Surface Water Improvement and Management Plan

Ochlockonee River and Bay Watershed

Draft

Northwest Florida Water Management District
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OCHLOCKONEE RIVER AND BAY WATERSHED SURFACE WATER IMPROVEMENT AND MANAGEMENT PLAN

Developed by the Northwest Florida Water Management District under the auspices of the Surface Water Improvement and Management Program

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Cover Photograph:

Scott Copeland (2009) – Ochlockonee River at Rocky Bluff Scenic Area, Apalachicola National Forest

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1.0 INTRODUCTION

1.1 Purpose and Scope

The Ochlockonee River and Bay Watershed Surface Water Improvement and Management (SWIM) plan provides the framework for watershed resource protection and restoration, encompassing programs and statutory responsibilities of the Northwest Florida Water Management District (NWFWMD or "District"). The planning area encompasses the Ochlockonee River and Bay watershed area within Florida, including portions of Gadsden, Leon, Liberty, Wakulla, and Franklin counties. The scope of the plan includes strategic management actions needed to address water quality, natural systems, and floodplain protection and management issues. The plan also identifies possible funding sources for implementation.

The SWIM plan has been developed pursuant to the Surface Water Improvement and Management Act, as enacted 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 act directs the five water management districts to develop plans and programs for improvement and management of surface waters and to conduct research in order to improve scientific understanding of the causes and effects of the degradation of surface waters and associated natural systems.

The purposes of the Ochlockonee River and Bay SWIM plan are to identify major issues affecting watershed resources and functions, to prescribe a set of responsive management strategies, and to provide a funding framework for resolving them. The actions proposed are limited to those within the mission and scope of the NWFWMD SWIM program, while recognizing the initiatives of local communities and other agencies. Successful watershed management requires coordination and implementation of complementary programs under the purview of all jurisdictions and agencies involved in the watershed. Among these are local, state, and federal regulatory agencies; conservation land acquisition and management programs; and other public and private initiatives (Appendix A). Examples of implementing actions include stormwater retrofits for water quality improvement and floodplain protection, wetland and aquatic habitat restoration, resource assessments, monitoring, and public outreach and awareness activities. The actions taken, when funded, are also monitored to provide feedback to determine if they are working, need adjustment, or if they need to be replaced.

1.2 Vision for the Ochlockonee River and Bay Watershed

The Ochlockonee River and Bay watershed shall be managed to ensure the long-term sustainability of watershed resources, values, and functions. This encompasses preservation and, where necessary, restoration of ecosystem health and integrity. The District's vision for this plan recognizes important and interlinking hydrologic and ecological functions and processes at work in the watershed that affect water quality and natural systems.

The natural systems of the Ochlockonee River and Bay watershed provide significant economic and recreational opportunities for people and ecosystem benefits for people and wildlife. The uses of water resources within the basin for agriculture, water supply, treated wastewater assimilation, and hydropower must be managed appropriately to achieve the vision of long-term sustainability of natural systems.

2.0 OCHLOCKONEE RIVER AND BAY WATERSHED DESCRIPTION

The Ochlockonee River and Bay watershed (Figure 1) extends from the clay hills of southern Georgia south through the Big Bend region of Florida to the Gulf of Mexico. The watershed covers approximately 2,476 square miles (1,584,525 acres). Approximately 53 percent of the watershed (1,300 square miles or 832,313 acres) is in Florida in the counties of Gadsden, Leon, Liberty, Wakulla and Franklin. The other 47 percent is in Georgia in Worth, Mitchell, Colquitt, Decatur, Grady, and Thomas counties. The watershed in Florida includes a portion of the city of Tallahassee, as well as the cities of Quincy, Midway, Gretna, Bristol, and Sopchoppy; the towns of Greensboro and Havana; and the communities of Hosford, Telogia, Hardaway, Sawdust, Wetumpka and Fort Braden. Municipalities in Georgia's portion of the watershed include Cairo, Thomasville, Attapulgus, Climax, Whigham, Ochlocknee, Meigs, Pelham, Coolidge, Funston, Sale City, Doerun, and a portion of Moultrie.

Major surface water features in Florida include the main stem of the Ochlockonee River and its impounded reach at Lake Talquin, major tributaries Little River and Telogia Creek, and the Sopchoppy and Crooked rivers. Tributaries in Georgia include Bridge Creek, Little Ochlockonee River, Barnett's Creek, and Tired Creek. Other major surface water features within the watershed are lakes Jackson and Iamonia, and the coastal receiving waters of Ochlockonee Bay.

The Ochlockonee River includes primarily alluvial, blackwater, and tidal characteristics (Georgia Conservancy *et al.*, 2005). The river's length is approximately 216 miles (USGS, 2009). The Florida portion is roughly 116 miles. The river descends in elevation about 100 feet from the state line to the bay (Leon County, 2007). Numerous tributaries contribute flow to the river system, ranging from small intermittent streams to moderate perennial streams. Ochlockonee Bay covers approximately nine square miles bordering southern Wakulla and Franklin counties. The primary sources of fresh water inflow into the bay are the Ochlockonee and Sopchoppy rivers.

