water, removing suspended particles that would otherwise reduce sunlight penetration needed for healthy seagrass beds.

4.1.4 Land Conservation

While the Ochlockonee River and Bay watershed benefits from extensive public land areas 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 protection of sensitive areas, including stream headwaters and riverine, stream-front, and estuarine shorelines. 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.

As demonstrated through the Florida Forever program and other state, federal, local, and private initiatives, preserving sensitive lands can be an effective part of protecting water quality and habitat, as well as preserving floodplain and wetland functions. Where land is acquired fee simple by public agencies, other benefits, such as public access and recreation, are also achieved.

In many cases, less-than-fee acquisition can also achieve resource protection goals, while also achieving cost savings and maintaining private property ownership and use. The less-than-fee approach has proven particularly useful within the Ochlockonee River and Bay watershed.

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 public 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 programs can bring together multiple partners such as federal, state, and local agencies; non-profit groups; and citizen volunteers by identifying common program goals and achieving overlapping 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; Offer Your Shell to Enhance Restoration (OYSTER); 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 (e.g., Bay Day, Earth Day). Continually educating and engaging citizen’s results in increased interest, understanding, support, and motivation.

4.1.6 Options for Further Study and Analysis

Additional work is needed to further advance the scientific understanding of resource conditions and watershed challenges and opportunities. Additional analytical work can also support improved project planning and the incorporation 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 current inventory and prioritization of erosion and sedimentation sites throughout the Ochlockonee River and Bay watershed. These may include, for example, unpaved road stream crossings, borrow pits, and other erosional features.
- Assess long-term runoff and streamflow trends to better understand effects on floodplain storage and downstream habitats. Utilize information to identify options for water quality and aquatic habitat protection and restoration.
- 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.

- 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 proposed target areas for central sewer connections and for advanced onsite systems.
- Develop a hydrodynamic model to improve the understanding of estuarine circulation, with application for 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:
  - Regional-scale shoreline habitat development proposals
  - Passive and/or pumped estuarine flushing systems
  - Proposals for major hydrologic alterations, such as causeway alterations, locks and dams, and barrier island pass alteration and maintenance
  - Stream channel reconfiguration
  - Dredged material removal and disposal
  - Benthic dredging
- Develop analysis of estuarine habitat, conditions, and trends, including for shellfish and submerged aquatic vegetation habitat, with assessment of suitability for restoration.
- Develop improved metrics for monitoring and evaluating projects, programs, and environmental conditions and trends.

4.2 Implementation

Table 4-2 outlines the planning progression for SWIM program priorities, objectives, and selected management options and approaches for the Ochlockonee River and Bay watershed. These, in turn, inform and guide 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		
Water Quality Impairments Water quality impairments for listed waters, to include nutrients, bacteria, and dissolved oxygen Water quality problems in Lake Jackson, Lake Talquin, Telogia Creek, Ochlockonee Bay, the upper Ochlockonee River, and tributaries	Protect water quality basin-wide, and restore water quality in impaired waters. Reduce nutrient and bacteria concentrations in receiving waterbodies. Prioritize water quality protection in spring groundwater contribution areas. Reduce water quality impacts from legacy pollutants.	• Stormwater retrofit projects • Comprehensive and integrated basin-wide stormwater management plans • Conversion of septic systems to central sewer • Evaluation and deployment of advanced passive onsite systems • Upgrades to wastewater infrastructure • Agricultural and silvicultural BMPs • Fee simple and less-than-fee protection of spring contribution areas, floodplains, riparian habitats, and other sensitive lands • Floodplain and wetland restoration • Riparian buffer zones • Water reclamation and reuse • Evaluate, prioritize, and address unpaved roads and associated erosion at stream crossings. • Evaluate and address other erosion sites, such as borrow pits and gullies
Wastewater Management Needs and opportunities for improved wastewater collection and treatment Point source discharges Inadequate treatment from conventional OSTDS	Reduce loading of nutrients and other pollutants from OSTDS. Expand the reuse of reclaimed water. Reduce pollutant loading from aging infrastructure.	
Nonpoint Source Pollution Stormwater runoff Sedimentation and turbidity from unpaved roads and other erosion sources	Continue to improve treatment of urban stormwater Reduce basinwide NPS pollution. Reduce sedimentation from unpaved roads and erosion.	

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

<table>
<tr><th>Watershed Priorities</th><th>Objectives</th><th>Management Options</th></tr>
<tr><td colspan="3">Natural Systems</td></tr>
<tr><td>Wetland Systems
Wetland loss and degradation</td><td>Protect and where needed restore wetland hydrology, vegetation, and functions.</td><td rowspan="3">• Restoration of wetland hydrology and vegetation
• Estuarine habitat restoration (e.g., oyster reefs, seagrasses, and tidal marsh) where water quality is sufficient
• Shoreline and riparian habitat restoration, integrated across multiple habitats where possible
• Natural channel stream restoration
• Fee simple and less-than-fee protection of floodplains, riparian habitats, and other sensitive lands
• Development of enhanced modeling tools (such as, but not limited to, suitability models for estuarine habitat restoration and enhancement)
• Development and dissemination of detailed elevation (LiDAR) data
• Coastal adaptation and land use planning
• Coastal infrastructure retrofits to enhance adaptation capacity and habitat resiliency
• Facilitation of shoreline/estuarine habitat migration along the coastal elevation and latitudinal gradients
• Agricultural, forestry, and construction best management practices
• Enhanced monitoring of hydrologic and water quality data
• Sediment removal from degraded aquatic habitats
• Prioritization and abatement of sedimentation from unpaved road stream crossings and other sources</td></tr>
<tr><td>Estuarine and Coastal Habitat
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</td><td>Restore and enhance estuarine benthic habitats.
Ensure restoration projects are compatible with coastal change.
Protect and restore the function of vegetated riparian buffers on public and private lands.
Protection and enhancement of fish and wildlife habitat, including designated critical habitat for listed species</td></tr>
<tr><td>Riverine, Stream, and Lacustrine Habitats
Physically altered and impacted floodplains, riparian habitats, and tributary streams
Sediment deposition
Streambank erosion</td><td>Evaluate and correct hydrological alterations where necessary.
Restore impacted stream, wetland, and lacustrine habitats.
Protect and restore riparian habitats.
Protect and enhance fish and wildlife habitat, including designated critical habitat for listed species
Restore the function of vegetated riparian buffers.
Reduce sedimentation from unpaved roads and landscape erosion.
Reduce erosion and sedimentation from agricultural and silvicultural operations.</td></tr>
</table>

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

Watershed Priorities	Objectives	Management Options
Floodplain Functions		
Impacts to Floodplains Headwater degradation and channelization Diminished or disconnected floodplain area Riparian buffer loss	Protect and reestablish functional floodplain area. Evaluate and correct hydrological alterations where necessary. 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. Restore the function of vegetated riparian buffers on public and private lands.	• Natural channel stream restoration • 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 • Continued flood map updates and detailed flood risk studies • Hydrologic restoration • Wetland and floodplain restoration

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

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 agricultural, silvicultural, and urban BMPs.	• Disseminate information about watershed resources and benefits via multiple approaches – Internet, publications, school programs, and workshops • Disseminate 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: Ochlockonee 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 Restoration	✓	✓	✓	✓
Estuarine Habitat Restoration	✓		✓	✓
Strategic Land Conservation	✓	✓	✓	✓
Watershed Stewardship Initiative	✓	✓	✓	✓
Sub-basin Restoration Plans	✓	✓	✓	✓
Lake Jackson Management Plan	✓	✓	✓	✓
Wastewater Treatment and Management Improvements	✓		✓	
Interstate Coordination	✓			✓
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 regional and multipurpose facilities, innovative treatment systems, 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. Comprehensive stormwater management plans
2. Completed stormwater retrofit facilities
3. Improved water quality and flood protection
4. Data evaluation and system validation, with lessons applicable to future projects

Watershed Priorities:

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

Supporting Priorities:

- ✓ Stormwater runoff and NPS pollution
- ✓ Aging infrastructure
- ✓ Sediment deposition
- ✓ Streambank erosion

Objectives:

- ✓ Reduce basinwide NPS pollution.
- ✓ Reduce nutrient and bacteria concentrations in receiving waterbodies.
- ✓ Reduce pollutant loading due to aging infrastructure.
- ✓ Prioritize and correct sedimentation and erosion sources.
- ✓ Reestablish and reconnect functional floodplain area.
- ✓ Restore stream, wetland, and estuarine benthic habitats.

Lead Entities:

- ✓ Local governments

Geographic Focus Areas:

All developed areas of the watershed. Specific project options include, but are not limited to:

- ✓ Lake Jackson basin, including Ford's Arm, Megginnis Arm, and Harbinwood
- ✓ Little River basin
- ✓ Tanyard Branch basin

Planning Level Cost Estimate:

>$5,000,000*

*Costs for stormwater facilities vary widely, depending on types of facilities and whether land needs to be acquired.

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.

Watershed Priority:

- ✓ Water Quality

Supporting Priorities:

- ✓ Inadequate treatment from conventional OSTDS
- ✓ Aging infrastructure

Objectives:

- ✓ Reduce nutrient and bacteria concentrations in receiving waterbodies.
- ✓ Reduce pollutant loading due to aging infrastructure.
- ✓ Prioritize water quality protection in spring groundwater contribution areas.

Lead Entities:

- ✓ Utilities, local governments

Geographic Focus Areas:

Locations with high densities and numbers of OSTDS; those close to waterbodies and other sensitive natural features, including:

- ✓ Harbinwood/Jackson Heights basin of Lake Jackson
- ✓ Vicinity of the cities of Quincy, Havana, Midway and Gretna
- ✓ Mashes Sands Beach
- ✓ Tide Creek/Otter Creek Area

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

Advanced Onsite Treatment Systems

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

Watershed Priority:
✓ Water Quality
Supporting Priorities:
✓ Inadequate treatment from conventional OSTDS ✓ Aging infrastructure
Objectives:
✓ Reduce nutrient and bacteria concentrations in receiving waterbodies. ✓ Reduce pollutant loading due to aging infrastructure. ✓ Prioritize water quality protection in spring groundwater contribution areas.
Lead Entities:
✓ Utilities, local governments
Geographic Focus Areas:
Rural areas near surface waters where central sewer is not available or cost-effective; particularly in northern reaches of the watershed. ✓ Greater Lake Talquin basin ✓ Telogia Creek basin ✓ Sopchoppy River 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. In consultation with FDACS, FWC, and NRCS, develop a comprehensive inventory of implemented agriculture and silviculture BMPs and identify potential gaps and/or potential improvements for implementation in the watershed.
2. In cooperation with FDACS, FFS, and the National Forest Service, evaluate relationships between forest management practices and hydrologic and water quality effects.
3. Based on funding resources, develop plans for cost-share or other assistance for implementation.
4. Develop an outreach plan to engage agricultural producers and forestry practitioners; supporting technical training and participation in developing implementation strategies.
5. Conduct program outreach to support implementation of property-specific approved BMPs, potentially including annual cost-share grant cycles as defined by funding sources.
6. Work with FDACS to offer free technical assistance in the design and implementation of property- and resource-specific BMPs.
7. Monitor 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.

Outcomes/Products:

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

Watershed Priorities:

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

Supporting Priorities:

- ✓ Stormwater runoff and NPS pollution
- ✓ Sedimentation and turbidity from unpaved roads and other erosion sources
- ✓ Riparian buffer loss
- ✓ Streambank erosion
- ✓ Need for improved BMP technical support

Objectives:

- ✓ Reduce basinwide nonpoint source pollution.
- ✓ Reduce nutrient and bacteria concentrations in receiving waterbodies.
- ✓ Prioritize and correct sedimentation and erosion sources.
- ✓ Restore the function of vegetated riparian buffers on public and private lands.
- ✓ Reduce erosion and sedimentation from agricultural and silvicultural operations.
- ✓ Support agricultural and silviculture BMPs.

Lead Entities:

- ✓ FDACS
- ✓ NRCS
- ✓ FWC
- ✓ Private landowners
- ✓ NWFWMD
- ✓ IFAS Extension

Geographic Focus Areas:

For agriculture, areas of focus include:

- ✓ Ocklawaha Creek basin
- ✓ Telogia Creek basin
- ✓ Little River basin
- ✓ Lewis Creek basin

For silviculture, the focus is basin-wide, as the watershed is predominantly forested.

Planning Level Cost Estimate:

$1,000,000 annually

Basinwide Sedimentation Abatement

Description:

This strategy consists of development and implementation of activities related to sedimentation abatement to improve surface water quality 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. If current assessment is unavailable, inventory and evaluate sedimentation sites. This includes initial desktop data collection and analysis, together with field data collection and site evaluation.
3. 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.
4. Develop individual site plans, which 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 a 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.

Watershed Priorities:

- ✓ Water Quality
- ✓ Natural Systems

Supporting Priorities:

- ✓ Stormwater runoff and nonpoint source pollution
- ✓ Sedimentation and turbidity from unpaved roads and other erosion sources
- ✓ Streambank erosion
- ✓ Shoreline destabilization and erosion

Objectives:

- ✓ Reduce basinwide NPS pollution.
- ✓ Prioritize and correct sedimentation and erosion sources.
- ✓ Evaluate and correct hydrological alterations, if necessary.
- ✓ Reduce erosion and sedimentation from agricultural and silvicultural operations.

Lead Entities:

- ✓ Local governments
- ✓ State and federal agencies

Geographic Focus Areas:

- ✓ Ocklawaha Creek basin
- ✓ Telogia Creek basin
- ✓ Little River basin
- ✓ Lewis Creek basin

Planning Level Cost Estimate:

$500,000*

*Initial screening and high priority projects

Outcomes/Products:

1. Improved water quality, both onsite and in receiving waters
2. Improved aquatic habitat quality, including for sensitive species such as Gulf Sturgeon and freshwater mussels

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

Watershed Priorities:

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

Supporting Priorities:

- ✓ Stormwater runoff and NPS pollution
- ✓ Sedimentation and turbidity from unpaved roads and other erosion sources
- ✓ Diminished or disconnected floodplain area
- ✓ Riparian buffer loss
- ✓ Shoreline destabilization and erosion

Objectives:

- ✓ Reduce basinwide NPS pollution.
- ✓ Reduce nutrient and bacteria concentrations in receiving waterbodies.
- ✓ Prioritize and correct sedimentation and erosion sources.
- ✓ Restore the function of vegetated riparian buffers on public and private lands.
- ✓ Restore stream, wetland, and estuarine benthic habitats.
- ✓ Reduce erosion and sedimentation from agricultural and silvicultural operations.
- ✓ Ensure restoration projects are compatible with coastal change.

Lead Entities:

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

Geographic Focus Areas:

- ✓ Headwater streams
- ✓ Estuarine shorelines
- ✓ Little River basin
- ✓ Telogia Creek basin
- ✓ Ocklawaha Creek and tributaries

Planning Level Cost Estimate:

TBD*

*Variable; includes passive implementation by property owners.

Aquatic, Hydrologic, and Wetland Restoration

Description:

This strategy consists of implementation of 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.

Scope of Work:

1. Conduct a site inventory and evaluation, to include channelized streams, drained/filled wetlands, road fill, and other areas conveying water. Evaluate freshwater and tidal drainage patterns and any restrictions in tidal flow. This includes initial desktop data collection and analysis, together with field data collection and site evaluation.
2. Identify restoration options, to include hydrologic reconnection (e.g., fill removal, low water crossings), tidal creek restoration, natural channel stream restoration, lake restoration with drawdown or natural drydown events, floodplain reestablishment, vegetation community reestablishment, tidal and riparian marsh restoration, and other options based on site characteristics and historic habitats.
3. Prioritize sites based on inventory and site evaluation, as well as consideration of water quality, other site and resource data, severity of impacts, cumulative effects, land ownership, and accessibility.
4. 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.
5. Develop detailed site restoration designs for priority sites, taking into account public input and preferences.
6. Execute on-the-ground restoration projects.
7. Monitor local water quality and physical and biological site characteristics, including before and after implementation.

Watershed Priorities:

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

Supporting Priorities:

- ✓ Headwater degradation and channelization
- ✓ Diminished or disconnected floodplain area
- ✓ Wetland loss and degradation
- ✓ Physically altered and impacted tributary streams
- ✓ Saltwater intrusion that could alter brackish and freshwater habitats
- ✓ Shoreline destabilization and erosion

Objectives:

- ✓ Evaluate and correct hydrological alterations, if necessary.
- ✓ Reestablish and reconnect functional floodplain area.
- ✓ Restore wetland area and functions.
- ✓ Restore the function of vegetated riparian buffers on public and private lands.

Lead Entities:

- ✓ FWC
- ✓ NWFWMD
- ✓ FDEP
- ✓ USFWS
- ✓ Public and private landowners

Geographic Focus Areas:

- ✓ Tates Hell Swamp
- ✓ Ochlockonee River tributaries
- ✓ Telogia Creek

Planning Level Cost Estimate:

TBD*

*Costs variable depending on specific sites. Approximately $1,500,000 for Ochlockonee basins of the Tates Hell Swamp restoration plan.

8. Analyze data to identify water quality trends.
9. Communicate results to watershed stakeholders and participating agencies.

Outcomes/Products:

1. Restored wetland, aquatic, and floodplain habitats and functions
2. Improved protection of water quality and natural systems
3. 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. Conduct a site inventory and evaluation, to include evaluation of such factors as need for stabilization, habitat stability, stressors impacting shorelines, projected sea level rise, shoreline profile, ecosystem benefits, property ownership, public acceptance, and feasibility.
2. Identify project options, which may include, but are not limited to:
   a) Restoration/establishment of riparian and littoral vegetation communities;
   b) On previously altered shorelines, establishment of integrated living shorelines and estuarine habitats;
   c) Restoration/reconnection of tidal marsh;
   d) Integrated restoration of multiple shoreline/estuarine habitats;
   e) Restoration/creation of oyster reefs or other benthic habitats.
3. Prioritize sites based on inventory and site evaluation, 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.
4. Consider development of demonstration projects on public lands.
5. 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.
6. Develop detailed site restoration designs for priority sites, taking into account public input and preferences.

Watershed Priorities:
✓ Water Quality
✓ Floodplain Functions
✓ Natural Systems
Supporting Priorities:
✓ Stormwater runoff and NPS pollution
✓ Diminished or disconnected floodplain area
✓ Wetland loss and degradation
✓ Saltwater intrusion that could alter brackish and freshwater habitats
✓ Shoreline destabilization and erosion
✓ Lack of understanding of current and potential effects of sea level rise S
✓ Riparian buffer loss
Objectives:
✓ Reduce basinwide NPS pollution.
✓ Reduce nutrient and bacteria concentrations in receiving waterbodies.
✓ Reduce pollutant loading due to aging infrastructure.
✓ Prioritize and correct sedimentation and erosion sources.
✓ Reestablish and reconnect functional floodplain area.
✓ Restore the function of vegetated riparian buffers on public and private lands.
✓ Restore wetland area and functions.
✓ Reduce sedimentation from unpaved roads and landscape erosion.
✓ Ensure restoration projects are compatible with coastal change.
Lead Entities:
✓ State and federal agencies
✓ Local governments
✓ Public and private landowners
Geographic Focus Areas:
✓ Ochlockonee Bay
Planning Level Cost Estimate:
TBD*   *Cost estimates will await completion of site inventory and evaluation.

7. Execute on-the-ground restoration projects as identified under Paragraph 2 above.
8. Monitor and evaluate water quality and habitat conditions before and after implementation.
9. Compile and evaluate data to determine trends and to objectively measure project benefits and outcomes.

Outcomes/Products:

1. Restored wetland and estuarine habitats and functions
2. Improved protection of water quality and natural systems
3. Increased resiliency of estuarine habitats to anticipated sea level rise and extreme weather events
4. Establishment of demonstration sites to promote additional implementation by private landowners and local governments

Strategic Land Conservation

Description:

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 lists (such as the Florida Forever Work Plan) to complete an inventory of 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

Watershed Priorities:
✓ Water Quality
✓ Floodplain Functions
✓ Natural Systems
Supporting Priorities:
✓ Stormwater runoff and NPS pollution
✓ Headwater degradation and channelization
✓ Diminished or disconnected floodplain area
✓ Riparian buffer loss
✓ Wetland loss and degradation
✓ Shoreline destabilization and erosion
Objectives:
✓ Reduce basinwide NPS pollution.
✓ Reduce nutrient and bacteria concentrations in receiving waterbodies.
✓ Restore the function of vegetated riparian buffers on public and private lands.
✓ Protect and reestablish functional floodplain area.
Lead Entities:
✓ Florida Department of Environmental Protection
✓ Tall Timbers Research Station and Land Conservancy
✓ Private landowners and working forests
✓ Local governments
Geographic Focus Areas:
✓ Ayavalla Plantation Project
✓ Ochlockonee River Conservation Area
✓ Little River Conservation Area
✓ Coastal Buffer Options
Planning Level Cost Estimate:
$12,500,000* *50% of DEP-estimated land value for designated projects

Watershed Stewardship Initiative

Description:

The purpose of the watershed stewardship initiative is to create meaningful 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 water quality and 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 volunteer 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.

Watershed Priorities:

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

Supporting Priorities:

Needs for:

- ✓ Public understanding of practices to protect water resources
- ✓ Opportunities for public participation
- ✓ Improved technical knowledge of BMP methods

Objectives:

- ✓ Support agricultural, silvicultural, and urban BMPs.
- ✓ Conduct education and outreach about watershed resources and personal practices to protect water and habitat quality.
- ✓ Create long-term partnerships among stakeholders, including government, academic institutions, non-governmental organizations, businesses, residents, and others, to maximize effectiveness of project implementation.

Lead Entities:

- ✓ FDEP
- ✓ Friends of Lake Jackson
- ✓ Local Governments
- ✓ Private landowners and working forests

Geographic Focus Areas:

- ✓ Watershed-wide

Planning Level Cost Estimate:

$200,000 annually*

* Inclusive of program for the St. Marks River watershed

Outcomes/Products:

1. Improved long-term protection of water quality, habitat, and floodplain functions
2. Improved public understanding of watershed resources, functions, and public benefits
3. Improved public understanding of, and participation in, resource programs and projects

Sub-basin Restoration Plans

Description:

This strategy consists of development of comprehensive restoration plans for discrete sub-basins or waterbodies. This work should incorporate aspects of other separate strategies described herein.

Scope of Work:

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. In cooperation with local governments and other stakeholders, conduct planning for lake restoration actions to be conducted in coordination with drawdowns or natural drydown events. This may include consideration and coordination of both sediment removal and vegetation management.
7. Identify separate actions and project types that can cumulatively achieve identified goals.
8. Implement public outreach and engagement by conducting field visits, public meetings, and providing innovative hands-on engagement opportunities. Coordinate with established watershed groups.
9. Implement selected actions.
10. 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.

Outcomes/Products:

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

Watershed Priorities:
✓ Water Quality ✓ Floodplain Functions ✓ Natural Systems ✓ Education and Outreach
Supporting Priorities:
✓ All Supporting Priorities
Objectives:
✓ All Objectives
Lead Entities:
✓ Local governments ✓ FDEP ✓ FWC ✓ NWFWMD ✓ Friends of Lake Jackson ✓ Tall Timbers Research Station and Land Conservancy ✓ Other private landowners and stakeholders
Geographic Focus Areas:
Targeted sub-basins within the watershed including: ✓ Lake Jackson ✓ Lake Talquin ✓ Lake Iamonia
Planning Level Cost Estimate:
TBD* *Costs depend on specific projects included

Lake Jackson Management Plan

Description:

This strategy is an application of sub-basin management plans, described above, specifically supporting continued implementation of priorities established under the Lake Jackson Management Plan in cooperation with the community, local governments, and state resource agencies.

Scope of Work:

1. Coordinate this effort to include other projects outlined within this plan.
2. Work with local governments and stakeholders to update current priorities for water quality protection and improvement and lake management.
3. Continue to secure funding to implement projects for Lake Jackson
4. Update stormwater management plans, as needed, in cooperation with local governments and stakeholders.
5. Support public outreach and engagement activities, to include participation in project design and prioritization, field visits, public meetings, and opportunities for participation in project implementation and monitoring. Coordinate with the Friends of Lake Jackson.
6. Monitor implementation of Lake Jackson-specific projects, including in coordination with the Lake Jackson Aquatic Preserve.
7. Monitor trends in upstream and downstream water quality: before and after project implementation and including trends in receiving waters.
8. Evaluate data to identify changes in trends of target pollutants.
9. In cooperation with local governments and other stakeholders, conduct planning for lake restoration actions to be conducted in coordination with natural drydown events. This may include consideration and coordination of both sediment removal and vegetation management.

Watershed Priority:

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

Supporting Priorities:

- ✓ Stormwater runoff and NPS pollution
- ✓ Inadequate treatment from conventional OSTDS
- ✓ Headwater degradation and channelization
- ✓ Physically altered and impacted tributary streams

Objectives:

- ✓ Reduce basinwide NPS pollution.
- ✓ Reduce nutrient and bacteria concentrations in receiving waterbodies.
- ✓ Reduce pollutant loading due to aging infrastructure.
- ✓ Prioritize water quality protection in spring groundwater contribution areas.
- ✓ Evaluate and correct hydrological alterations, if necessary.
- ✓ Protect and reestablish functional floodplain area.
- ✓ Restore the function of vegetated riparian buffers on public and private lands.

Lead Entities:

- ✓ FDEP Aquatic Preserve Program
- ✓ FWC
- ✓ NWFWMD
- ✓ Local governments
- ✓ Friends of Lake Jackson
- ✓ Other private landowners and stakeholders

Geographic Focus Areas:

- ✓ Lake Jackson Aquatic Preserve
- ✓ Ford's Arm
- ✓ Timberlane Creek
- ✓ Megginnis Arm
- ✓ Harbinwood Estates
- ✓ Carr Lake
- ✓ Mallard Pond
- ✓ And others

Planning Level Cost Estimate:

TBD*

*Costs depend on specific projects included

Outcomes/Products:

1. Continued improvements in water quality, habitat quality, and public uses and benefits for Lake Jackson
2. Continued support for public participation in watershed management and project implementation

Wastewater Treatment and Management Improvements

Watershed Priorities:
✓ Water Quality
Supporting Priorities:
✓ Needs and opportunities for improved wastewater collection and treatment ✓ Aging infrastructure ✓ Point source discharges
Objectives:
✓ Reduce nutrient and bacteria concentrations in receiving waterbodies. ✓ Reduce pollutant loading due to aging infrastructure. ✓ Prioritize water quality protection in spring groundwater contribution areas.
Lead Entities:
✓ Local governments ✓ Utilities
Geographic Focus Areas:
✓ Watershed-wide ✓ Systems within spring contribution areas and proximate to direct coastal drainages
Planning Level Cost Estimate:
>$3,500,000* *Costs depend on specific projects included

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

Interstate Coordination

Description:

This strategy consists of activities related to interstate coordination to improve and protect surface water quality in the basin.

Watershed Priority:
✓ Water Quality ✓ Natural Systems ✓ Education and Outreach
Supporting Priorities:
✓ Public education and outreach ✓ Expansion of cooperative community initiatives
Objectives:
✓ Reduce basinwide NPS pollution. ✓ Reduce nutrient and bacteria concentrations in receiving waterbodies. ✓ Support agricultural, silvicultural, and urban BMPs. ✓ Coordinate with state, federal, and local agencies on strategies to address out of state point source discharges. ✓ Conduct education and outreach about watershed resources and personal practices to protect water and habitat quality. ✓ Create long-term partnerships among stakeholders, including government, academic institutions, non-governmental organizations, businesses, residents, and others, to maximize effectiveness of project implementation.
Lead Entities:
✓ State and federal agencies ✓ Local governments
Geographic Focus Areas:
Watershed-wide with particular focus on northern extents of the watershed where Florida and Georgia interface
Planning Level Cost Estimate:
$25,000 annually

Scope of Work:

1. Develop a comprehensive plan for coordination between interstate agencies within the watershed. Evaluate case studies of successful interstate programs.
2. Develop a comprehensive contact list for the jurisdictions within the watershed. Develop an email distribution list, SharePoint group, and/or website to foster easy file and information sharing. Agencies should include USDA, Georgia Department of Natural Resources, other federal and state agencies, local governments (counties and cities), and non-profit watershed groups.
3. Identify areas of study and possible gaps in information.
4. Coordinate with Worth, Mitchell, Colquitt, Decatur, Grady, and Thomas counties in Georgia on the development of the sub-basin plans, agricultural/silvicultural BMPs, and sediment abatement issues.
5. Identify strategies to further address out of state point sources discharges.
6. Continually inform and engage all stakeholders during progress or discussions of watershed issues. Hold regular open joint meetings between stakeholders from both states.
7. Coordinate closely on all implementation projects for stormwater management, hydrologic alteration/restoration, sedimentation, agricultural BMPs, etc. Utilize a publicly shared file and discussion tool (such as a website) to house the status and outcome(s) of all implementation projects within the watershed (within both states).

Outcomes/Products:

1. Progress toward basin approach to watershed protection
2. Expanded public participation and knowledge of watershed resources and management needs

Analytical Program Support

Watershed Priorities:
✓ All identified program priorities
Supporting Priorities:
✓ All identified program priorities
Objectives:
✓ All watershed objectives
Lead Entities:
✓ State and federal resource agencies ✓ US EPA ✓ USFWS ✓ FWC ✓ NWFWMD ✓ Educational and research institutions ✓ Other cooperative, public-private initiatives
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. Identify research needs that would quantify the water quality benefits of BMP implementation, provide outreach and training, and strategies for implementing BMPs.
8. Inventory, evaluate, and prioritize unpaved road stream crossings and other sedimentation sites in support of Basinwide Sedimentation Abatement.
9. 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

10. Develop and refine hydrodynamic and water quality modeling tools. Develop specific management applications in cooperation with resource agencies and other public and nonprofit initiatives.
11. 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.
12. Identify and describe long-term trends with respect to wetland and aquatic habitats, aquatic plants, and water chemistry. Identify management implications and recommendations.
13. Evaluate nearshore groundwater discharges within the estuary. Identify management implications and recommendations.
14. Develop improved quantitative and qualitative metrics for evaluating conditions and guiding program and project implementation.

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

Watershed Priorities:
✓ All identified program priorities
Supporting Priorities:
✓ All identified program priorities
Objectives:
✓ All watershed objectives
Lead Entities:
✓ State resource agencies ✓ Local governments ✓ Community-based watershed monitoring initiatives ✓ Institutions of higher education; other environmental and watershed organizations ✓ Tall Timbers Research Station and Land Conservancy ✓ Friends of Lake Jackson ✓ UF-IFAS, Florida LakeWatch
Geographic Focus Areas:
✓ Watershed-wide, including across jurisdictional boundaries
Planning Level Cost Estimate:
$1,500,000 annually

Description:

Given 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 an 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 Development 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 include the following:

1. Projects with responsible parties that will implement, operate, and maintain the completed facilities;
2. Projects that achieve multiple, complementary objectives;
3. Restoration that is substantially self-sustaining;
4. Responsible parties that support long-term monitoring to facilitate verification, lessons learned, and adaptive management;
5. Sites and systems that reflect and are adaptable to natural variability; and
6. Cost effectiveness, technical feasibility, and regulatory factors are criteria to be considered in prioritization and funding..

Natural variability, for example, would include a habitat restoration project that is 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).

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 8 disproportionately affected Panhandle 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; • Infrastructure projects benefitting the economy or ecological resources; including port infrastructure & flood protection; • Promotion of tourism and Gulf seafood consumption; or • Administrative costs and planning assistance.
Gulf Coast Ecosystem Restoration Council (also known as The Council or Bucket/Pot 2)	Project selection based on Comprehensive Plan developed by the Council with input from the public.	The Comprehensive Plan incorporates projects that: • 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, the Coalition of Counties, or Bucket/Pot 3)	The Gulf Consortium, consisting of Gulf Coast counties is developing a State Expenditure Plan that must be approved by the RESTORE Council.	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)	Florida's Center of Excellence is the University of South Florida, Florida Institute of Oceanography.	• 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 • Replenish and protect living resources including oysters, red snapper and other reef fish, Gulf Coast bird populations, sea turtles and marine mammals.
Federal Sources		
Land and Water Conservation Fund	Projects that protect national parks, areas around rivers and lakes, national forests, and national wildlife refuges.	Many types of projects may be supported, including • Recreational trails • Restoration projects • grants to protect working forests, wildlife habitat, critical drinking water supplies • Also provide matching grants for state and local parks and recreation projects
North American Wetlands Conservation Act	Projects that increase bird populations and wetland habitat, while supporting local economies and traditional uses.	• Projects must protect migratory birds and associated habitats
National Coastal Wetlands Conservation Act	State and local governments, private landowners, and conservation organizations	• Projects that protect, restore and enhance coastal wetland ecosystems and associated uplands

Funding Source	Eligibility[1]	Project Types
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.
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.
US Fish and Wildlife Service and FWC, Partners for Fish and Wildlife	• Private landowners	Cooperative and voluntary effort between landowners, the FWC, and the USFWS to improve habitat conditions for fish and wildlife.
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

Funding Source	Eligibility[1]	Project Types
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.
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.

Funding Source	Eligibility[1]	Project Types
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.
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.
FWC 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.
FWC 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 NWFWMD developed a SWIM Plan for Lake Jackson in 1988 and revised the plan in 1990 and 1994. The Lake Jackson SWIM plan was updated in 1997 with the publication of the Lake Jackson Management Plan Addendum, which provided recommendations for future consideration and documented progress towards meeting the plan's goals and objectives. In 2012, the District developed a draft Ochlockonee River and Bay watershed SWIM Plan, to include the Lake Jackson basin. The Lake Jackson SWIM program emphasized NPS pollution control, while the 2012 Draft Ochlockonee SWIM Plan suggested a number of management strategies to address the larger watershed's challenges and improve watershed conditions, including stormwater treatment and management, protection of critical lands and habitats, ecological restoration, monitoring, floodplain management, public education and outreach, and intergovernmental coordination.

The Lake Jackson Management Plan included a project plan with four programs: water quality, preservation and restoration, watershed management, and public education and awareness (NWFWMD 1997). The 2012 draft SWIM plan subsequently recognized three priority objectives which also address three of the NWFWMD's statutory areas of responsibility relating to watershed management:

- Water quality protection and improvement, focusing on prevention and abatement of NPS pollution in the upper reaches of the basin;
- Natural systems protection, enhancement, and restoration, including stream, wetland, aquatic, and riparian habitat restoration on lands purchased for conservation in the lower basin; and
- Protection and, if necessary, restoration of floodplain functions.

Progress toward Meeting Plan Goals and Objectives

Significant progress has been made on addressing a number of the issues and priorities identified. 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 the noteworthy accomplishments are:

- Implementation of dedicated programs and projects to retrofit stormwater systems and improve water quality treatment by Leon County and the city of Tallahassee.
- Implementation of Environmental Resource Permitting (ERP) by the District and the FDEP.
- Implementation of local grant projects with grant funding from the Florida Forever program, including projects to achieve urban stormwater retrofits for water quality improvement.
- Since 1994, a number of major SWIM priorities for Lake Jackson were completed in cooperation with the city of Tallahassee, Leon County, the FWC, the FDEP, and others. These included collection and evaluation of water quality data; design and implementation of regional stormwater retrofit projects; construction of the Okeeheepkee Prairie, Boone Boulevard, Sharer Road, and Fuller Road stormwater treatment facilities (among others); Megginnis Arm habitat restoration; invasive plant management, evaluation of septic and sewer issues, and a major restoration effort to remove deposited sediments from the lake bottom during dry-down events.

- From 1999 through 2001, approximately 2 million cubic yards of deposited sediment had been removed as part of the Lake Jackson restoration effort.
- The FWC Bureau of Invasive Plant Management continues to implement aquatic plan management throughout the lakes of Leon County (http://myfwc.com/wildlifehabitats/invasive-plants/).