2.1 Physiography and Ecoregions

The watershed encompasses two main physiographic regions in Florida: the Tallahassee Hills subdivision of the Northern Highlands and the Gulf Coastal Lowlands (Purdum and Penson, 1998; Pratt *et al.*, 1996; Wolfe *et al.*, 1988; Pascale and Wagner, 1982). In simplified terms, the Tallahassee Hills region is distinguished by sand and red clay soils with high runoff and low recharge. Substantial recharge, however, occurs in the vicinity of closed basin lakes as described below. The coastal lowlands have sandy soil underlain by clay, muck and peat with low runoff, poor drainage and low but slightly better recharge. Intergrading these regions are relict erosional marine terraces and depositional coastal features (Pascale and Wagner, 1982). Topography is depicted in Figure 2. U.S. Environmental Protection Agency (EPA) ecoregion mapping (Griffith *et al.*, 2001a and 2001b) classifies most of the interstate watershed north of Lake Talquin as Tifton Upland except for the area east of the river, which is the Tallahassee Hills/Valdosta Limesink ecoregion (Georgia Conservancy *et al.*, 2005). West of the lake is Southern Pine Plains and Hills. South to the coast is mostly Gulf Coast Flatwoods.

2.2 Climate

The climate for north Florida is cool, sometimes cold, in winter with appreciable rainfall, while summers are hot, humid, and rainy (Griffin, 2010). For the Tallahassee region, the mean average annual temperature from 1971 to 2000 was 68.0°F. The mean minimum temperature was 39.7°F in January and mean maximum was 92.0°F in July. Mean annual precipitation is 63 inches with July being the rainiest (mean maximum 8 inches) and September being the driest (mean 3 inches) (NWS CLIMOD, 2010). In Quincy over the last 43 years, the average monthly temperature ranged from 50.6°F in January to 80.8°F in July, with an average annual precipitation of 56 inches (Southeast Regional Climate Center, 2011).