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-1 Project Implementation

Project	General Description	Lead Entity	Corresponding SWIM Project*	Status
Megginnis Arm Restoration	Stormwater treatment for 2,200-acre basin in the Lake Jackson watershed	NWFWMD	Regional Storm-water Retrofit	Complete 1993
Yorktown Pond Retrofit	Stormwater treatment; Tallahassee Mall	City of Tallahassee	Regional Storm-water Retrofit	Completed 1995
Megginnis Arm Sediment Removal	Removal of approximately 112,000 CY of contaminated sediment from Megginnis Arm	NWFWMD	Contingency Mgt. Plan for Natural Drawdown	Complete 1993
Woodmont Pond Retrofit	Stormwater retrofit	Leon County	Regional Storm-water Retrofit	Completed 2004
Boone Boulevard Stormwater Improvement	Stormwater treatment for 80-acre basin in the Lake Jackson watershed	City of Tallahassee	Regional Storm-water Retrofit	Completed 2005
Lake Jackson Sediment Removal	Lake Jackson restoration/ sediment removal project. Approximately 2 million cubic yards of muck removed.	Leon County, NWFWMD	Contingency Mgt. Plan for Natural Drawdown	Completed 2001
Harbinwood Estates Drainage Improvement	Stormwater treatment for 200-acre basin in the Lake Jackson watershed	Leon County	Regional Storm-water Retrofit	Completed 2008
Sharer Road Stormwater Improvements	Stormwater treatment for 1,500-acre basin in the Lake Jackson watershed	City of Tallahassee	Regional Storm-water Retrofit	Completed 2009
Okeeheepkee-Prairie Regional Stormwater Facility	Stormwater treatment for 328-acre basin in the Lake Jackson watershed	Leon County	Okeeheepkee Stormwater Retrofit	Completed 2010
Rhoden Cove Ecological Restoration	Invasive Plant Management	Leon County	Aquatic plant management	Completed 2011
Sharer Road Outfall Stabilization	Stormwater retrofit	Leon County	Regional Storm-water Retrofit	Completed 2012
Killearn Lakes Unit 3 Stormwater Retrofit	Stormwater retrofit	Leon County	Regional Storm-water Retrofit	Completed 2013
Killearn Lakes Stormwater Retrofit	Stormwater retrofit	Leon County	Regional Storm-water Retrofit	Under construction
Fords Arm South Restoration	Stormwater retrofit	Leon County	Regional Storm-water Retrofit	Currently in design

* Lake Jackson Management Plan (1994, 1997)

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 (OWFs) under section 403.061(27), F.S., which are then 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 include:

- Ochlockonee River
- Sopchoppy River
- Lake Jackson Aquatic Preserve
- St. Marks National Wildlife Refuge
- Ochlockonee River State Park
- Alfred B. Maclay State Gardens
- Bear Creek State Recreation Area
- Mashes Sands

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. The Lake Jackson Aquatic Preserve is the only freshwater preserve in the Northwest Florida Water Management District. Additional details on the Lake Jackson Aquatic Preserve and its management may be found at http://www.dep.state.fl.us/coastal/sites/lakejackson/. The Big Bend Seagrasses Aquatic Preserve, which adjoins Ochlockonee Bay, is the largest in Florida, and it encompasses expansive aquatic habitats including Florida's largest seagrass communities.

Surface Water Classifications

Most of the waters throughout the Ochlockonee River and Bay watershed have been classified by the state as Class III waters (designated for recreation and maintenance of a healthy, well-balanced population of fish and wildlife). Most of Ochlockonee Bay has been designated Class II waters, to support shellfish propagation or harvesting. Class III waters within the estuary include those within and proximate to bayous and other areas with substantial freshwater inflow. Quincy Creek and Holman Branch have been designated as Class I waters, for potable water supplies. Additional information may be found in Chapter 62-302, F.A.C.

Conservation Lands

As described previously, conservation lands account for nearly 44 percent of the land area within the Florida portion of the Ochlockonee River and Bay watershed. These lands include the Apalachicola

National Forest and portions of Tate's Hell State Forest. The watershed also includes eight state parks and forests encompassing more than 50,000 acres, the majority of which is managed by FDEP and FDACS. Lake Talquin State Forest encompasses part of the designated 2,700-acre Ochlockonee River Wildlife Management Area, managed by the FWC. The FWC also manages the Joe Budd Wildlife Management Area.

Approximately 18,816 acres of conservation lands are owned and managed by the Tall Timbers Research Station and Land Conservancy, a private organization devoted to land stewardship through research, conservation, and education. The Conservancy's research is focused on the southeastern coastal plain, including ecology and management of fire dependent ecosystems (Tall Timbers Research Station and Land Conservancy 2016).

The NWFWMD manages approximately 3,675 acres within the watershed, and it jointly manages Elinor Klapp-Phipps Park on the eastern shore of Lake Jackson with the City of Tallahassee. The watershed also includes local and county parks managed by Leon and Wakulla counties and the cities of Tallahassee and Quincy. The Tallahassee-Leon County Greenways Program identifies several additional properties within the watershed for future acquisition or greenway improvements (City of Tallahassee and Leon County 2015a).

Gulf Ecological Management Sites

The watershed includes one designated Gulf Ecological Management Sites (GEMS): the Big Bend Seagrasses Aquatic Preserve in Apalachee Bay, which encompasses 682,826 acres of submerged lands in coastal Wakulla and Jefferson counties. 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 sites are priorities for protection, restoration, and conservation 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

Sections of the Ochlockonee River above and below Lake Talquin are federally designated critical habitat for four listed mussel species: Ochlockonee moccasinshell (*Medionidus simpsonianus*), oval pigtoe (*Pleurobema pyriforme*), shinyrayed pocketbook (*Hamiota subangulata*), and purple bankclimber (*Elliptoideus sloatianus*) (USFWS 2016).

The FWC has identified two Strategic Habitat Conservation Areas (SHCAs) for the Florida black bear (*Ursus americanus floridanus*) in the watershed. One SHCA on the west side of the Ochlockonee River includes the lower Telogia Creek basin along with several nearby tributaries, while the other encompasses the lower portion of the watershed mostly in Franklin County (Endries *et al.* 2009). Additional SHCAs have been identified for wading birds along Telogia Creek, the Ochlockonee River above Lake Talquin, and lakes Jackson and Iamonia (Endries *et al.* 2009).

Other protected species with important habitat within the watershed include the threatened Gulf sturgeon (*Acipenser oxyrinchus desotoi*), the threatened piping plover (*Charadrius melodus*), the endangered red-cockaded woodpecker (*Picoides borealis*), and the threatened frosted flatwoods salamander (*Ambystoma cingulatum*).

Coastal Barrier Resource System

Congress passed the Coastal Barrier Resources Act of 1982 to minimize loss of human life by discouraging development in high risk areas; to reduce wasteful expenditure of federal resources; and to protect the natural resources associated with coastal barriers. The Act restricts most Federal expenditures and financial assistance that tend to encourage development, including Federal flood insurance, in the John H. Chafee Coastal Barrier Resource System (CBRS). The CBRS contains two types of mapped units, System Units and Otherwise Protected Areas (OPAs). These designated areas are ineligible for both direct and indirect federal expenditures and financial assistance. Most new Federal expenditures and assistance, including Federal flood insurance, are prohibited within System Units. Within OPAs, the only Federal spending prohibition is on Federal flood insurance. If a proposed project is located within the CBRS, federal funding cannot be used to accomplish that project (including "any project to prevent the erosion of, or to otherwise stabilize, any inlet, shoreline, or inshore area") unless it meets one of the exceptions listed under Section 6 of the CBRA. Within the Ochlockonee River and Bay watershed, Mashes Island, Bald Point, and the mouth of Ochlockonee Bay have been designated within the CBRS.

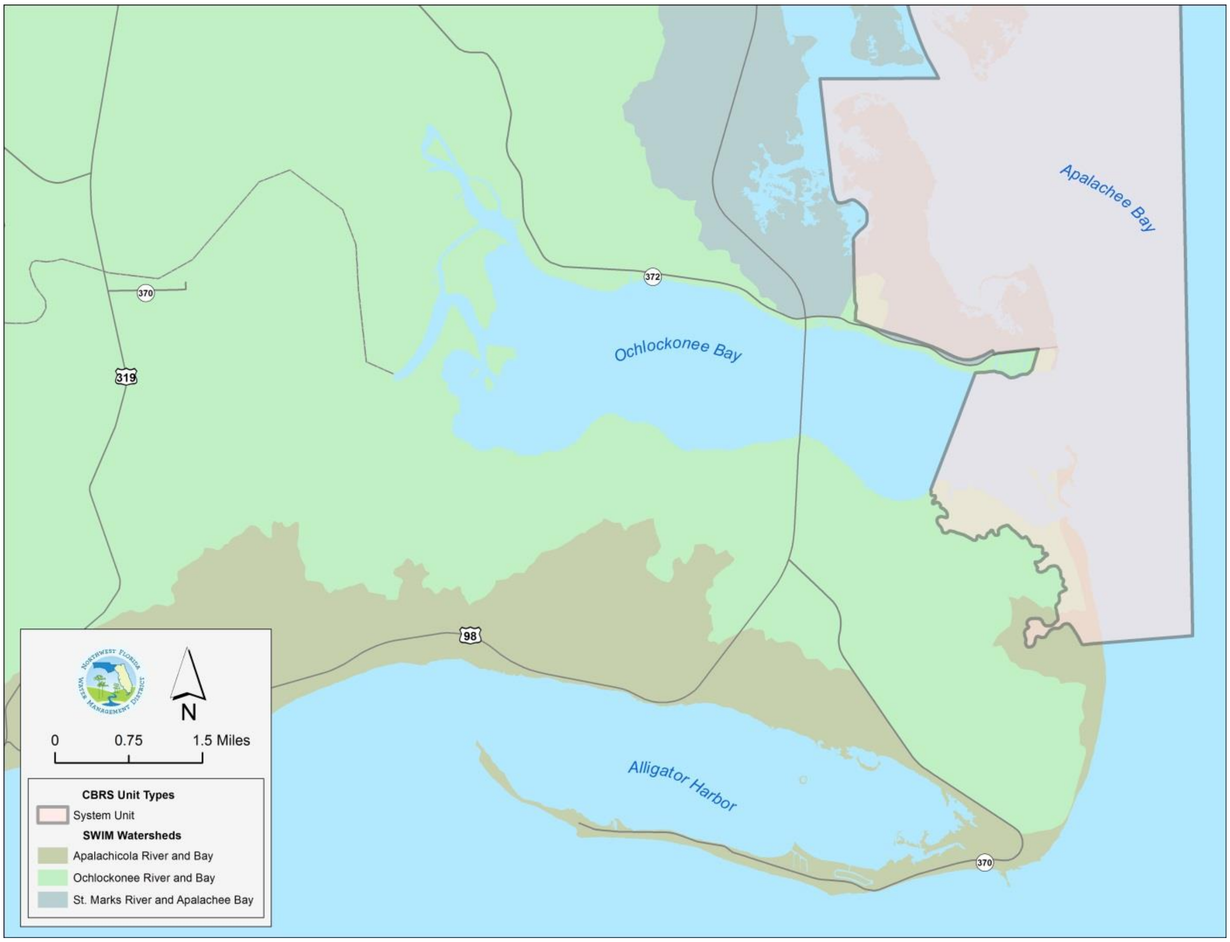

Figure B-1 Coastal Barrier Resource System Designated Areas within the Ochlockonee River and Bay Watershed

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 to FDEP's Deepwater Horizon project portal 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 Act

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

Direct Component Funds ("Bucket 1"): Thirty five percent of the funds in the Trust Fund will be split evenly among the five Gulf States. Florida's seven percent of these funds will be directly allocated to 23 Gulf Coast counties 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 15 non-disproportionately impacted Gulf Coastal counties – Jefferson to Monroe 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 publically vetted projects and goals (FDEP 2016d).

Comprehensive Plan Component ("Bucket 2"): The Gulf Coast Ecosystem Restoration Council, which includes the five Gulf States and six federal agencies, is charged with developing and implementing a Comprehensive Plan for the Gulf Coast Region. 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. Once developed and approved by the Governor, the State Expenditure Plan shall be submitted by the Governor to the RESTORE Council for its review and approval. Projects will be submitted by each of the 23 counties on Florida's Gulf Coast.

Natural Resource Damage Assessment

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 Natural Resource Damage Assessment (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

The National Fish and Wildlife Foundation (NFWF) established the GEBF to administer funds arising from plea agreements that resolve the criminal cases against BP 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. The amount of these funds that will be allocated to projects in the Ochlockonee River and Bay watershed is unknown as of this writing.

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 Ecosystem Restoration Council (TNC 2014).

The plan developed for the Apalachicola to St. Marks watersheds, including the Ochlockonee River and Bay watershed, identifies 13 projects to address four 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; and
- Reduce sedimentation.

To complete the planning process and ensure that all of the priority issues are identified and addressed, the plan recommended updating the 2012 Draft Ochlockonee River and Bay SWIM Plan—the subject of this report (TNC 2014).

Monitoring

The majority of the monitoring data in the Ochlockonee 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 of the data collected by the FDEP and its partners is uploaded to the statewide water quality database for assessment.

Several water quality monitoring programs are ongoing in the watershed. These include Leon County's Water Resources Program; the City of Tallahassee's Lakes Monitoring Program; the NWFWMD; the FDACS Shellfish Environmental Assessment Section (SEAS); and the FDOH Florida Healthy Beaches monitoring program. The following subsections provide an overview of these programs and some of their relevant findings.

FDEP/NWFWMD

Long-term trends in the water quality of Florida's waters are monitored by FDEP's Surface Water Temporal Variability (SWTV) and Groundwater Temporal Variability (GWTV) Monitoring Networks. These are statewide networks of fixed sites selected to reflect the water quality impacts across the state. The SWTV network includes two sites on the Ochlockonee River. The first station, located near the state boundary with Georgia, is used to measure the water quality of the Ochlockonee River as it enters Florida. The second site is located within the Apalachicola National Forest at a point of the river that is representative of the land use activities within the Ochlockonee basin. A third station is located on Telogia Creek near its furthest western reach. 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 2016e, 2016f).

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 2016g).

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) (Figure C-4).

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 2003). 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 50 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)

Under the SEAS program, the FDACS monitors bottom and surface temperature, salinity, DO, surface pH, turbidity, fecal coliform bacteria, water depth, and wind direction and speed at shellfish beds. The FDACS has identified two waterbody segments as verified impaired for bacteria in the Ochlockonee River and Bay watershed, based on shellfish classifications issued by the FDACS (FDEP 2014b):

- Ochlockonee Bay (waterbody identification number [WBID] 1248A); and
- Ochlockonee Bay/Gulf of Mexico (WBID 8025).

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. Local county health departments participate in the program with weekly monitoring of beaches for *enterococcus* and fecal coliform bacteria. The departments issue health advisories or warnings when bacterial counts are too high (FDEP 2003). While small in total number of records, the data provided by the FDOH include bacterial data used in their beach monitoring program (Florida Healthy Beaches Program) and have resulted in identification of several impaired segments based on beach closures.

The FDEP identified one beach segment as verified impaired for bacteria in the Ochlockonee River and Bay watershed, based on beach advisories issued by the county health departments (FDEP 2014b): Mashes Island (WBID 8025B).

Local Governments

Leon County conducts an ambient condition trend monitoring program. The program includes quarterly water quality sampling and annual sediment and biological assessments of 13 lakes, 27 streams, and two rivers at a total of 73 monitoring stations (including the Ochlockonee River and Lake Talquin). The 2016 Water Quality Report for data collected in 2015 is available as an Interactive Water Quality Data Map at the following link: http://cms.leoncountyfl.gov/Home/Departments/Public-Works/Engineering-Services/Stormwater-Management/Water-Quality-Data (Leon County 2016).

The program also assesses water quality using the Lake Vegetation Index, which evaluates how closely a given lake's plant community resembles a pristine condition, and the Stream Condition Index, which evaluates the biological health of a stream based on the population and diversity of macroinvertebrates (Leon County 2016).

The City of Tallahassee also conducts a Lakes Monitoring Program. The program monitors approximately 10 lakes within the city limits, including two sites in Lake Jackson, to track water quality trends and implement potential improvements if warranted. Twenty plus water quality parameters are evaluated on a quarterly cycle. Lake Vegetative Index surveys within each lake are performed bi-annually to evaluate lake community health.

Florida LakeWatch

The University of Florida's LakeWatch volunteer monitoring program collects water quality data at dozens of sites within the watershed. Parameters monitored include total nitrogen, total phosphorus, chlorophyll-*a*, and *Secchi* depth, which are collected monthly at lake stations and some stream stations by citizen volunteers, including the Friends of Lake Jackson. Data are sometimes collected on aquatic vegetation (FDEP 2003).

Submerged Aquatic Vegetation Monitoring

Submerged aquatic vegetation abundance and health varies within the watershed. Most areas appear to be declining. In addition to the loss of seagrasses due to limited sunlight, they are also being damaged by boat propellers in shallow waters. Public education and marking of navigation channels can help reduce these occurrences.

Since 2009, the FWC's Fish and Wildlife Research Institute (FWRI) has monitored changes in the extent, density, and patchiness of seagrass in the Big Bend region as part of the statewide Seagrass Integrated Mapping and Monitoring (SIMM) program. The FWRI also is currently conducting a study to identify the roadblocks to SAV recovery, which may be different from the causes for their losses.

Water Quality Restoration and Protection

Water quality in the Ochlockonee River and Bay watershed is protected through several programs working together to restore water quality and prevent degradation. These programs include the FDEP's adopted TMDLs; BMPs for silviculture, agriculture, construction, and other activities related to land use and development; regulatory programs including NPDES, domestic and industrial wastewater permits, stormwater permits, and the ERP; and local efforts to retrofit stormwater infrastructure to add or improve water quality treatment. Additionally, water quality is protected through a number of conservation, mitigation, and management programs that protect water resources, aquifer recharge areas, floodplains, and other natural systems within the watershed. These programs include the Florida Forever Work Plan, regional mitigation for state transportation projects, and local government efforts to protect resources and provide for flood protection. The following subsection 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 goals to guide restoration activities and identify 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. The FDEP has developed specific guidance for implementing fecal coliform TMDLs that focuses on identifying and removing bacteria sources (FDEP 2011a).

National Pollutant Discharge Elimination System (NPDES) Permitting

The FDEP implements the NPDES stormwater program in Florida under delegation from the EPA. The program requires 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.

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. National Pollutant Discharge Elimination System permits include "reopener clauses" that allow the FDEP to incorporate new discharge limits when a TMDL is established. For municipal stormwater permits, the FDEP will insert requirements for BMAP implementation upon completion (FDEP 2003).

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 water quality goals for surface waters.

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). Best management practices have been 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.

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.

Regional Mitigation for State Transportation Projects

Under Section 373.4137, F.S., the NWFWMD offers mitigation services 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 annually updated, 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 2016a). The plan is developed and implemented in consultation with the FDOT, the FDEP, the USACE, the EPA, the USFWS, the U.S. National Marine Fisheries Service, and the FWC. It is maintained and available for review at http://www.nwfwmdwetlands.com/.

The three mitigation sites in the Ochlockonee River and Bay watershed are (NWFWMD 2016a):

- **Shuler (ILF Project)** in Liberty County. The NWFWMD acquired a conservation easement on the 1,573-acre property in July 2008. The easement prevents development of the site and allows the NWFWMD to implement wetlands restoration, management, and stream restoration.
- **Megginnis Arm (Lake Jackson) Mitigation Area** in Leon County. The goal of this project is exotic/invasive plant species eradication and restoration of shoreline wetland vegetation on 17 acres. Restoration activities implemented include eradication of Chinese tallow and other exotic/invasive plant infestations, and planting appropriate wetland species.
- **Tate's Hell - Womack Creek Mitigation Area** in Liberty County. This mitigation site is in the Womack Creek drainage of Tate's Hell Swamp. It is adjacent to the Ochlockonee River and consists of approximately 70 acres of bottomland hardwood forest. Most of this area was cut in the early 1990s and not replanted. Mitigation included mechanical shrub reduction and planting of appropriate bottomland tree species.

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 (NWFWMD 2016b).

The NWFWMD's primary focus in the Ochlockonee River and Bay watershed has been to acquire less than fee rights on privately owned floodplain land separating existing federal and state properties. The District presently has 3,675 acres in less than fee holdings in the area and has identified approximately 11,767 acres for potential less than fee acquisition (NWFWMD 2016c).

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 Levels (MFLs)

Section 373.042, F.S., requires each water management district to develop 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 level 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 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. (NWFWMD 2016d).

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 has begun and will occur concurrently for several waterbodies. Starting in 2018, one MFL assessment is expected to be completed annually within the NWFWMD. There are no MFL assessments scheduled for any waters in the Ochlockonee River and Bay watershed; however, the 2016-2017 MFL Priority List and Schedule lists Telogia Creek as a waterbody to consider for MFL assessment in future years (NWFWMD 2016d).

Lake Management

Historically, Lake Jackson has periodically drained through sinkholes in the lakebed and has refilled during wet-weather periods. Recent lake restoration efforts coincided with lake dry-down periods. Beginning in 1999, an interagency team — including the NWFWMD, the FDEP, the FWC, and Leon County — conducted several phases of a restoration after prolonged drought and sinkholes drained the lake and provided opportunity for access. During the comprehensive effort during the 1999–2000 Lake Jackson dry-down, approximately 2 million cubic yards of nutrient-laden deposits of organic muck and sediment were removed from Megginnis Arm, Ford's Arm, Church Cove, and the southern part of the lake. These actions were part of the project scope described in the Lake Jackson Management Plan.

The FWC's Invasive Plant Management Section is the lead agency responsible for coordinating and funding statewide programs for controlling invasive aquatic and upland plants on public conservation lands and waterways (FWC 2015). The FWC has been responsible for restoration and habitat enhancement projects for lakes Iamonia and Talquin. Following the drought in 1999, Lake Iamonia was targeted for habitat enhancement. In 2000, the FWC removed muck from approximately 26 acres of the bottom on the north shore along the Lake Iamonia Landing boat ramp. A controlled burn along the western shore was implemented in the winter of 2000 to remove tussocks.

An artificial drawdown of Lake Talquin has been used as a prescribed habitat management practice on several occasions. In 1998, under the supervision of the FWC, Lake Talquin was partially drawn down ten feet for six months to allow for the oxidation and compaction of accumulated organic muck. Native aquatic plants were planted to reestablish emergent littoral vegetation. Grass seed was planted to provide nursery areas for the newly spawned sport fish. While this practice created a temporary hardship on area marinas and fish camps, the drawdown stimulated the fishery and improved the lake's overall health. In the 2014/2015 fiscal year, FWC treated nearly 150 acres of Lake Talquin to remove floating plants, burhead sedge (*Oxycaryum cubense*), and taro (*Colocasia esculenta*) (FWC 2015).

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 programs and partnerships help protect water resources across the Ochlockonee River and Bay watershed and the state of Florida. Such programs and partnerships include the Fisheries and Aquatic Sciences and Marine Sciences Program, the Aquatic and Invasive Plants Center, the Florida Cooperative Fish and Wildlife Research Unit, the Florida Partnership for Water, Agriculture and Community Sustainability, the Natural Resources Leadership Institute, the Wetland Biogeochemistry Laboratory, the Sea Grant, and the Shellfish Aquaculture Extension, among 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 (UF-IFAS 2016). 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.

City and County Initiatives

The City of Tallahassee and Leon County have carried out extensive stormwater management and retrofit activities for the basin. Activities have focused on implementing drainage improvements, stormwater retrofits, and lake restoration. A number of these are listed in Appendix A.

In accordance with the 1990 Tallahassee–Leon County Comprehensive Plan, a stormwater ordinance and a stormwater utilities department were created. From the resulting Stormwater Master Plan, local stormwater planners developed a list of approximately 20 capital improvement projects to address flooding and drainage improvements. Recent examples include the Boone Boulevard, Okeeheepkee Prairie, Harbinwood Estates, and Sharer Road retrofit facilities, completed with local funding and funding from the NWFWMD from Florida Forever. These projects provided treatment for hundreds of acres and were completed within the Lake Jackson basin from 2005 through 2010. These projects, in turn, build upon earlier efforts, including construction of the Interstate 10 Stormwater Treatment Facility, among others.

Leon County and the City of Tallahassee are continuing major activities to improve the treatment and management of stormwater runoff, improving water quality in Lake Jackson and other waterbodies within the basin. The Okeeheepkee Prairie Park facility was completed in 2015. New stormwater facilities are under construction within the Ford's Arm basin.

Development guidelines and permitting requirements to prevent or minimize stormwater contamination also resulted from the Comprehensive Plan and the stormwater ordinance. New developments are now required to include adequate stormwater treatment measures. Redeveloped sites must also be retrofitted to provide treatment, and efforts are made to preserve sensitive areas (FDEP 2003). The city has constructed 11 regional facilities throughout the community that incorporate both water quality treatment as well as flood prevention into their design.

The non-structural stormwater practices include public information, staff training, incident reports, and other activities to address and prevent polluted stormwater. For the last ten years, the city of Tallahassee has sponsored the TAPP – Think About Personal Pollution Campaign to help educate citizens on ways that they can make small personal changes in their home and yard practices to help keep local lakes, sinks, and streams cleaner. The campaign has been recognized nationally for its effectiveness.

Other Programs and Actions

As described in the preceding section, local governments and organizations are active participants in the restoration projects being or expected to be funded through the RESTORE Act, the NRDA, and the NFWF. These organizations have been longstanding partners in monitoring water quality and environmental health throughout the watershed. They have also been key partners in developing stormwater master plans and retrofit projects to reduce and treat stormwater, as well as building community support for watershed protection through the creation of citizen advisory councils and volunteer organizations.

Numerous citizen or citizen-government groups with a primary interest in protecting or enhancing water resources are active in the Ochlockonee River and Bay watershed. Most organizations have a specific geographic focus at either the watershed or waterbody level. Identified groups and their activities are:

- **Friends of Lake Jackson** – The Friends of Lake Jackson, Inc. was formed in 1998 to help organize informed and concerned citizens sharing a desire to protect Lake Jackson. This citizen action group provides a forum for residents within the basin and promotes the health, preservation, and maintenance of the lake. The Friends of Lake Jackson has been an involved stakeholder during the development of the Lake Jackson SWIM Plan and plan updates, local development reviews, and restoration and stormwater projects within the basin. Friends of Lake Jackson also provides education on topics and events related to the overall status and well-being of the lake through the Friends of Lake Jackson website (http://friendsoflakejackson.org/folj/) and other media (Friends of Lake Jackson 2016).

- **Apalachee Audubon** – The Apalachee Audubon is North Florida's chapter of the National Audubon Society, a non-profit organization dedicated to the "protection of the environment through education, appreciation, and conservation" through education, membership, field trips, and public programs (Apalachee Audubon 2016). The Apalachee Audubon Society Conservation Plan, adopted in November 2015, outlines the organization's plans to conduct conservation activities such as direct habitat enhancement projects and wildlife monitoring to identify population trends. The Conservation plan also outlines the Apalachee Audubon's goal and intent to comment on agency resource management plans and public position statements that concern important conservation issues in north Florida (Apalachee Audubon 2015).

Appendix C Geographic and Physical Characteristics

Overview

The greater Ochlockonee River and Bay watershed covers approximately 2,476 square miles of Florida and Georgia. About 53 percent of this area is within Florida (Figure C-1). There is distinct topographical variation, with the highest elevations and most significant slopes within Georgia and the northern extent of the watershed in Florida (Figure C-2). The lower reach of the watershed, within Liberty and Wakulla counties, is defined by a broad coastal plain.

Generalized land cover (Figure C-3) reflects extensive forestlands and wetlands within Florida. Significant agricultural uses are prominent in Georgia, as well as within Gadsden County, Florida. Urbanized areas include the City of Tallahassee and Thomasville, Georgia, as well as smaller communities in Georgia and Florida.