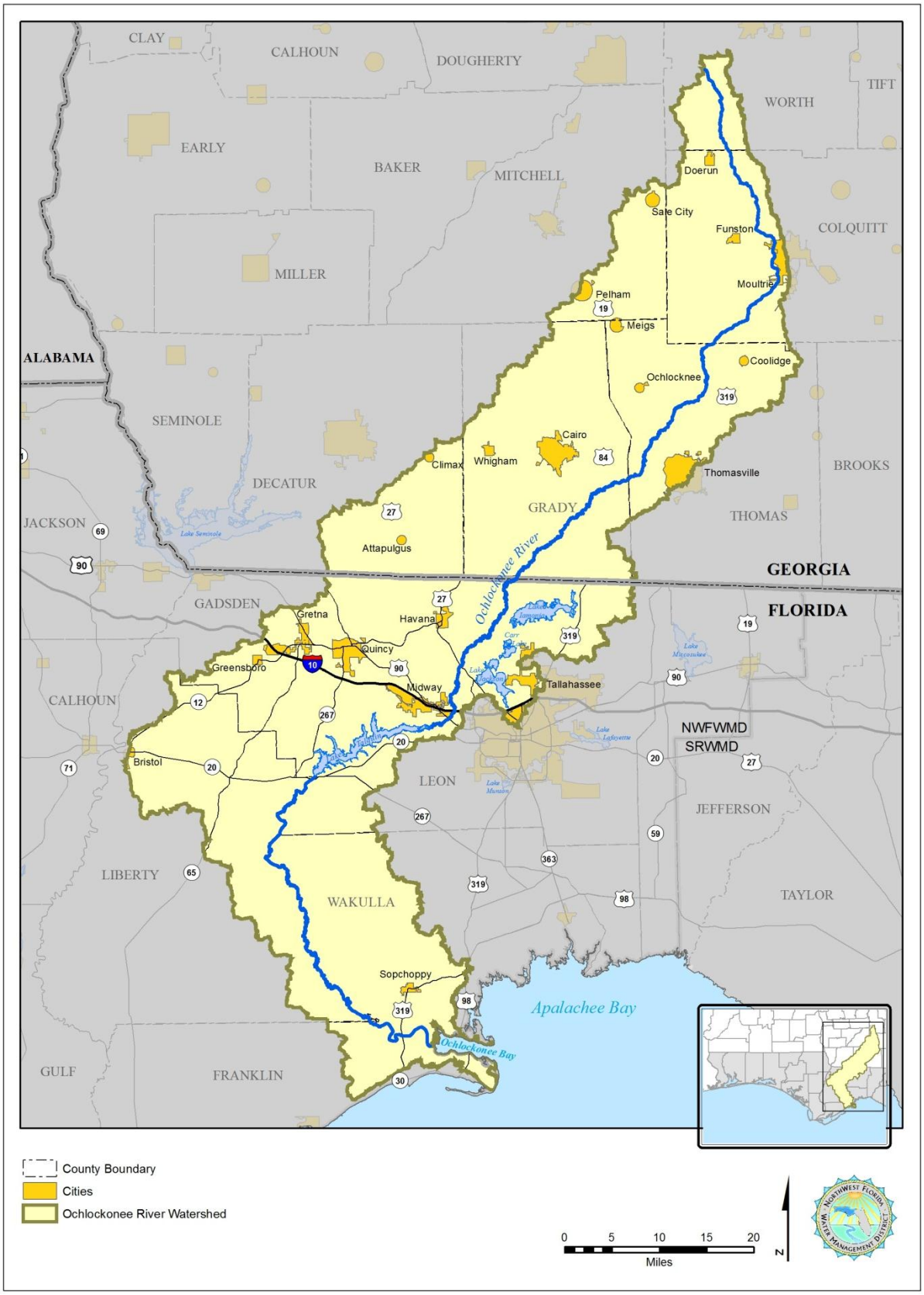


Figure 1. Ochlockonee River and Bay Watershed

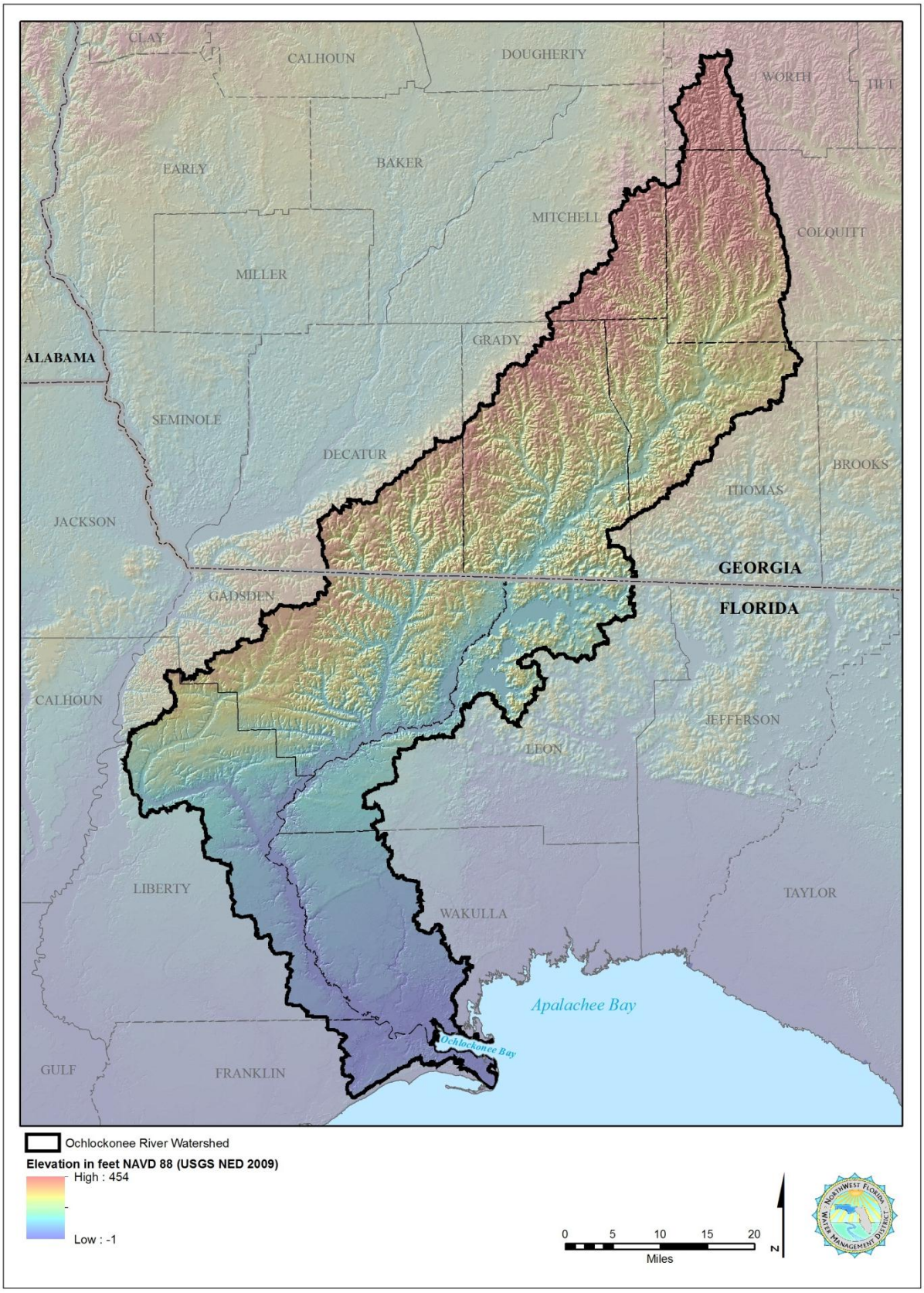


Figure 2. Ochlockonee River and Bay Watershed Topography

2.3 Hydrologic Characteristics

The Ochlockonee River receives most of its water from surface runoff (Georgia Conservancy *et al.*, 2005). Shallow aquifers provide base flow to the river and its tributaries. The Intermediate System with its minor water bearing zone contributes in the north. The Surficial Aquifer, composed of sandy layers, is the primary source of this flow in the central portion. The Floridan Aquifer provides base flow in the south (Pascale and Wagner, 1982). These aquifers, however, do not yield much water to the system (FDEP, 2001), and base flow is lower in Ochlockonee watershed streams than other areas of northwest Florida (Pascale and Wagner, 1982). Water levels in the main stem of the river depend upon precipitation and are highly variable. The predominance of clay soils in the Tallahassee Hills, together with land use changes that increase runoff, contribute to water level and flow variability within the watershed. The water level of the Ochlockonee River downstream of Lake Talquin is controlled through the retention and release of water from the dam.