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

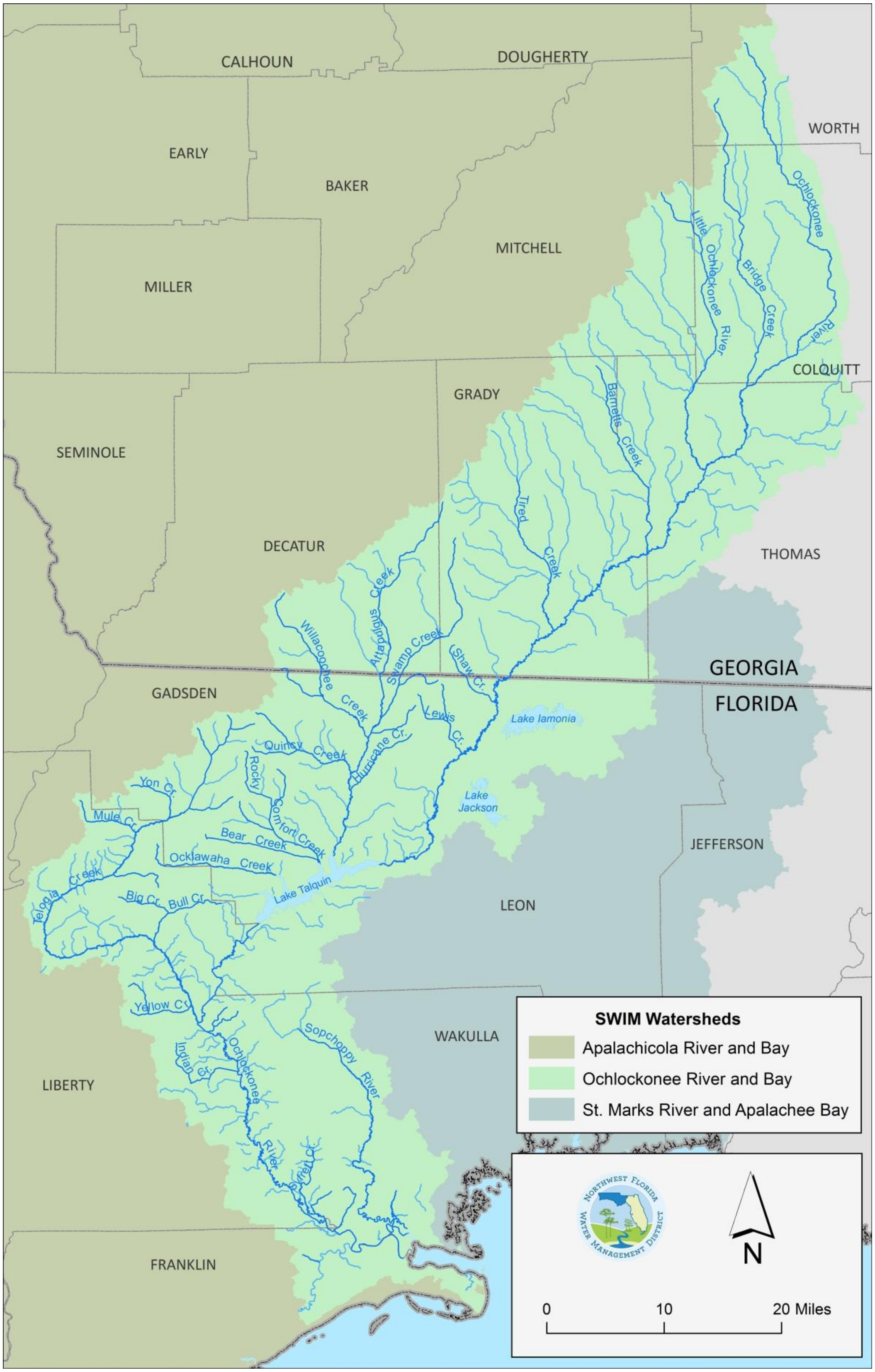

Figure C-1 Greater Ochlockonee River and Bay Watershed

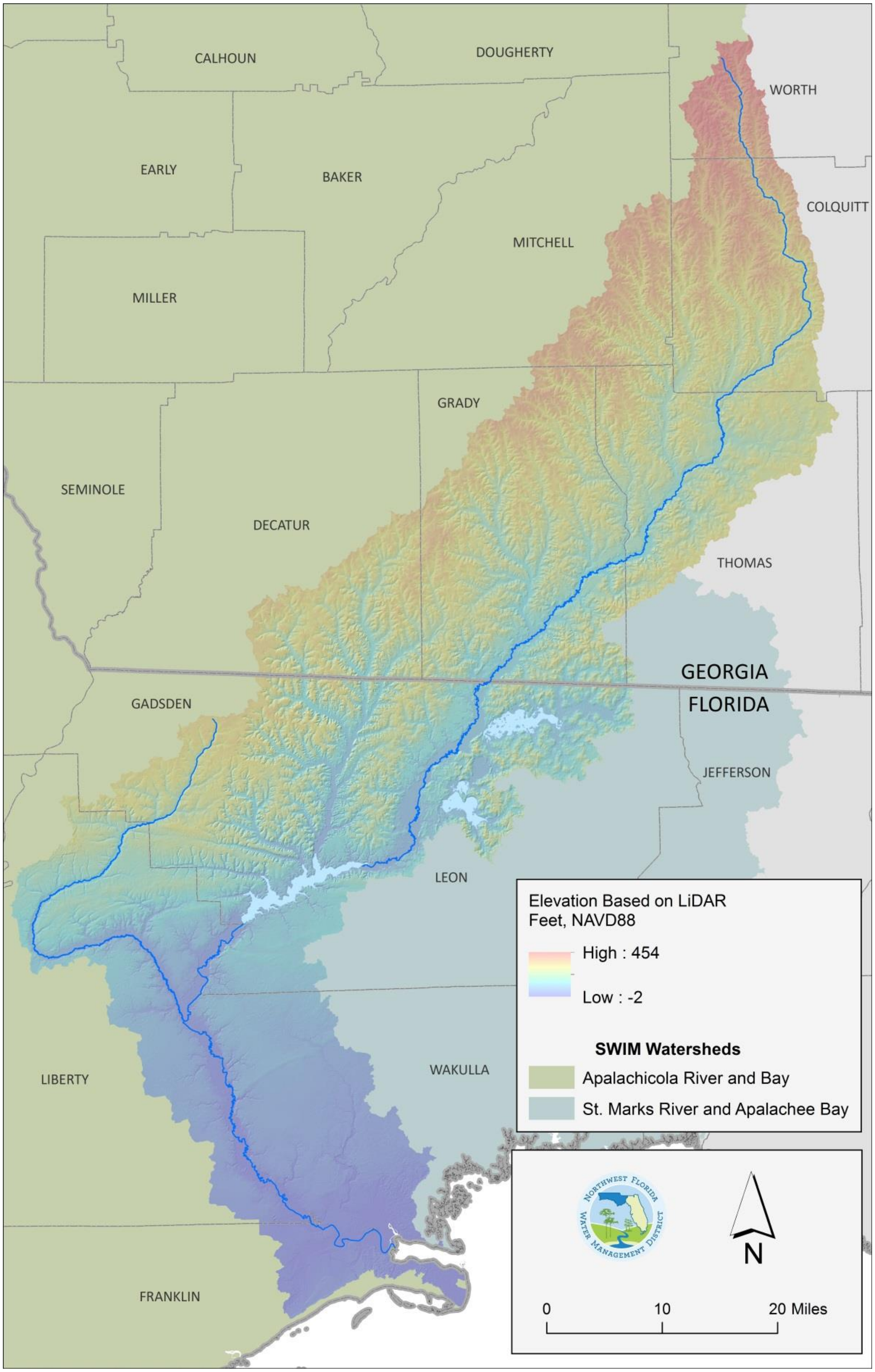

Figure C-2 Greater Ochlockonee River and Bay Watershed Topography

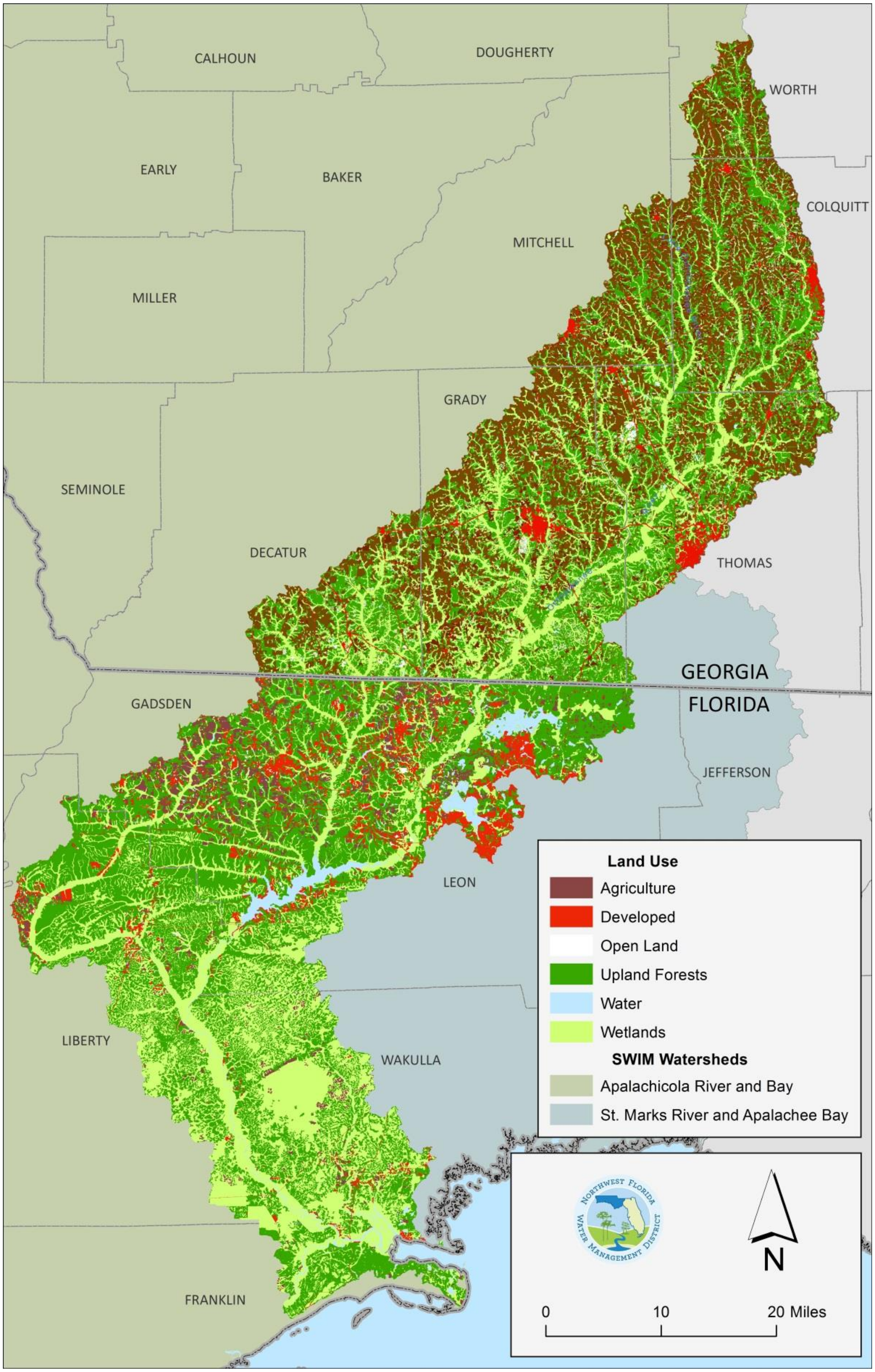

Figure C-3 Greater Ochlockonee River and Bay Watershed Land Use and Land Cover

Within Florida, the Ochlockonee River and Bay watershed encompasses two localized physiographic regions, distinctly by the Cody Scarp: the Tallahassee Hills subdivision of the Northern Highlands and the Gulf Coastal Lowlands. Both physiographic regions exhibit unique geology and soils. The Tallahassee Hills have sandy and red clay soils and are characterized as having high runoff and low recharge as the Florida aquifer is thinly confined. Intermittent or underground streams are common. Coastal Lowlands are described as a flat, weakly dissected alluvial plain formed by deposition of continental sediments onto a submerged, shallow continental shelf, that were later exposed by sea level subsidence. Elevation ranges from 0 to 80 feet (0 to 25 meters) and the local relief varies from 0 to 100 feet (0 to 30 meters) (USDA 2009) relative to mean sea level. For coastal areas, fluvial deposition and shore zone processes are active in developing and maintaining beaches, swamps, and mud flats.

Most of the Ochlockonee River and Bay Watershed is within the Apalachicola Embayment and Gulf Trough (Torak *et al.* 2010). This structure feature is a northeast to southwest trending paleochannel, with accumulated clastic and carbonate sediments (Torak *et al.* 2010). Within the Apalachicola Embayment, the aquifer is well-confined, recharge rates are generally low, and aquifer yields are relatively low. However, near the edge of the embayment in northwest Leon County and in Wakulla County south of Cody Scarp, the Floridan aquifer is semi-confined or unconfined and aquifer yields can be higher.

Floridan Aquifer Vulnerability Assessment

In 2017, the Florida Geological Survey released the Floridan Aquifer System Contamination Potential (FAVA II) dataset (Figure C-4). 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 generally straddle Lake Jackson, Lake Iamonia, the Ochlockonee River and Telogia Creek. No areas classified as least vulnerable are located within the Ochlockonee River and Bay Watershed. The lowest area of vulnerability within the planning area is classified as “More Vulnerable.” Limited areas, mostly near the fringe of the watershed, are within this classification while areas determined by the model to be more vulnerable are shown in blue. The bulk of these more vulnerable areas are in the northwest of the watershed.

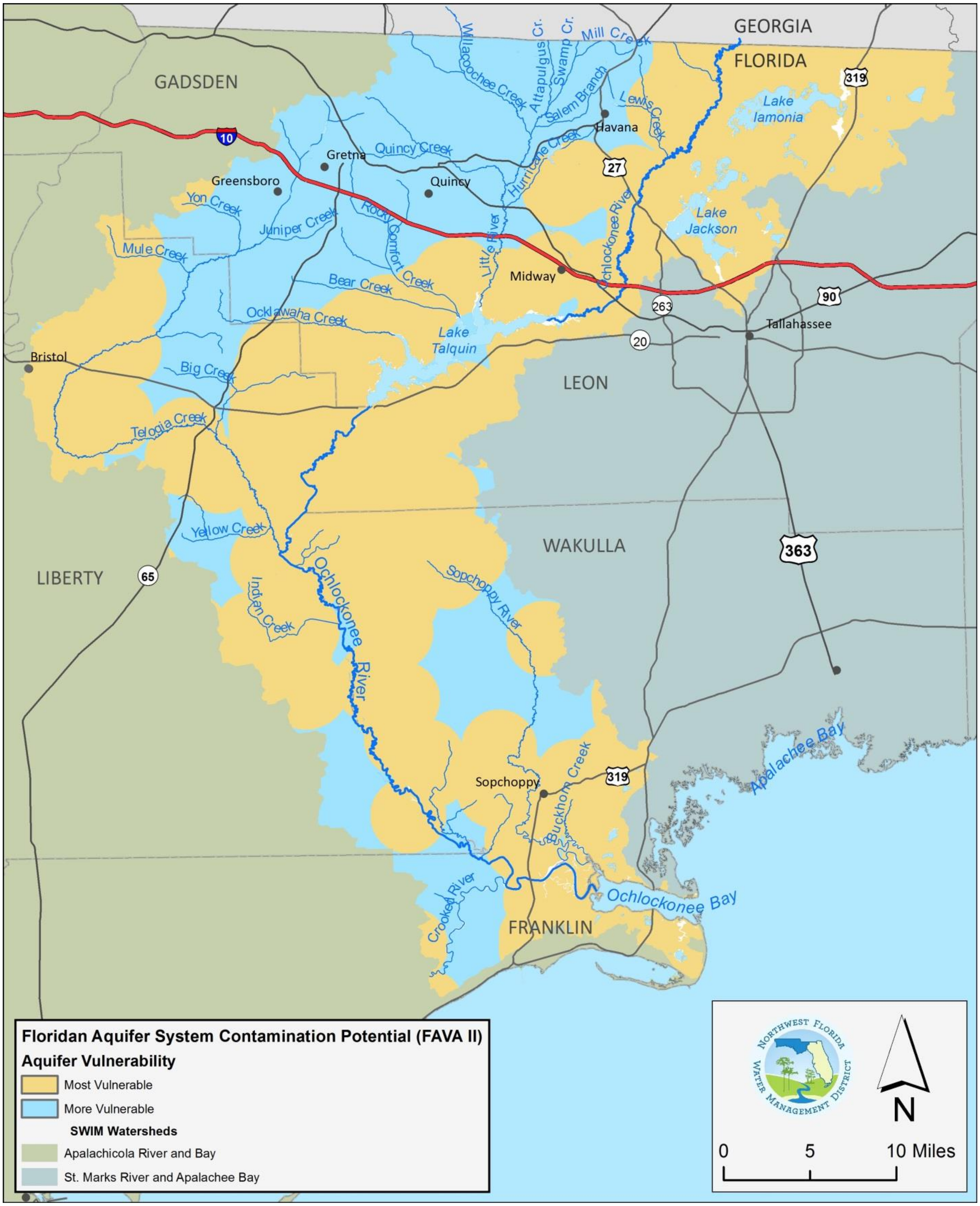

Figure C-4 Floridan Aquifer System Contamination Potential

Geologic Units

In the northern extent of the watershed, particularly in Leon County, the uppermost geologic unit is generally the Miccosukee Formation. The Miccosukee Formation is made up of interbedded clay, silt, sand, and gravel, similar in overall lithology to the Citronelle Formation. Deposits of the Citronelle Formation range from clay through gravel, but sands are the most common size fraction. The deposits are commonly cross-bedded, lenticular, graveliferous sands with an occasional thin bed of clay and varying amounts of silt and clay that can weakly harden or cement the sediment. The Miccosukee contains less gravel and more fine-to-medium clayey sand than the Citronelle.

The Jackson Bluff Formation extends roughly south from Lake Talquin to where Highway 267 crosses the Leon-Wakulla county line and westward to the Ochlockonee River in Liberty County. The Jackson Bluff Formation overlies either the Tampa Limestone or the Hawthorn Group–Torreya Formation, and functions as a semi-confining unit. Above the Cody Scarp, the thin, clastic cover can be breached by erosion from streams and subsidence sinkholes. This erosional separation has broadened the escarpment into a transitional zone. Marine-terrace deposits consisting of Pleistocene undifferentiated quartz sand and clay lie on the Citronelle, Miccosukee, Torreya, or Chattahoochee formations (representing a break in the sedimentary record).

The southern portion of the watershed is essentially flat and has Pleistocene-age to Holocene-age unconsolidated sediments extending from the Gulf of Mexico north to the Cody Scarp in Leon County. The area is underlain by sand and clay deposits that are as much as 80 feet deep. Holocene-age alluvial and eolian deposits are predominantly fine-grained quartz sand and are difficult to differentiate from Pleistocene sediment. The Gulf Coastal Lowlands are divided into the Woodville Karst Plain and the Apalachicola Coastal Lowlands (Hendry and Sproul 1966). The Woodville Karst Plain is a low, gently sloping plain consisting of sand dunes lying on a limestone surface that begins in the southern part of Leon County and extends southward through Wakulla County to the Gulf. It is bounded on the west by the Apalachicola Coastal Lowlands and extends eastward into Jefferson County. It is characterized by loose quartz sand thinly veneering a limestone substratum that has resulted in sinkhole sand dune topography. The Lake Munson Hills are located as a strip at the western edge of the Woodville Karst Plain area and has a general land surface of about 30 to 50 feet higher than that to the east.

The Ochlockonee River Valley Lowlands include the floodplain terraces of the Ochlockonee River. These lowlands are usually well defined by the nature of the sediments and by the escarpment that separates them from the Tallahassee Hills. Near the Florida-Georgia state line, the Ochlockonee Lowlands are about two miles wide. This area is dominated by nearly level, poorly drained, clayey soils (USDA 1979). The Apalachicola Coastal Lowlands are flat, sandy areas underlain by thick sandy clay, clayey sand, and peat extended from western Leon County into western Wakulla County to U.S. 319, making up most of the Apalachicola National Forest. These sediments are underlain by early Miocene limestone.

In the southeastern portion of the watershed, the early Miocene sediments of the St. Marks Formation are underlain by the Suwannee Limestone and are overlain by the Hawthorn Group. The St. Marks Formation underlies nearly all of Wakulla County and meets the Chattahoochee Formation to the west in an interfingering zone. The St. Marks formation is composed of tan to white, slightly sandy, molluskan moldic, very fine grained, un-recrystallized to completely recrystallized limestone. Occasional thin beds of brown quartz sand and green to blue, relatively pure clay are interbedded with the limestone to the north in Wakulla County, but beneath Franklin County the St. Marks formation is predominantly limestone (USDA 1990). The early Miocene Torreya Formation is characteristically a siliciclastic unit consisting of very fine or medium clayey sand to sandy silty clay. Carbonate sediments of the Hawthorn Group-Torreya Formation consist of clayey limestone or dolomitic limestone, which grade downward to a predominantly limestone base in Gadsden County. The Torreya Formation extends into northwestern and western Wakulla County (USDA 1987). Undifferentiated Hawthorn Group sediments underlie nearly all of western Wakulla County. The Intracoastal Formation is a soft, sandy middle Miocene to late Pliocene-age limestone underlying the coastal area along the southern Ochlockonee River and floodplain. Pleistocene-age and Holocene-age undifferentiated quartz sand, silt, and clay make up the undifferentiated surficial sediments in south-central Wakulla County and Liberty County (USDA 1987). They make up much of the Apalachicola National Forest that falls within the watershed. Holocene alluvial deposits thinly blanket stream valleys such as in Alligator Point and Bald Point and commonly are indistinguishable from Pleistocene sediments.

Many of the geologic processes described above are a product of prehistoric marine deposition during periods when sea level was higher than present. Fluvial processes, in conjunction, are also greatly responsible for the modern land surface of the Ochlockonee River and Bay watershed.

Soils

Soils within the Ochlockonee River and Bay watershed have been used extensively for crop production, silviculture, and pastureland. Along with being a valuable agricultural resource, soils also protect water quality by absorbing runoff, store soil organic carbon, and help mitigate flooding. The following soils are found in the Florida portion of the Ochlockonee River and Bay watershed.

Ultisols are intensely-weathered soils of warm and humid climates, and are usually formed on older geologic formations in parent material that is already extensively weathered (i.e., upland areas of the watershed). They are generally low in natural fertility and high in soil acidity, but contain subsurface clay accumulations that give them a high nutrient retention capacity. In the Ochlockonee River and Bay watershed, soils found north of the Woodville Karst Plain where the landscape has been relatively stable over recent geologic time are primarily ultisols (Collins 2010). Ultisols are the primary agricultural and silvicultural soils of the watershed, as their high clay content contributes to nutrient and water retention, when properly managed and are found extensively in Gadsden County.

Entisols are young soils that show little development, have no diagnostic horizons, and are largely unaltered from their parent material, which can be unconsolidated sediment or rock (USDA 2014). Entisols make up the western margin of the Ochlockonee Bay from St. Teresa north and east, where surficial processes are active and parent materials have not undergone substantial weathering (Collins 2010).

Spodosols are sandy, acidic soils, often found in cool, moist climates such as coastal conifer forests (USDA 2014). They are easily identified by their strikingly-colored horizons, which form as a result of leaching and accumulation processes. Spodosols are not extensive in the Ochlockonee River and Bay watershed, but can be found locally in the Lake Talquin State Forest (Collins 2010; FDEP 2011b). The presence of spodosols indicates an area that was historically dominated by a pine (longleaf) over-story.

South of Tallahassee and along the coast from Sopchoppy to the eastern edge of the watershed, soils are classified predominantly as alfisols. Areas within the Apalachicola National Forest are classified primarily as alfisols (forest soils), inceptisols, and histosols (wetland soils).

Inceptisols are described as soils in the beginning stages of soil profile development, as the differences between soil horizons are just beginning to appear in the form of color variation due to accumulations of small amounts of clay, salts, and organic material. Inceptisols occur predominantly within the Apalachicola National Forest and in the coastal region of St. James Island, including Bald Point State Park (Collins 2010).

Histosols are predominantly composed of organic material in various stages of decomposition. These soils are usually saturated, resulting in anaerobic conditions, slower rates of decomposition, and increased organic matter accumulation. Histosols generally consist of at least half organic materials and are common in wetlands (USDA 2014). Histosols in the Ochlockonee River and Bay watershed occur in eastern Wakulla County, throughout the Apalachicola National Forest, and adjacent to the southern side of Lake Talquin in the Lake Talquin State Forest (Collins 2010; USDA 2014). Histosols cover approximately 6,155 square miles in the state of Florida and store more organic carbon than any other soil type (Kolka *et al*. 2016; Vasques *et al.* 2010). Drainage of wetland areas and the associated decomposition of organic matter stored in histosols is a well-documented source of atmospheric carbon dioxide and methane.

Appendix D Threatened and Endangered Species

The Ochlockonee River and Bay watershed supports a wide array of biological resources and habitats for many species of flora and fauna. This appendix provides a list of species that are protected and tracked for the watershed, as well as their habitat requirements (FNAI 2010; FWC 2016b; USFWS 2016):

Scientific Name	Common Name	Designation			Natural Communities
		FNAI	State	Federal	
Plants					
Andropogon arctatus	Pinewood Bluestem	S3	T	N	Lacustrine: wet pine flatwoods, seepage wetlands, bogs, wet pine savannas
Agrimonia incisa	Incised Groove-bur	S2	T	N	Terrestrial Habitat(s): Forest/Woodland, Woodland - Conifer, Woodland - Mixed
Aquilegia canadensis var. australis	Marianna Columbine	S1	E	N	N/A
Arnoglossum diversifolium	Variable-leaved Indian-plantain	S2	T	P	Palustrine Habitat(s): Forested Wetland, Riparian Terrestrial Habitat(s): Forest - Hardwood, Forest/Woodland
Asclepias viridula	Southern Milkweed	S2	T	N	Estuarine Habitat(s): Bay/sound Terrestrial Habitat(s): Savanna
Asplenium heteroresiliens	Wagner's Spleenwort	S1	N	N	Limestone and marl outcroppings in dense hardwood forests
Baptisia megacarpa	Apalachicola Wild Indigo	S1	E	N	Palustrine: floodplain forest Terrestrial: upland mixed forest, slope forest
Bigelowia nuttallii	Nuttall's Rayless Goldenrod	S1	E	N	Sandstone or siltstone outcrops
Brickellia cordifolia	Flyr's Brickell-bush	S2	E	SSC	Terrestrial Habitat(s): Forest - Hardwood, Forest - Mixed, Forest Edge, Forest/Woodland, Woodland - Mixed
Calamintha dentata	Toothed Savory	S3	T	N	Terrestrial: longleaf pine-deciduous oak sandhills, planted pine plantations, sand, open and abandoned fields, and roadsides
Calopogon multiflorus	Many-flowered Grass-pink	S2S3	T	N	Palustrine Habitat(s): Bog/fen, Forested Wetland, Herbaceous Wetland Terrestrial Habitat(s): Forest Edge, Forest/Woodland, Grassland/herbaceous, Savanna, Woodland - Conifer
Carex chapmanii	Chapman's Sedge	S3	T	N	Terrestrial Habitat(s): Forest - Mixed, Forest/Woodland
Carex tenax	Sandhill Sedge	S3	N	N	Dry sandy sites in turkey oak/bluejack oak woods; Longleaf pine/turkey oak sandhills; ruderal in sandy fields and roadsides. Dry, coarse soils
Conradina glabra	Apalachicola Rosemary	S1	E	E	Terrestrial Habitat(s): Forest - Conifer, Forest Edge, Forest/Woodland, Old field, Woodland - Mixed

Scientific Name	Common Name	Designation			Natural Communities
		FNAI	State	Federal	
Croomia pauciflora	Croomia	S2	E	N	Rich, moist, loamy soils in mixed hardwood forests, usually on the steep slopes of ravines or bluffs, often over limestone
Croton elliottii	Elliott's Croton	SH	N	P	Palustrine Habitat(s): Forested Wetland, Herbaceous Wetland, Riparian, Temporary Pool; Terrestrial Habitat(s): Cropland/hedgerow, Forest Edge, Forest/Woodland, Grassland/herbaceous, Savanna, Woodland - Conifer
Euphorbia telephioides	Telephus Spurge	S1	E	LT	Terrestrial Habitat(s): Forest/Woodland, Grassland/herbaceous, Savanna, Shrubland/chaparral, Woodland - Conifer
Forestiera godfreyi	Godfrey's Swampprivet	S2	E	N	Terrestrial Habitat(s): Forest - Hardwood, Forest/Woodland, Woodland - Hardwood
Gentiana pennelliana	Wiregrass Gentian	S3	E	SSC	Moist to wet longleaf pine/wiregrass flatwoods, wet prairies and ecotonal seepage slopes between flatwoods and titi swamps
Helianthus debilis ssp. tardiflorus	Late Flowering Beach Sunflower	S3	N	N	N/A
Hymenocallis godfreyi	Godfrey's Spiderlily	S1	E	N	Palustrine Habitat(s): Herbaceous Wetland
Hymenocallis henryae	Panhandle Spiderlily	S2	E	N	Palustrine Habitat(s): Bog/fen, Herbaceous Wetland Terrestrial Habitat(s): Forest/Woodland
Justicia crassifolia	Thick-leaved Water-willow	S3	E	N	Black, sandy peats or sandy peat mucks of slash pine-saw palmetto wet flatwoods, bogs, and cypress swamps
Lachnocaulon digynum	Bog Button	S3	T	N	Riverine Habitat(s): Pool Palustrine Habitat(s): Bog/fen, Forested Wetland
Leitneria floridana	Corkwood	S3	T	N	Swamp
Liatris provincialis	Godfrey's Blazing Star	S2	E	N	Terrestrial Habitat(s): Forest Edge, Forest/Woodland, Old field, Savanna, Shrubland/chaparral, Woodland - Conifer, Woodland - Mixed
Linum westii	West's Flax	S1	E	N	Palustrine: dome swamp, depression marsh, wet flatwoods, wet prairie, pond margins
Litsea aestivalis	Pondspice	S2	E	N	Palustrine Habitat(s): Bog/fen
Lobelia boykinii	Boykin's Lobelia	S1	E	N	Palustrine Habitat(s): Forested Wetland, Herbaceous Wetland, Scrub-Shrub Wetland Terrestrial Habitat(s): Forest/Woodland, Savanna, Woodland - Conifer
Lupinus westianus	Gulf Coast Lupine	S3	T	N	Terrestrial: beach dune, scrub, disturbed areas, roadsides
Lythrum curtissii	Curtiss' Loosestrife	S1	E	P	Blowouts in dunes

Scientific Name	Common Name	Designation			Natural Communities
		FNAI	State	Federal	
Macbridea alba	White Birds-in-a-nest	S2	E	LT	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	SSC	Terrestrial: slope and upland hardwood forest, ravines
Matelea alabamensis	Alabama Spiny-pod	S2	E	N	Terrestrial Habitat(s): Cliff, Forest - Hardwood, Forest - Mixed, Forest Edge, Forest/Woodland, Woodland - Hardwood, Woodland - Mixed
Matelea floridana	Florida Spiny-pod	S2	E	N	Terrestrial Habitat(s): Forest - Hardwood, Forest - Mixed, Forest/Woodland, Woodland - Hardwood, Woodland - Mixed
Nolina atopocarpa	Florida Beargrass	S3	T	N	Terrestrial Habitat(s): Forest/Woodland, Woodland - Conifer
Nuphar advena ssp. ulvacea	West Florida Cowlily	S2	N	N	Riverine Habitat(s): Medium River, Spring/Spring Brook
Nyssa ursina	Bog Tupelo	S2	N	N	Open bogs, wet flatwoods, and swamps, often with titi
Oxypolis greenmanii	Giant Water-dropwort	S3	E	N	Shrub (hypericum) bogs, margins of cypress or gum ponds, freshwater marshes, wet ditches, depressions in flatwoods; saturated peat/muck soils
Panicum nudicaule	Naked-stemmed Panicgrass	S3	T	N	N/A
Parnassia grandifolia	Large-leaved Grass-of-parnassus	S2	E	N	N/A
Phoebanthus tenuifolius	Narrow-leaved Phoebanthus	S3	T	N	Terrestrial: sandy pinelands
Phyllanthus liebmannianus ssp. platylepis	Pinewoods Dainties	S2	E	N	N/A
Physostegia godfreyi	Apalachicola Dragon-head	S3	T	N	Wet Flatwoods, Longleaf Pine/Wiregrass Savannahs
Pinguicula ionantha	Godfrey's Butterwort	S2	E	T	Palustrine Habitat(s): Bog/fen Terrestrial Habitat(s): Forest/Woodland, Savanna, Woodland - Conifer
Pinguicula primuliflora	Primrose-flowered Butterwort	S3	E	N	Palustrine: bogs, pond margins, margins of spring runs
Pityopsis flexuosa	Zigzag Silkgrass	S3	E	SSC	Terrestrial Habitat(s): Sand/dune, Shrubland/chaparral

Scientific Name	Common Name	Designation			Natural Communities
		FNAI	State	Federal	
Platanthera integra	Yellow Fringeless Orchid	S3	E	N	Palustrine Habitat(s): Bog/fen, Forested Wetland, Herbaceous Wetland, Scrub-Shrub Wetland; Terrestrial Habitat(s): Forest - Conifer, Forest/Woodland
Polygonella macrophylla	Large-leaved Jointweed	S3	T	N	Terrestrial: scrub, sand pine/oak scrub ridges
Pycnanthemum floridanum	Florida Mountain-mint	S3	T	N	Wet swales/depressions in pine flatwoods; wet prairies, floodplain forest, soils are typically black sandy peats
Quercus arkansana	Arkansas Oak	S3	T	N	Sandy or sandy clay uplands or upper ravine slopes near heads of streams in deciduous woods
Rhexia parviflora	Small-flowered Meadowbeauty	S2	E	N	Palustrine Habitat(s): Bog/fen, Forested Wetland, Scrub-Shrub Wetland
Rhexia salicifolia	Panhandle Meadowbeauty	S2	T	P	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
Rhododendron austrinum	Florida Flame Azalea	S3	E	CE	Lacustrine: shaded ravines & in wet bottomlands on rises of sandy alluvium or older terraces
Rhododendron chapmanii	Chapman's Rhododendron	S1	E	E	Palustrine Habitat(s): Bog/fen, Scrub-Shrub Wetland
Rudbeckia nitida	St. John's Blackeyed Susan	S2	E	N	Seasonally wet pine savannas and flatwoods; flatwood depressions; clearings and pastures on former pineland sites
Ruellia noctiflora	Nightflowering Wild Petunia	S2	E	N	Riverine Habitat(s): Spring/Spring Brook Palustrine Habitat(s): Bog/fen, Forested Wetland, Herbaceous Wetland Terrestrial Habitat(s): Forest/Woodland, Grassland/herbaceous, Savanna, Woodland - Conifer
Ruellia pedunculata ssp. pinetorum	Pinewoods Wild Petunia	S1	N	N	N/A
Sarracenia leucophylla	White-top Pitcherplant	S3	E	N	Palustrine: wet prairie, seepage slope, baygall edges, ditches
Schisandra glabra	Bay Starvine	S2	E	N	Rich mesic woods twining over subcanopy and understory trees, usually in bottomlands or in the bluffs along creeks and rivers generally on rich sandy-silt-loams; . The forests it frequents are almost always mixed-mesophytic
Schwalbea americana	American chaffseed		E	E	N/A
Scutellaria floridana	Florida Skullcap	S2	E	LT	Palustrine: seepage slope, wet flatwoods, grassy openings Terrestrial: mesic flatwoods

Scientific Name	Common Name	Designation			Natural Communities
		FNAI	State	Federal	
Spigelia gentianoides	Gentian Pinkroot	S1	E	LE	Terrestrial Habitat(s): Forest - Hardwood, Forest/Woodland
Stachydeoma graveolens	Mock Pennyroyal	S2S3	E	N	Palustrine: forested wetland Terrestrial: forest edge, forest/woodland, savanna, woodland-conifer
Stachydeoma graveolens	Mock Pennyroyal	S2S3	E	N	Palustrine Habitat(s): Forested Wetland Terrestrial Habitat(s): Forest Edge, Forest/Woodland, Savanna, Woodland - Conifer
Stachys hyssopifolia var. lythroides	Tallahassee Hedge-nettle	S1	E	N	N/A
Trillium lancifolium	Narrow-leaved Trillium	S2	E	N	Rich, moist, wooded slopes of bluffs and ravines
Uvularia floridana	Florida Merrybells	S1	E	N	Palustrine Habitat(s): Forested Wetland, Riparian Terrestrial Habitat(s): Forest - Hardwood, Forest/Woodland
Xyris longisepala	Karst Pond Xyris	S2S3	E	P	Palustrine Habitat(s): Herbaceous Wetland, Riparian, Temporary Pool
Xyris scabrifolia	Harper's Yellow-eyed Grass	S3	T	SSC	Palustrine: seepage slope, wet prairie, bogs
Xyris stricta var. obscura	Kral's Yellow-eyed Grass	S1	N	N	Lacustrine: sandhill upland lake margins
Invertebrates					
Crangonyx grandimanus	Florida Cave Amphipod	S2	N	N	Caves
Crangonyx hobbsi	Hobbs' Cave Amphipod	S2S3	N	N	Caves
Alasmidonta wrightiana	Ochlockonee Ark-mussel	SH	N	N	Riverine Habitat(s): Low gradient, MEDIUM RIVER, Riffle
Anodonta heardi	Apalachicola Floater	S1	N	N	Riverine Habitat(s): BIG RIVER, Low gradient, Pool; Lacustrine Habitat(s): Deep water, Shallow water
Elliptoideus sloatianus	Purple Bankclimber	S1S2	FT	T(CH)	Riverine: Slow to moderate current rivers with a sandy floor, with mud or gravel mixture.
Glebula rotundata	Round Pearlshell	S3	N	N	Riverine Habitat(s): big river, Low gradient, medium river, Pool Lacustrine Habitat(s): Deep water, Shallow water
Lampsilis subangulata	Shiny-rayed Pocketbook	S1S2	FE	E(CH)	Riverine: mid-sized rivers and creeks with a clear or sandy silt floor
Medionidus penicillatus	Gulf Moccasinshell	S1	FE	E	Riverine Habitat(s): Big river, creek, Low gradient, medium river, Moderate gradient, Riffle
Medionidus simpsonianus	Ochlockonee Moccasinshell	S1	FE	E(CH)	Riverine: large creeks and mid-sized rivers of moderate current and sandy, gravel floor

Scientific Name	Common Name	Designation			Natural Communities
		FNAI	State	Federal	
Megalonaias nervosa	Washboard	S3	N	N	Riverine Habitat(s): big river, creek, Low gradient, medium river
Pleurobema pyriforme	Oval Pigtoe	S1S2	FE	E(CH)	Riverine: medium-sized creeks to small rivers; various
Utterbackia peggyae	Florida Floater	S3	N	N	substrates; slow to moderate currents
Cambarus puronotus	Fire-back Crayfish	S2	N	N	Palustrine Habitat(s): Riparian
Procambarus horsti	Big Blue Spring Cave Crayfish	S1	N	N	Subterranean springs of Jefferson and Leon counties
Procambarus orcinus	Woodville Karst Cave Crayfish	S1	N	N	Caves of Leon and Wakulla counties
Procambarus youngi	Florida Longbeak Crayfish	S2	N	N	Riverine Habitat(s): creek, Riffle, spring/spring brook
Cordulegaster sayi	Say's Spiketail	S1S2	N	N	Riverine Habitat(s): Spring/Spring Brook
Baetisca rogersi	A Mayfly	S3	N	N	Freshwater
Fish					
Acantharchus pomotis	Mud Sunfish	S3	N	N	Riverine Habitat(s): big river, creek, Low gradient, medium river Lacustrine Habitat(s): Shallow water Palustrine Habitat(s): forested wetland
Acipenser oxyrincus desotoi	Gulf Sturgeon	S2	FT	T	Estuarine: various Marine: various habitats; Riverine: alluvial and blackwater streams
Ameiurus brunneus	Snail Bullhead	S3	N	N	Riverine Habitat(s): creek, High gradient, medium river, Moderate gradient, Pool, Riffle
Ameirus serracanthus	Spotted Bullhead	S3	N	N	Riverine: deep holes of small to medium rivers with slow to swift currents and rock substrates or sand bottoms; it also occurs over mud bottoms, typically near stumps, in impoundments
Atractosteus spatula	Alligator Gar	S3	N	N	Riverine: sluggish pools of large rivers and their bayous, oxbow lakes, swamps, and backwaters, rarely brackish or marine waters along the coast
Cyprinella callitaenia	Bluestripe Shiner	S2	N	N	Riverine Habitat(s): big river, medium river, Moderate gradient
Cyprinella leedsi	Bannerfin Shiner	S3	N	N	Riverine Habitat(s): big river, Low gradient, medium river
Etheostoma parvipinne	Goldstripe Darter	S2	N	N	Riverine Habitat(s): creek, Low gradient, Moderate gradient, Pool, Riffle, spring/spring brook
Luxilus zonistius	Bandfin Shiner	S1S2	N	N	Riverine Habitat(s): creek, High gradient, medium river, Moderate gradient, Pool
Micropterus cataractae	Shoal Bass	S1	SSC	N	Riverine Habitat(s): creek, Low gradient, medium river, Moderate gradient, Pool, Riffle

Scientific Name	Common Name	Designation			Natural Communities
		FNAI	State	Federal	
Micropterus notius	Suwannee Bass	S3	N	N	Riverine: Rivers with moderate to swift currents near limestone or woody structure
Moxostoma sp.1	Apalachicola Redhorse	S2	N	N	N/A
Amphibians					
Ambystoma cingulatum	Frosted Flatwoods Salamander	S2S3	FT	T	Lacustrine: shallow water Palustrine: forested wetland, herbaceous wetland, riparian, scrub-shrub wetland, temporary pool Terrestrial: forest - conifer, forest/ woodland, savanna, woodland - conifer
Ambystoma tigrinum	Tiger Salamander	S3	N	N	Riverine Habitat(s): Creek, Pool, Spring/Spring Brook Lacustrine Habitat(s): Shallow water Palustrine Habitat(s): Bog/fen, Forested Wetland, Herbaceous Wetland, Riparian, Temporary Pool Terrestrial Habitat(s): Cropland/ hedgerow, Desert, Forest - Conifer, Forest - Hardwood, Forest - Mixed, Grassland/herbaceous, Savanna, Shrubland/chaparral, Suburban/orchard, Woodland - Conifer, Woodland - Hardwood, Woodland - Mixed
Amphiuma pholeter	One-toed Amphiuma	S3	N	N	Riverine Habitat(s): Creek, Low gradient, Spring/Spring Brook Palustrine Habitat(s): Forested Wetland, Riparian, Scrub-Shrub Wetland, Temporary Pool
Desmognathus apalachicolae	Apalachicola Dusky Salamander	S3	N	N	Palustrine: seepage stream edges at bottoms of deep, moist, wooded ravines that support mixed-hardwood forest on slopes
Hemidactylium scutatum	Four-toed Salamander	S2S3	N	N	Palustrine Habitat(s): Bog/fen, Forested Wetland, Riparian, Scrub-Shrub Wetland
Notophthalmus perstriatus	Striped Newt	S2S3	C	C	Lacustrine Habitat(s): Shallow water Palustrine Habitat(s): Forested Wetland, Herbaceous Wetland, Riparian, Temporary Pool Terrestrial Habitat(s): Woodland - Conifer, Woodland - Mixed
Lithobates capito	Gopher Frog	S3	N	P	Terrestrial; sandhill, scrub, scrubby flatwoods, xeric hammock (reproduces in ephemeral wetlands within these communities)