In the Tallahassee Hills/Valdosta Limesink ecoregion, much of the surface water drains to closed basin lakes. These lakes are karst features with connections to aquifers where the confining layer has been breached at sinkholes or where it is relatively permeable. Monitoring data indicate that the lakes are connected hydraulically to the Intermediate System, a regional confining unit that contains minor water bearing carbonate zones. Drainage appears to be primarily to the Intermediate System, which, in turn, discharges to the Ochlockonee River on the west side of the Lake Jackson basin. Lakes Jackson and Iamonia experience periodic dry downs during drought periods when drainage to the underlying ground water exceeds input from precipitation within their respective sub-watersheds.

Lake Iamonia has an intermittent surface water connection to the Ochlockonee River during times of high river flows or lake levels. A dam built on the lake's connection to the river in 1976 for wildlife management no longer operates, and gates have been removed (Richardson, 2009). Gated culverts leading to a sink on the northeast side of the lake also no longer operate. Other structures have been constructed to retard drainage to the sink. Water flows over them during high water and connects the lake to the sink. An April 2010 site visit showed a breach providing access to the sink for small boats.

The Gulf Coastal Lowlands are generally poorly drained and characterized by swamps and wet flatwoods. Sluggish streams drain surface water in the flatwoods region. The Sopchoppy River drains approximately 102 square miles of flat sandy terrain, beginning as a blackwater stream in the Apalachicola National Forest. The 50-mile river receives some base flow from Floridan Aquifer seepage discharge further downstream where the channel has eroded through limestone (Pascale and Wagner, 1982; FDER 1987). Telogia Creek originates in the Tallahassee Hills physiographic region/Tifton Upland ecoregion as an alluvial stream and continues about 60 miles through the Gulf Coastal Lowlands to the Ochlockonee River. It is used heavily for agriculture (Pascale and Wagner, 1982).

The Ochlockonee and Sopchoppy rivers discharge a significant quantity of freshwater into western Ochlockonee Bay. This bay is connected with Apalachee Bay, a shallow estuary at the Big Bend of northwest Florida that is open and in direct contact with the Gulf of Mexico (Lewis *et al.*, 2009). Salinity within Ochlockonee Bay tends to be highly variable and stratified (Ichiye *et al.*, 1961). The lower Ochlockonee River, the lower Sopchoppy River, and Crooked River are all tidally influenced, with tidal influence extending approximately 12 miles upstream of the mouth of the Ochlockonee River (NWFWMD, 2006; Wolfe *et al.*, 1988).