Scientific Name	Common Name	Designation			Natural Communities
		FNAI	State	Federal	
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	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
Caretta caretta	Loggerhead Sea Turtle	S3	FT	T	Terrestrial: sandy beaches; nesting
Chelonia mydas	Green Sea Turtle	S2	FE	E	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 Turtle	S2	FE	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 imbricata	Hawksbill sea turtle	S1	FE	E	Marine coastal and oceanic waters. Nests on coastal sand beaches, often in vegetation.
Eumeces anthracinus	Coal Skink	S3	N	N	Palustrine Habitat(s): Bog/fen, Forested Wetland, Riparian, Scrub-Shrub Wetland; Terrestrial Habitat(s): Forest - Conifer, Forest - Hardwood, Forest - Mixed, Woodland - Conifer, Woodland - Hardwood, Woodland - Mixed
Gopherus polyphemus	Gopher Tortoise	S3	ST	C	Terrestrial: sandhills, scrub, scrubby flatwoods, xeric hammocks, coastal strand, ruderal
Graptemys barbouri	Barbour's Map Turtle	S2	ST	N	Palustrine: floodplain stream, floodplain swamp Riverine: alluvial stream
Heterodon simus	Southern Hog Nose Snake	S2	N	N	Palustrine: sandhill, pine flatwood, sand ridges; Terrestrial: coastal dunes

Scientific Name	Common Name	Designation			Natural Communities
		FNAI	State	Federal	
Lampropeltis calligaster	Mole Snake	S2S3	N	N	Palustrine Habitat(s): Riparian Terrestrial Habitat(s): Cropland/hedgerow, Grassland/herbaceous, Old field, Sand/dune, Savanna, Woodland - Conifer, Woodland - Hardwood, Woodland - Mixed
Lepidochely kempii	Kemp's Ridley	S1	FE	E	Terrestrial: sandy beaches; nesting
Macroclemys apalachicolae	Alligator Snapping Turtle	S3	SSC	P	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 mugitis	Florida Pine Snake	S3	ST	P	Lacustrine: ruderal, sandhill upland lake Terrestrial: sandhill, scrubby flatwoods, xeric hammock, ruderal
Pseudemys concinna suwanniensis	Suwannee Cooter	S3	N	N	Riverine: blackwater, alluvial, and spring-fed rivers, impoundments
Birds					
Aimophila aestivalis	Bachman's Sparrow	S3	N	N	N/A
Ammodramus maritimus juncicola	Wakulla Seaside Sparrow	SNR	ST	N	Estuarine: tidal marshes
Ammodramus maritimus peninsulae	Scott's Seaside Sparrow	S3	ST	N	N/A
Aramus guarauna	Limpkin	S3	N	N	Estuarine: scrub-shrub wetland Palustrine: forested wetland, herbaceous wetland, riparian
Calidris canutus rufa	Red knot	S2	FT	T(CH)	Estuarine: bays, tidal flats, salt marshes Terrestrial: sandy beaches Marine: aerial, near shore
Charadrius alexandrinus	Snowy Plover	S1	ST	N	Estuarine: exposed unconsolidated substrate Marine: exposed unconsolidated substrate Terrestrial: dunes, sandy beaches, and inlet areas
Charadrius melodus	Piping Plover	S2	FT	T	Estuarine: exposed unconsolidated substrate Marine: exposed unconsolidated substrate Terrestrial: dunes, sandy beaches, and inlet areas. Mostly wintering and migrants
Cistothorus palustris marianae	Marian's Marsh Wren	S3	ST	N	N/A

Scientific Name	Common Name	Designation			Natural Communities
		FNAI	State	Federal	
Egretta caerulea	Little Blue Heron	S4	ST	N	Estuarine: herbaceous wetland, lagoon, scrub-shrub wetland, tidal flat/shore Riverine: low gradient Lacustrine: shallow water Palustrine: forested wetland, herbaceous wetland, riparian, scrub-shrub wetland
Egretta rufescens	Reddish Egret	S2	ST	N	Estuarine: tidal swamp, depression marsh, bog, marl prairie, wet prairie Lacustrine: flatwoods/prairie lake, marsh lake; Marine: tidal swamp
Egretta thula	Snowy Egret	S3	N	N	Estuarine: bay/sound, herbaceous wetland, lagoon, river mouth/tidal river, scrub-shrub wetland, tidal flat/shore Riverine: low gradient Lacustrine: shallow water Palustrine: forested wetland, herbaceous wetland, riparian
Egretta tricolor	Tricolored Heron	S4	ST	N	Estuarine: bay/sound, herbaceous wetland, lagoon, river mouth/tidal river, scrub-shrub wetland, tidal flat/shore; Riverine: low gradient Lacustrine: shallow water Palustrine: forested wetland, herbaceous wetland, riparian
Elanoides forficatus	Swallow-tailed Kite	S2	N	N	Estuarine Habitat(s): Scrub-shrub wetland; Palustrine Habitat(s): Forested wetland, herbaceous wetland, Riparian Terrestrial Habitat(s): Forest - Conifer, Forest - Hardwood, Forest - Mixed, Savanna, Woodland - Conifer, Woodland - Hardwood, Woodland - Mixed
Elanus leucurus	White-tailed Kite	S1	N	N	Palustrine Habitat(s): Herbaceous wetland, Riparian; Terrestrial Habitat(s): Cropland/hedgerow, Grassland/herbaceous, Savanna, Woodland - Hardwood
Eudocimus albus	White Ibis	S4	N	N	Estuarine: bay/sound, herbaceous wetland, lagoon, river mouth/tidal river, scrub-shrub wetland, tidal flat/shore; Riverine: low gradient Lacustrine: shallow water Palustrine: forested wetland, herbaceous wetland, riparian
Falco columbarius	Merlin	S2	N	N	Estuarine Habitat(s): Herbaceous wetland, Tidal flat/shore Palustrine Habitat(s): Bog/fen, herbaceous wetland, Riparian Terrestrial Habitat(s): Cliff, Cropland/hedgerow, Desert, Forest - Conifer, Forest - Hardwood, Forest - Mixed, Grassland/herbaceous, Savanna, Suburban/orchard, Woodland - Conifer, Woodland - Hardwood, Woodland - Mixed

Scientific Name	Common Name	Designation			Natural Communities
		FNAI	State	Federal	
Falco peregrinus	Peregrine Falcon	S2	N	N	Marine: aerial; Estuarine: aerial, bay/sound, herbaceous wetland, lagoon, river mouth/tidal river, tidal flat/shore Riverine: aerial; Lacustrine: aerial Palustrine: aerial, herbaceous wetland, riparian; Terrestrial: cliff, desert, shrubland/ chaparral, tundra, urban/edificarian, woodland - conifer, woodland - hardwood, woodland - mixed
Falco sparverius paulus	Southeastern American Kestrel	S3	ST	N	Estuarine: various habitats Palustrine: various habitats Terrestrial: open pine forests, clearings, ruderal, various
Grus canadensis pratensis	Florida Sandhill Crane	S2S3	ST	N	Lacustrine Habitat(s): Shallow water Palustrine Habitat(s): Herbaceous wetland, Riparian Terrestrial Habitat(s): Grassland/herbaceous, Savanna
Haematopus palliatus	American Oystercatcher	S2	ST	N	Estuarine: tidal flat/shore Terrestrial: bare rock/talus/scree, sand/dune
Haliaeetus leucocephalus	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
Helmitheros vermivorus	Worm-eating Warbler	S1	N	N	Palustrine Habitat(s): Riparian Terrestrial Habitat(s): Forest - Hardwood, Shrubland/chaparral, Woodland - Hardwood
Laterallus jamaicensis	Black Rail	S2	N	N	Estuarine Habitat(s): Herbaceous wetland; Palustrine Habitat(s): Herbaceous wetland
Mycteria americana	Wood Stork	S2	FE	E	Estuarine: marshes; Lacustrine: floodplain lakes, marshes (feeding), various Palustrine: marshes, swamps, various
Nyctanassa violacea	Yellow-crowned Night-heron	S3	N	N	Estuarine Habitat(s): Herbaceous wetland, Lagoon, Scrub-shrub wetland, Tidal flat/shore; Lacustrine Habitat(s): Shallow water; Palustrine Habitat(s): Forested wetland, herbaceous wetland, Riparian
Nycticorax nycticorax	Black-crowned Night-heron	S3	N	N	Estuarine Habitat(s): Bay/sound, Herbaceous wetland, Lagoon, River mouth/tidal river, Scrub-shrub wetland, Tidal flat/shore; Riverine Habitat(s): Low gradient, Moderate gradient, Pool Lacustrine Habitat(s): Shallow water Palustrine Habitat(s): Forested wetland, herbaceous wetland, Riparian Terrestrial Habitat(s): Sand/dune

Scientific Name	Common Name	Designation			Natural Communities
		FNAI	State	Federal	
Pandion haliaetus	Osprey	S3S4	N	N	Marine: near shore Estuarine: bay/sound, herbaceous wetland, lagoon, river mouth/tidal river Riverine: big river, medium river Lacustrine: deep water, shallow water Palustrine: forested wetland, riparian Terrestrial: cliff
Parkesia motacilla	Louisiana Waterthrush	S2	N	N	Palustrine Habitat(s): Forested Wetland, Riparian Terrestrial Habitat(s): Forest - Hardwood, Woodland - Hardwood
Picoides borealis	Red-cockaded Woodpecker	S2	FE	E	Terrestrial: mature pine forests
Picoides villosus	Hairy Woodpecker	S3	N	N	Palustrine Habitat(s): Forested Wetland, Riparian; Terrestrial Habitat(s): Forest - Conifer, Forest - Hardwood, Forest - Mixed, Suburban/ orchard, Woodland - Conifer, Woodland – Hardwood, Mixed
Platalea ajaja	Roseate Spoonbill	S2	ST	N	Estuarine Habitat(s): Bay/sound, Herbaceous wetland, Lagoon, Scrub-shrub wetland, Tidal flat/shore Riverine Habitat(s): Low gradient Lacustrine Habitat(s): Shallow water Palustrine Habitat(s): Forested Wetland, Herbaceous Wetland, Riparian
Rallus longirostris scottii	Florida Clapper Rail	S3?	N	N	Estuarine Habitat(s): Herbaceous wetland, Tidal flat/shore
Recurvirostra americana	American Avocet	S2	N	N	Estuarine Habitat(s): Bay/sound, Herbaceous wetland, Lagoon, River mouth/tidal river, Tidal flat/shore Riverine Habitat(s): Low gradient Lacustrine Habitat(s): Shallow water Palustrine Habitat(s): Herbaceous wetland, Riparian Terrestrial Habitat(s): Playa/salt flat
Rynchops niger	Black Skimmer	S3	ST	N	Marine: near shore Estuarine: bay/sound, herbaceous wetland, lagoon, river mouth/tidal river, tidal flat/shore Riverine: big river, low gradient Lacustrine: deep water, Shallow water Palustrine: riparian Terrestrial: sand/dune
Sitta carolinensis	White-breasted Nuthatch	S2	N	N	Palustrine Habitat(s): Riparian Terrestrial Habitat(s): Forest - Conifer, Forest - Hardwood, Forest - Mixed, Suburban/orchard, Woodland - Conifer, Woodland - Hardwood, Woodland - Mixed

Scientific Name	Common Name	Designation			Natural Communities
		FNAI	State	Federal	
Sterna antillarum	Least Tern	S3	ST	E	Estuarine: various Lacustrine various Riverine: various Terrestrial: beach dune, ruderal. Nests common on rooftops
Sterna caspia	Caspian Tern	S2	N	N	Marine Habitat(s): Near shore Estuarine Habitat(s): Bay/sound, Herbaceous wetland, Lagoon, River mouth/tidal river, Tidal flat/shore Riverine Habitat(s): Big river, Low gradient, medium river Lacustrine Habitat(s): Deep water, Shallow water Palustrine Habitat(s): Herbaceous wetland, Riparian Terrestrial Habitat(s): Sand/dune
+Sterna maxima	Royal Tern	S3	N	N	Marine: near shore Estuarine: bay/sound, lagoon, river mouth/tidal river, tidal flat/shore Terrestrial: sand/dune
Sterna sandvicensis	Sandwich Tern	S2	N	N	Marine: near shore Estuarine: bay/sound, lagoon, river mouth/tidal river, tidal flat/shore Terrestrial: sand/dune
Mammals					
Corynorhinus rafinesquii	Rafinesque's Big-eared Bat	S2	N	N	Palustrine Habitat(s): Riparian Terrestrial Habitat(s): Forest - Hardwood, Suburban/orchard, Urban/edificarian, Woodland – Hardwood; Subterranean Habitat(s): Subterrestrial
Mustela frenata olivacea	Southeastern Weasel	S3	N	N	Palustrine: forested wetland, riparian Terrestrial: forest - hardwood, old field, woodland - conifer, woodland - hardwood, woodland - mixed
Mustela vison halilimnetes	Gulf Salt Marsh Mink	S3	N	N	Estuarine Habitat(s): Herbaceous wetland, River mouth/tidal river
Myotis austroriparius	Southeastern Bat	S3	N	N	Riverine Habitat(s): Aerial Palustrine Habitat(s): Aerial, Forested wetland, Riparian Terrestrial Habitat(s): Forest - Conifer, Forest - Hardwood, Forest - Mixed, Forest Edge, Forest/Woodland, Suburban/orchard, Urban/edificarian, Woodland - Conifer, Woodland - Hardwood, Woodland - Mixed Subterranean Habitat(s): Subterrestrial
Myotis grisescens	Gray Bat	S1	FE	E	Palustrine: caves, various Terrestrial: caves, various
Neofiber alleni	Round-tailed Muskrat	S3	N	N	Estuarine Habitat(s): Herbaceous wetland
Sciuris niger shermani	Sherman's Fox Squirrel	S3	SSC	N	Terrestrial: woodland - conifer, woodland - mixed

Scientific Name	Common Name	Designation			Natural Communities
		FNAI	State	Federal	
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; FWC 2016b; 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.
CE = Consideration encouraged
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.
E(CH) = Endangered critical habitat
N = None
P = Petitioned for Federal listing
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. Based on GIS analysis, there are 29 unique natural communities recognized by the FNAI within the Ochlockonee River and Bay watershed (FNAI 2010). 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	
Bluff	Bluff is a habitat characterized as a steep slope with rock, sand, and/or clay substrate that supports sparse grasses, herbs, and shrubs. Bluffs are found in the center of Florida's portion of the watershed; Lake Talquin and contributing tributaries; and on the east side of the Ochlockonee River to about Forest Road 13.
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 Ochlockonee River and Bay watershed, healthy mesic flatwoods occur in the Apalachicola National Forest and the in the Ochlockonee River State Park in the eastern section of the park near the highway, and in the older section of the park abutting the river. Throughout the Ochlockonee River State Park, small changes in elevation result in a mosaic of mesic flatwoods, scrubby flatwoods, some sandhill, and wet flatwoods (FDEP 2008).
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 Ochlockonee River and Bay watershed, exemplary sandhill communities can be found extensively throughout the Apalachicola National Forest and in a small tract of the Ochlockonee River State Park (FNAI 2010).

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. Within the Ochlockonee River and Bay watershed, exemplary scrub community can be found throughout Bald Point State Park.
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*), Florida scrub-jay (*Aphelocoma coerulescens*) (Peninsular Florida only), gopher tortoise (*Gopherus polyphemus*), the Florida gopher frog (*Rana capito*), goldenaster (*Chrysopsis floridana*) and large-plumed beaksedge (*Rhynchospora megaplumosa*) (FNAI 2010). Within the Ochlockonee River and Bay watershed, scrubby flatwood communities can be found at Bald Point State Park and intermediately between mesic flatwoods and sandhill communities at Ochlockonee River State Park (FDEP 2008).
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 Ochlockonee River State Park and 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. The Ochlockonee River State Park contains evidence of pre-contact habitation, including a shell midden near the primitive group camp (FDEP 2008). A pre-Columbian Native American shell midden dating back possibly to the Weedon Island Period 1,500 years ago sits along the shore of the Dead River (Ochlockonee River State Park 2015).

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). In the Ochlockonee River and Bay watershed, basin marsh occurs around Lake Miccosukee in Leon and Jefferson counties.
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 (FNAI 2010). Within the Ochlockonee River and Bay watershed coastal interdunal swale can be found throughout St. James Island.

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 Ochlockonee and Sopchoppy rivers.
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. The soil is often soft and mucky underfoot, in contrast to the firm texture of the bordering sandhill and upland pine soils. Seepage slopes range from the Alabama border eastward to Calhoun County in the inland portions of the Florida Panhandle (FNAI 2010). Seepage slopes are found in the center of Florida's portion of the watershed; Lake Talquin and contributing tributaries; and on the east side of the Ochlockonee River to about Forest Road 13.