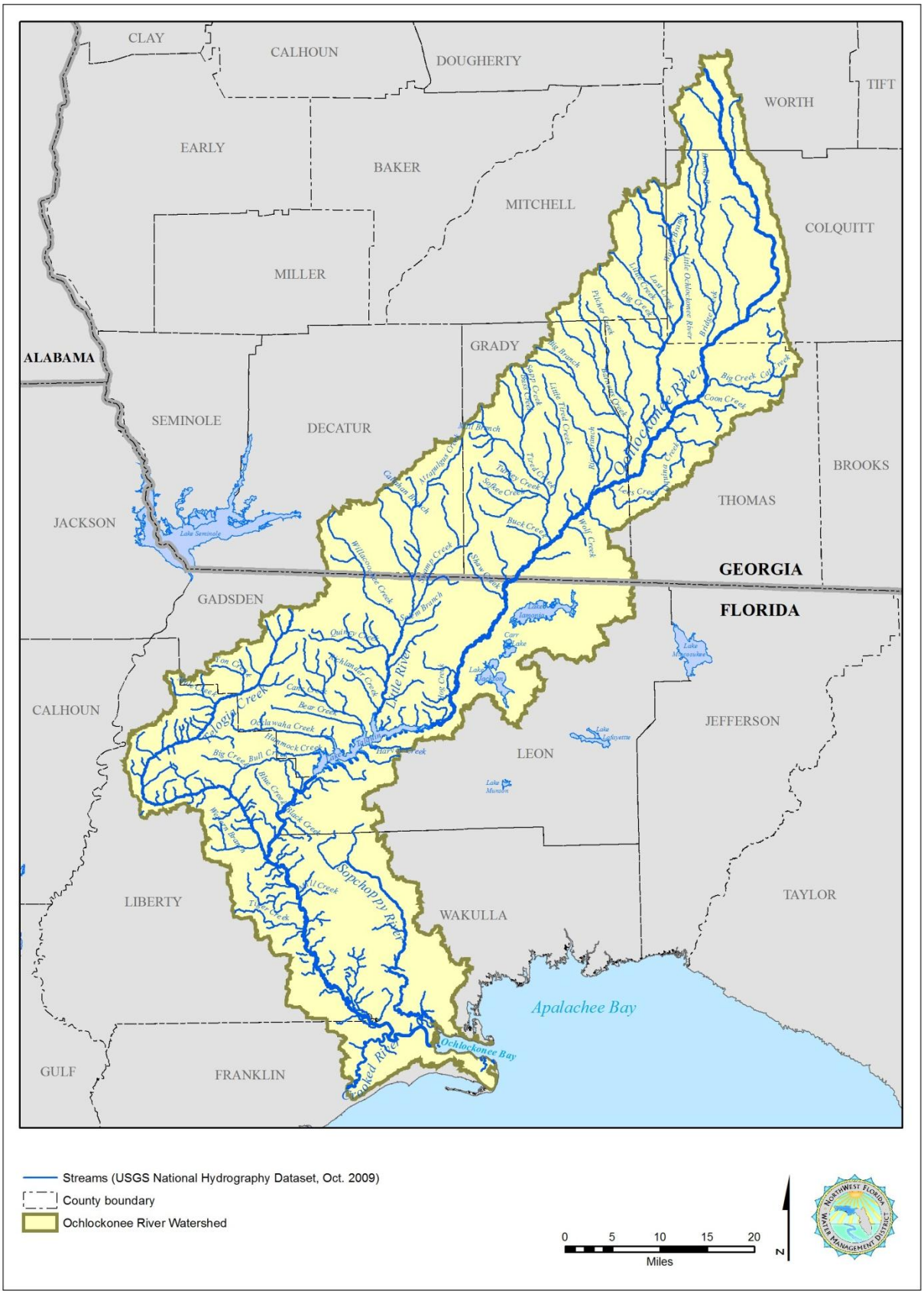


Figure 3. Ochlockonee River and Bay Watershed Hydrography

Springs in the Ochlockonee River watershed are almost exclusively onshore seeps (Copeland, 2003). Of the innumerable seeps, many of which head a multitude of first-order streams, two are named. White Spring in Liberty County and Indian Spring in Gadsden County are impounded surficial aquifer seep springs (Rosenau *et al.,* 1977; Georgia Conservancy *et al.*, 2005). Both are on privately owned land and no longer open to the public. Bottled water operations occurred at Indian Springs from 1994 to 2003 and have continued at White Spring since 2000 (NWFWMD 2007). Other documented springs are vents in the tidally influenced terminus of the watershed, including Bear Creek Rise in Franklin County and Cray's Rise in Wakulla County (Means, 2010; Scott *et al.*, 2004; Rosenau *et al.*, 1977). Bear Creek Rise is located on Bear Creek, a tributary of the lower Ochlockonee River. The tidally-influenced spring varies in color and turbidity. Cray's Rise is located near Ochlockonee Bay and discharges to the bay. It also has variable characteristics and is suspected to be the re-emergence of a subterranean portion of either the Ochlockonee River or Sopchoppy River (Scott *et al.*, 2004). Discharge measured in 1972 was 82 cubic feet per second (cfs), and dissolved solids data pointed to discharge from the Floridan Aquifer (Pascale and Wagner, 1982). Discharge was 164 cfs when measured in 2002. Salinity measurements show an increase between 1972 and 2002.

The U.S. Geological Survey (USGS) maintains stream gages that record flow data at four river locations in Florida and one in Georgia. There are additional gages on tributaries. The mean river flow above Lake Talquin at Havana is 1,036 cfs with an 82 year period of record (USGS, 2008). Below the dam, mean flow is about 1,672 cfs with a 78 year period of record (USGS, 2008). Tributary streams flowing into Lake Talquin account for this additional input. Mean monthly and annual discharge data for these five gage stations are shown in Table 1. The lowest flows generally occur during the fall months, while the highest flows occur in late winter/early spring.

Table 1. Ochlockonee River Flows

River gage location (North to South)	Years of record	Mean annual discharge (cfs)	Mean monthly discharge (cfs)											
			Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Thomasville, GA	71	509	163	191	411	607	915	1,256	908	355	316	422	374	238
Concord, FL	10	805	504	370	432	742	1,321	2,045	1,082	274	451	865	1,093	505
Havana, FL	82	1,036	497	394	714	1,268	1,935	2,283	1,838	771	621	736	854	578
Bloxam, FL	78	1,672	984	780	1,294	1,978	2,834	3,303	2,706	1,291	1,159	1,288	1,535	1,256
Smith Creek, FL	12	1,876	1,311	1,170	1,465	1,882	2,872	4,201	2,113	854	1,215	1,715	2,367	1,351

Streams within the watershed have been extensively altered by impoundments for agricultural and other purposes. Impoundments are prevalent in Gadsden County where there are no natural lakes for water storage. Pascale and Wagner (1982) reported 50 dams and associated ponds in Gadsden County. A desktop geographic information system (GIS) analysis of the Telogia Creek basin above CR 65B (upstream gauge site in Figure 8) identified 46 impoundments. Of 46 total stream miles above CR 65B, approximately 25 miles (54%) have been affected by in-stream impoundments. In the Little River and upper Telogia Creek systems, almost every tributary has at least one impoundment. Many of the ponds in the watershed were constructed before current regulations were enacted.

Lake Talquin is the largest impoundment in the watershed. The lake was created by impounding the Ochlockonee River at the Jackson Bluff Dam, now C.H. Corn Hydroelectric Dam, built in the 1920s to provide hydroelectric power. The reservoir covers approximately 8,800 acres. The lake and surrounding state lands have become important for recreational uses such as fishing, hunting, hiking and boating.