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. The Ochlockonee River has historically been categorized as a blackwater stream, but also exhibits alluvial stream characteristics. The character of the river was probably more characteristic of a true alluvial stream prior to the placement of the dam on Lake Talquin (FDEP 2008). Many of the Ochlockonee's smaller tributaries are true blackwater streams, including several streams that traverse the Apalachicola National Forest.
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). Within the Ochlockonee River and Bay watershed, seepage streams are found throughout the Apalachicola National Forest.
Sinkhole Lakes	Sinkhole lakes typically form in deep, funnel-shaped depressions in limestone bedrock and are moderately widespread in the karst regions of the Florida Panhandle. Sinkhole depressions are geologic features which are relatively permanent; however, water levels may fluctuate dramatically due to hydrologic connectivity with the aquifer. Sinkhole lakes are characterized by clear, alkaline water with high concentrations of calcium, bicarbonate, and magnesium. The vegetation in some sinkhole lakes is absent or limited to a narrow fringe of emergent species at the edge of the water, while other sinkhole lakes are completely covered by floating vegetation. Sinkhole Lakes are considered endangered in Florida due to the threat of erosion which destroys the surrounding vegetation and pollutes the aquifer with which these lakes are closely connected (FNAI 2010). Sinkhole lakes are prevalent throughout the watershed in areas where karst geology exists. An exemplary sinkhole lake is Lake Jackson in Leon County (northwestern Tallahassee).

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). Spring run streams are found throughout the northern portions of the watershed where karst geology is prominent.
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 Ochlockonee Bay and are particularly extensive at the St. Marks National Wildlife Refuge.
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). Seagrass beds occur throughout Alligator Harbor and the Ochlockonee Bay.
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 along St. James Island and throughout the Ochlockonee Bay.

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). Unconsolidated (marine) substrate can be found along St. James Island and throughout the Ochlockonee Bay.

Sources: FNAI 2010, 2016a.

Appendix F 2013 FDEP-Verified Impaired Waterbody Segments in the Ochlockonee 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 (EPA 2016a). The following table provides a list of 2013 FDEP designated and impaired waters in the Ochlockonee River and Bay watershed.

Waterbody ID	Water Segment Name	County	Waterbody Class[1]	Parameters Assessed Using the Impaired Waters Rule (IWR)
757	Bear Creek	Gadsden	3F	Fecal Coliform
913	Big Creek	Liberty	3F	Fecal Coliform
8025	Gulf of Mexico (Franklin County; Ochlockonee Bay)	Franklin, Wakulla	2	Fecal Coliform (SEAS Classification)
879	Hammock Creek	Gadsden, Liberty	3F	Dissolved Oxygen
746A	Harbinwood Estates Drain	Leon	3F	Dissolved Oxygen
746A	Harbinwood Estates Drain	Leon	3F	Fecal Coliform
746A	Harbinwood Estates Drain	Leon	3F	Iron
921	Harvey Creek	Leon	3F	Fecal Coliform
582B	Lake Jackson	Leon	3F	Dissolved Oxygen
582B	Lake Jackson	Leon	3F	Nutrients (TSI)
582D	Lake Jackson Outlet	Leon	3F	Fecal Coliform
546C	Lake Monkey Business	Leon	3F	Nutrients (TSI)
689	Lake Overstreet Drain	Leon	3F	Fecal Coliform
1297C	Lake Talquin	Gadsden, Leon	3F	Dissolved Oxygen
1297C	Lake Talquin	Gadsden, Leon	3F	Nutrients (TSI)
1297D	Lake Talquin	Gadsden, Leon	3F	Nutrients (TSI)
424	Little River	Gadsden	3F	Fecal Coliform
8025B	Mashes Island	Wakulla	3M	Bacteria (Beach Advisories)
809A	Megginnis Arm Run	Leon	3F	Fecal Coliform
684	Mule Creek	Gadsden, Liberty	3F	Fecal Coliform
1248A	Ochlockonee Bay	Franklin, Wakulla	2	Fecal Coliform (3)
1248A	Ochlockonee Bay	Franklin, Wakulla	2	Fecal Coliform (SEAS Classification)
1297B	Ochlockonee River	Leon, Liberty, Wakulla	3F	Iron
1297B	Ochlockonee River	Leon, Liberty, Wakulla	3F	Nutrients (Historic Chlorophyll-a)

Waterbody ID	Water Segment Name	County	Waterbody Class[1]	Parameters Assessed Using the Impaired Waters Rule (IWR)
896	Polk Creek	Leon	3F	Fecal Coliform
1303	Quincy Creek	Gadsden	1	Fecal Coliform
1303	Quincy Creek	Gadsden	1	Iron
1303A	Quincy Creek	Gadsden	3F	Fecal Coliform
480	Salem Branch	Gadsden	3F	Dissolved Oxygen
480	Salem Branch	Gadsden	3F	Fecal Coliform
540A	Tallavanna Lake	Gadsden	3F	Fecal Coliform
540A	Tallavanna Lake	Gadsden	3F	Nutrients (TSI)
1300	Telogia Creek	Gadsden, Liberty	3F	Fecal Coliform
758	Timberlane Run	Leon	3F	Fecal Coliform

Source: FDEP 2013 Verified Impaired Waters List.

Notes:
* = new Florida listings since 2003
Footnote 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

Appendix G Public and Conservation Lands within the Ochlockonee River and Bay Watershed

Within the Ochlockonee River and Bay watershed, there are approximately 366,218 acres of conservation lands, including 240,209 acres of federally managed lands, 105,817 acres state-managed, 905 acres of locally managed lands, and 19,287 acres of privately managed lands. Six conservation lands within the Ochlockonee 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	One of Florida's premier conservation areas, this forest includes vast expanses of longleaf pine sandhills and flatwoods, and harbors the largest population of red-cockaded woodpeckers in the state. Wet prairies, seepage slopes, ravines, numerous blackwater streams.	http://www.fs.fed.us	225,387
Levy Ditch Research Natural Area	US Dept. of the Interior, Fish and Wildlife Service	Wakulla	This research natural area is part of the St. Marks National Wildlife Refuge.	http://www.fws.gov/southeast	74
St. Marks National Wildlife Refuge	US Dept. of the Interior, Fish and Wildlife Service	Jefferson, Taylor, Wakulla	This refuge represents a large area of protected coast from the Aucilla River to Ochlockonee Bay. Natural communities include estuarine tidal marsh, coastal hammock, wet flatwoods, mesic flatwoods, dome swamps, depression marshes, and bottomland forests. The refuge has extensive artificial impoundments managed for waterfowl and used by many other bird species.	http://www.fws.gov/southeast	14,748
State-Managed					
Alfred B. Maclay Gardens State Park	FL Dept. of Environmental Protection, Div. of Recreation and Parks	Leon	Significant features include a pristine upland clastic lake, sinkholes and ravines with slope forests.	http://www.floridastateparks.org/	1,164
Bald Point State Park	FL Dept. of Environmental Protection, Div. of Recreation and Parks	Franklin	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/	4,017

Conservation Land	Managing Agency	County(ies)	Description	Website	Acres Within Watershed
Coastal Forest Resources Conservation Easement	Northwest Florida Water Management District	Gadsden	The Coastal Forest Resources Conservation Easement is located northeast of Midway, FL, adjacent to the Ochlockonee River. The easement does not allow public access.	http://www.nwfwater.com/	156
Davidson/Hosford Conservation Easement	Northwest Florida Water Management District	Liberty	The Davidson/Hosford Conservation Easement is located east of the Apalachicola National Forest and just west of the Wakulla/Liberty county line. The easement does not allow public access.	http://www.nwfwater.com/	1,517
Jackson Conservation Easement (NWFWMD)	Northwest Florida Water Management District	Leon	The Jackson Conservation Easement is located just east of the Ochlockonee River south of Lake Talquin and is owned by private individuals. The easement is not open for public access.	http://www.nwfwater.com/	108
Joe Budd Wildlife Management Area	FL Fish and Wildlife Conservation Commission	Gadsden	Joe Budd Wildlife Management area includes xeric uplands as well as streams, seepage slopes, and mesic forest supporting Ashe's magnolia, pyramid magnolia, Florida merrybells, orange azalea, and wiregrass gentian. The FWC has lead management authority on 2756 acres of the wildlife management area (FNAI boundaries). The rest is contained within Lake Talquin State Forest, including the 2018-acre Rocky Comfort tract which is jointly managed by FL DACS Florida Forest Service and FL FWCC.	http://myfwc.com	2,955
Lake Jackson Mounds Archaeological State Park	FL Dept. of Environmental Protection, Div. of Recreation and Parks	Leon	The Lake Jackson Mounds State park conserves a Native American archeological site. This was a cultural and religious center with a large population around 1100-1200 AD. The park encompasses six earthen temple mounds and one possible burial mound. Artifacts of pre-Columbian societies have been found including copper breastplates, necklaces, bracelets, anklets, and cloaks. Just along the nature trail are ruins of an 1800-era grist mill.	http://www.floridastateparks.org/	200

Conservation Land	Managing Agency	County(ies)	Description	Website	Acres Within Watershed
Lake Talquin State Forest	FL Dept. of Agriculture and Consumer Services, Florida Forest Service	Gadsden, Leon, Wakulla	The Lake Talquin State Forest includes the shores of Lake Talquin (an impoundment of the Ochlockonee River) and inundated historic river floodplain. It contains pine and hardwood forests and deep ravines along the edge of the lake that form refugee for many rare plants and animals.	http://www.floridaforestservice.com/index.html	19,169
Lake Talquin State Park	FL Dept. of Environmental Protection, Div. of Recreation and Parks	Gadsden, Leon, Wakulla	Lake Talquin State Park provides access to Lake Talquin, which was formed in 1927 when the Ochlockonee River was dammed. It contains extensive high quality slope and upland hardwood forests.	http://www.floridastateparks.org/	552
Ochlockonee River State Park	FL Dept. of Environmental Protection, Div. of Recreation and Parks	Wakulla	The Ochlockonee River State Park includes pine flatwoods, grass ponds, bayheads, and oak thickets bordering alluvial stream. It also supports a red-cockaded woodpecker colony.	http://www.floridastateparks.org/	546
Shuler Conservation Easement	Northwest Florida Water Management District	Liberty	The Shuler Conservation Easement lies along the west side of the Liberty/Wakulla county border, north of Davidson/Hosford Conservation Easement. The site is not accessible to the public.	http://www.nwfwater.com/	1,571
Tate's Hell State Forest	FL Dept. of Agriculture and Consumer Services, Florida Forest Service	Franklin, Liberty	Tate’s Hell State Park 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	25,522
Thompson/Gray Conservation Easement	Northwest Florida Water Management District	Gadsden	The Thompson/Gray Conservation Easement is located on the north and south side of State Road 8 adjacent to the west side of Lake Talquin State Forest. The easement is owned by private individuals and is not accessible to the public.	http://www.nwfwater.com/	323

Conservation Land	Managing Agency	County(ies)	Description	Website	Acres Within Watershed
Torreya State Park	FL Dept. of Environmental Protection, Div. of Recreation and Parks	Gadsden, Liberty	Torreya State Park contains high quality, extensive upland hardwood forests, with some high pineland, hardwood hammock, river floodplain forests, steep ravines, and calcareous bluffs. Only a small portion of the park is in the Ochlockonee River watershed.	http://www.floridastateparks.org/	134
Locally Managed					
Elinor Klapp-Phipps Park	City of Tallahassee and NWFWMD	Leon	Elinor Klapp-Phipps Park contains a diverse landscape of open fields, upland mixed pine/oak/hickory forest, loblolly flats, seepage ravines, and swamp forests. It is used for a variety of passive recreational activities including hiking, biking, horseback riding, and nature study. The Red Hills Horse Trials, an international equestrian competition, is held annually at the park in March.	http://www.talgov.com/parks	662
Mashes Sands Park	Wakulla County	Wakulla	Marshes Sands Park contains beach dunes with tidal marsh and trails through scrubby flatwoods and mesic flatwoods.	http://www.wcprd.com/Parks/parks_mashessands.asp	36
Okeeheepkee Prairie	Leon County	Leon	Okeeheepkee Prairie is a wetland park that serves as a regional stormwater management facility. It includes a forebay (settling) pond, a waterfall, and a deep pool with winding channels that connects the uplands with Lake Jackson. The created wetland provides wildlife habitat.	http://www.leoncountyfl.gov/parks	26
Tanyard Creek Preservation Park	City of Quincy	Gadsden	Tanyard Creek Preservation Park is made up of several disjunctured parcels along Tanyard Creek, on the southeast side of Quincy, that are connected by a utility easement. It is a passive park with nature trails, and the City is restoring the creek. An amphitheater constructed on 32 acres is used for community events.	http://www.myquincy.net/	109
Timberlane Ravine	City of Tallahassee	Leon	Timberlane Ravine is a 72 acre park owned by the City of Tallahassee. It is located on the south and north sides of I-10, south of Alfred B Maclay Gardens State Park. Timberlane Ravine is a public park.	http://www.talgov.com/parks	72

Conservation Land	Managing Agency	County(ies)	Description	Website	Acres Within Watershed
Privately Managed					
Apalachicola Bluffs and Ravines Preserve	The Nature Conservancy	Liberty	Paleo-refugium of sheltered slopes and ravines dissecting bluffs east of the Apalachicola River, harboring many endemic plants. The preserve also contains some high quality sand hill.	http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/florida/index.htm	470
Cherokee Plantation Conservation Easement	Tall Timbers Research, Inc.	Leon	The Cherokee Plantation Conservation Easement is located just south of the Florida/Georgia state border between the Tall Timbers Research Station and the Foshalee Plantation Conservation easement bordering Lake Iamonia to the north.	http://www.talltimbers.org	1,671
Cherokee Waterway Conservation Easement	Tall Timbers Research, Inc.	Leon	The Cherokee Waterway Conservation Easement is on the southern end of the Cherokee Plantation Conservation easement.	http://www.talltimbers.org	25
Conlin Island Conservation Easement	Tall Timbers Research, Inc.	Leon	The Colin Island Conservation Easement is located in the western portion of Lake Iamonia. Lake Iamonia is just south of the Florida/Georgia state border.	http://www.talltimbers.org	41
Davidson-Riverview Conservation Easement	Tall Timbers Research, Inc.	Gadsden	The Davidson-Riverview Conservation Easement is located north of Havana Highway and west of South Main Street in Gadsden County. The Little River runs through the western portion of the easement. Davidson-Riverview	http://www.talltimbers.org	278
Farm's Eden Conservation Easement	Tall Timbers Research, Inc.	Leon	Farm’s Eden Conservation Easement is just east of Lake Jackson and west of Alfred B. Maclay Gardens State Park. It also borders Elinor Klapp-Phipps Park to the south.	http://www.talltimbers.org	168
Foshalee Plantation Conservation Easement	Tall Timbers Research, Inc.	Leon	The Foshalee Plantation Conservation Easement is located on the Florida/Georgia Border, east of Thomasville Road.	http://www.talltimbers.org	1,801
Green Family Conservation Easement	Tall Timbers Research, Inc.	Leon	The Green Family Conservation Easement is located at the eastern tip of the Foshalee Plantation Easement along the Florida/Georgia border.	http://www.talltimbers.org	22

Conservation Land	Managing Agency	County(ies)	Description	Website	Acres Within Watershed
Hiamonee Plantation Conservation Easement	Tall Timbers Research, Inc.	Leon	The Hiamonee Plantation Conservation Easement is located on the west side of Lake Iamonia, bordering the River Ridge Plantation Conservation easement to the south.	http://www.talltimbers.org	122
Hinkle Property Conservation Easement	Tall Timbers Research, Inc.	Leon	The Hinkle Property Conservation Easement is located on the south side of Lake Iamonia.	http://www.talltimbers.org	93
Horseshoe Plantation Conservation Easement	Tall Timbers Research, Inc.	Leon	The Horseshoe Plantation Conservation Easement is 17 disconnected properties on the southeastern side of Lake Iamonia. Thomasville road runs through the largest property on its western edge. The easement largest property Is also bordered by Woodfield Springs Plantation Conservation easement on the east side.	http://www.talltimbers.org	5,826
Mistletoe Conservation Easement	Tall Timbers Research, Inc.	Leon	The Mistletoe Conservation Easement is located just south of the Florida/Georgia border, to the west of North Meridian Road in Leon County.	http://www.talltimbers.org	40
RCM Farms Conservation Easement	Tall Timbers Research, Inc.	Gadsden	The RCM Farms Conservation Easement is located west of North Monroe Street and north of I-10. The easement is not accessible to the public.	http://www.talltimbers.org	463
River Ridge Plantation Conservation Easement	Tall Timbers Research, Inc.	Leon	The River Ridge Plantation Conservation Easement is just south of the Florida/Georgia border and northwest of Lake Iamonia. The easement is bordered by Hilamonee Plantation Conservation Easement on the north side.	http://www.talltimbers.org	1,107
Shade Farm Conservation Easement	Tall Timbers Research, Inc.	Gadsden	The Shade Farm Conservation Easement is north of State Road 8 and just south of the Florida/Georgia border.	http://www.talltimbers.org	627
Sunny Hill Plantation Conservation Easement	Tall Timbers Research, Inc.	Leon	The Sunny Hill Plantation Conservation Easement borders the Leon/Jefferson county line and is located north-northwest of Lake Miccosukee. Straw pond Conservation Easement borders the north portion of the property. The easement is not accessible to the public.	http://www.talltimbers.org	1,279

Conservation Land	Managing Agency	County(ies)	Description	Website	Acres Within Watershed
Swamp Creek Preserve Conservation Easement	Tall Timbers Research, Inc.	Gadsden	The Swamp Creek Preserve is west of the Florida Georgia Highway and north of Havana Highway. The easement is not accessible to the public.	http://www.talltimbers.org	496
Tall Timbers Research Station and Land Conservancy	Tall Timbers Research, Inc.	Leon	Tall Timbers lands include extensive acreage of upland pine forests, hardwood hammocks, and bottomland hardwoods in the Tallahassee Red Hills region.	http://www.talltimbers.org	3,949
Woodfield Springs Plantation Conservation Easement	Tall Timbers Research, Inc.	Leon	The Woodfield Springs Plantation Conservation Easement is to the west of Lake Miccosukee and to the southeast of Lake Iamonia. The easement is not accessible to the public.	http://www.talltimbers.org	69
Woodland Corners Conservation Easement	Tall Timbers Research, Inc.	Leon	The Woodland Corners Conservation Easement is located adjacent to the Florida/Georgia border. The south side of the easement is bordered by the Cherokee Plantation Conservation Easement and is not accessible to the public.	http://www.talltimbers.org	740

Source: FNAI 2016a