An additional surface water feature in Gadsden County is the Interlocking Lakes northwest of Quincy. These are depressions created by Fuller's earth mines that collected surface water runoff. Colson Creek, a tributary of Quincy Creek, is impounded here by a dam (Arteaga *et al.*, 1994). Surface storage in these lakes may delay runoff and account for what appears to be higher than expected base flow in Quincy Creek (Maristany, 1983).

2.4 Natural Communities

Natural communities within the watershed include alluvial stream, baygall, blackwater stream, clastic upland lake, depression marsh, dome swamp, estuarine tidal marsh, floodplain forest, floodplain swamp, mesic flatwoods, sandhill, scrub, seepage slope, slope forest, upland hardwood forest, upland mixed forest, and upland pine forest (FNAI 2008). River bluffs and steephead ravines are found in the center of Florida's portion of the watershed. Bluffs occur along Lake Talquin and contributing tributaries and on the east side of the Ochlockonee River to about Forest Road 13. Streams flow through deep ravines sheltered by a dense tree canopy, moderating climate extremes and providing habitat for many species of plants and animals. Steephead ravines occur 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, and within the Telogia Creek drainage in Gadsden and Liberty counties.

Approximately 40% of the Florida watershed consists of wetlands as estimated from National Wetland Inventory data (Figure 4). These primarily consist of forested wetlands, including wet pine flatwoods, bottomland hardwood forests, and seepage swamps. Prominent habitats in and associated with Ochlockonee Bay include extensive tidal marshes, tidal creeks, oyster beds, and tidal flats (FDEP, 2010b). Mattson *et al.* (2006) identified patchy seagrasses at the mouth of Ochlockonee Bay and within the bay south of the mouth of the Ochlockonee River. Extensive seagrass beds occur outside the mouth of Ochlockonee Bay. Bottom sediments within the bay are predominantly mud, with sand and shell bottoms in places (Hulings, 1958).

The watershed serves as important habitat for a diversity of wildlife. The Florida Fish and Wildlife Conservation Commission (FWC) has identified two Strategic Habitat Conservation Areas (SHCA) for the Florida black bear (*Ursus americanus floridanus*) on the west side of the Ochlockonee River: one encompassing the lower Telogia Creek basin and several nearby Ochlockonee tributaries in Liberty County, and the other at the lower end of the watershed mostly in Franklin County. There are also numerous SHCAs identified in the watershed for wading birds, primarily along Telogia Creek, the Ochlockonee River above Lake Talquin, and proximate to lakes Jackson and Iamonia (Endries et al., 2009). Large sections of the river above and below Lake Talquin are federally designated critical habitat for four listed mussel species.

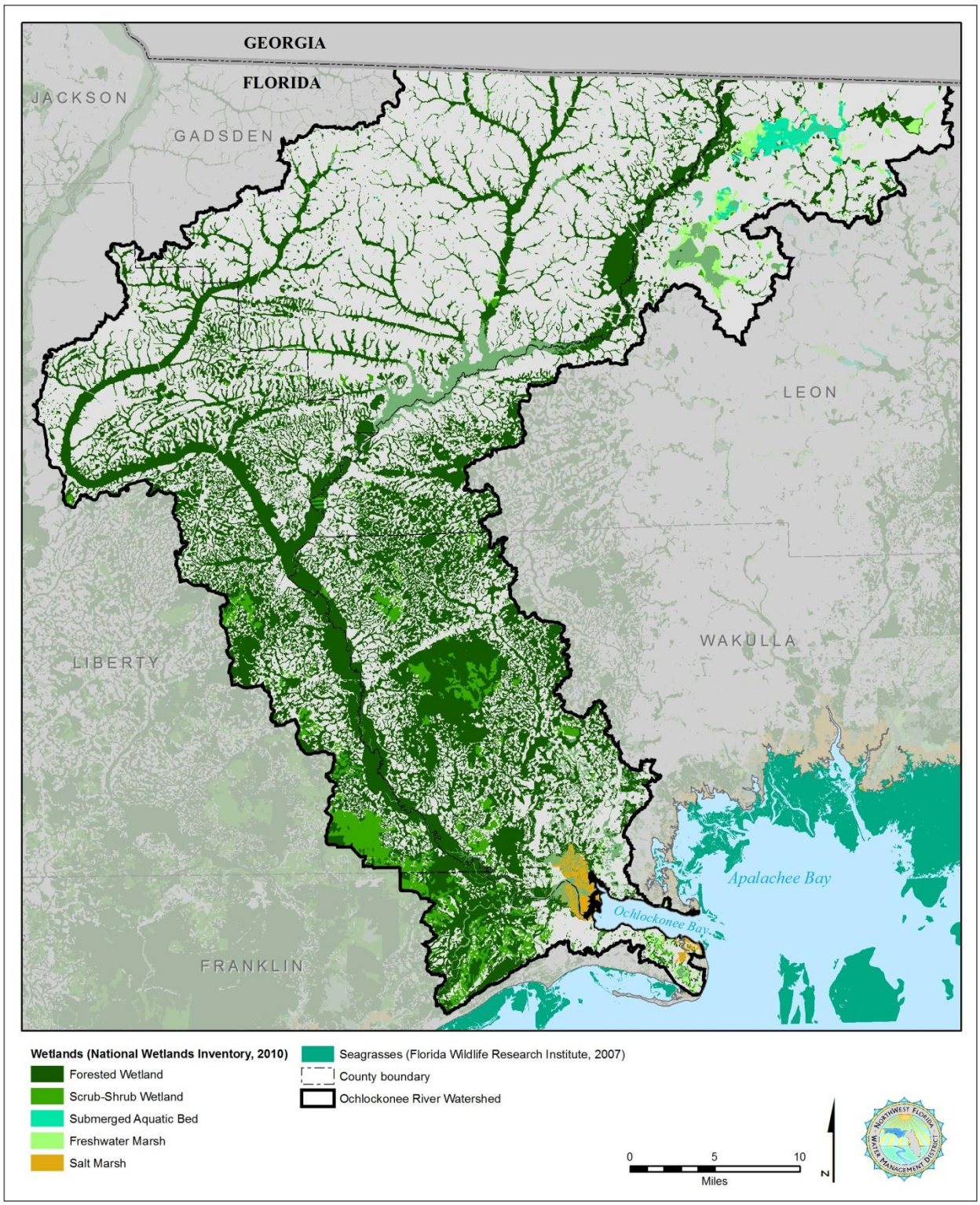


Figure 4. Wetland and Aquatic Habitats

2.5 Special Designations

Under Florida's surface water quality standards set forth in Chapter 62-302 of the Florida Administrative Code (F.A.C.), most surface waters in the Florida portion of the Ochlockonee River watershed are classified as Class III, suitable for recreation, fish, and wildlife. Quincy Creek and its tributary Holman Branch are designated Class I, intended for potable water use. The City of Quincy no longer uses this source for drinking water, but instead has a potable water wellfield in northwest Gadsden County. Class II waters for shellfish harvesting are designated in Ochlockonee Bay. Under this program, water quality is to be maintained sufficient for the designated use through an antidegradation policy as described in Chapter 62-302 F.A.C.

A number of waterbodies and segments within the Ochlockonee River watershed have been recognized and receive additional regulatory protection through designation as Outstanding Florida Waters (OFW), 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

2.6 Population, Land Use, and Land Cover

Table 2 provides population and recent population growth estimates for the watershed. The estimates were derived from U.S. Census Bureau data, applying a GIS analysis of individual census blocks located within or mostly within the watershed.

Table 2. Population Estimates for the Florida Ochlockonee River and Bay Watershed

	Census Population[1]		
County	**2000[2]**	**2010[3]**	**% Change**
Franklin	103	101	-1.9%
Gadsden	38,401	39,263	2.2%
Leon	41,674	47,187	13.2%
Liberty	4,589	5,694	24.1%
Wakulla	2,489	2,568	3.2%
Watershed Total	**87,256**	**94,813**	**8.7%**

[1]*Watershed population derived from Census block data using GIS spatial analysis.*

[2]*Source: U.S. Census Bureau, Census 2000. Data adjusted to remove population indicated in undeveloped blocks.*

[3]*Source: U.S. Census Bureau, Census 2010*

Predominant land cover and land use in the cross-state watershed consists of upland forest followed equally by agriculture and wetlands (Figure 5). Agriculture is dominant in Georgia, while forests cover sizeable areas (University of Georgia, 2007). Among the agricultural uses in the Georgia watershed are livestock, farm crops and orchards (GAEPD, 2002).

Florida land use and land cover is mostly upland forest and wetlands (Table 3). Urban lands are within and proximate to the cities of Tallahassee and Quincy. Other population centers include the cities of Midway, Havana, Gretna, Greensboro, Bristol, and Sopchoppy and the unincorporated communities of Hosford, Telogia, Hardaway, Sawdust, Wetumpka, and Fort Braden. Residential development is scattered across unincorporated areas, with concentrations in northeast Gadsden County and around lakes Talquin, Jackson, and Iamonia.

Table 3. Land Use and Land Cover in the Florida Ochlockonee River Watershed

Generalized Land Use/Land Cover	Acres	Percent
Upland Forest	373,437	44.85%
Wetland	306,260	36.79%
Agriculture	81,284	9.76%
Water	18,992	2.28%
Developed*	49,218	5.91%
Open Land (Open Land; Barren Land)	2,115	0.25%
Mining and Extraction	1,245	0.15%
Florida Total	832,551	100.00%

**Includes residential, commercial, transportation, utilities, industrial, and recreational uses.*
Source: FDEP Land Use - Land Cover, 2006-2007

Over 317,000 acres of the watershed within Florida are protected conservation lands (Table 4; Figure 6). Prominent are the Apalachicola National Forest, Tate's Hell State Forest, Lake Talquin State Forest, and St. Marks National Wildlife Refuge. Conservation lands cover most of the lower watershed, while the upper watershed has comparatively little protection. Other notable public lands are Bald Point State Park, Joe Budd Wildlife Management Area, Alfred B. Maclay Garden State Park, Elinor Klapp-Phipps Park, Lake Talquin State Park, and Ochlockonee River State Park. Private conservation lands include Tall Timbers Research Station and conservation easements on private forest and wetland mitigation lands.

Table 4. Conservation Lands in the Florida Ochlockonee River Watershed

Owner or Easement Holder	Acres*
NWFWMD	675
NWFWMD (Less than Fee)	3,677
City of Tallahassee	56
Leon County	26
Tall Timbers Land Conservancy	3,954
Tall Timbers Land Conservancy (Less Than Fee)	14,156
The Nature Conservancy	470
State of Florida	54,249
US Dept. of the Interior, Fish and Wildlife Service	14,886
US Dept. of Agriculture, Forest Service	225,544
Total	**317,693**

**Based on GIS analysis.*
Source: Florida Natural Areas Inventory, December 2010

Lands of interest for conservation purposes are identified in the Florida Forever land acquisition work plans of the District and the Florida Department of Environmental Protection (FDEP) (NWFWMD, 2011a; FDEP, 2010a). The District's Ochlockonee River Basin project focuses on lands bordering the river. The state's Ochlockonee River Conservation Area and Ayavalla Plantation projects identify a conservation corridor between the river and lakes Jackson and Iamonia. The Hosford Chapman's Rhododendron Protection Zone would protect a population of this federally endangered Florida endemic plant and enhance connectivity between conservation lands.

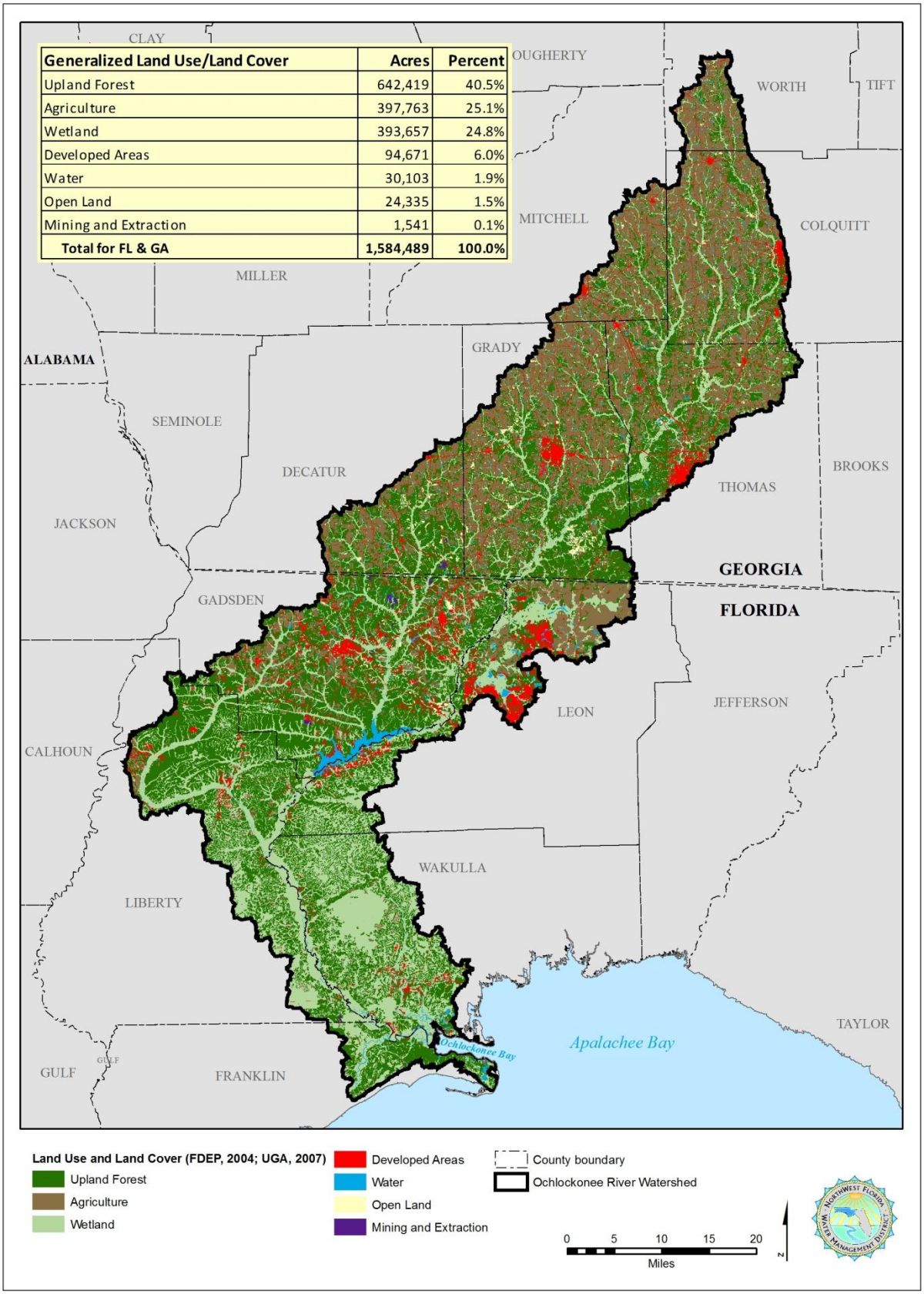


Figure 5. Ochlockonee River and Bay Watershed Generalized Land Use and Land Cover

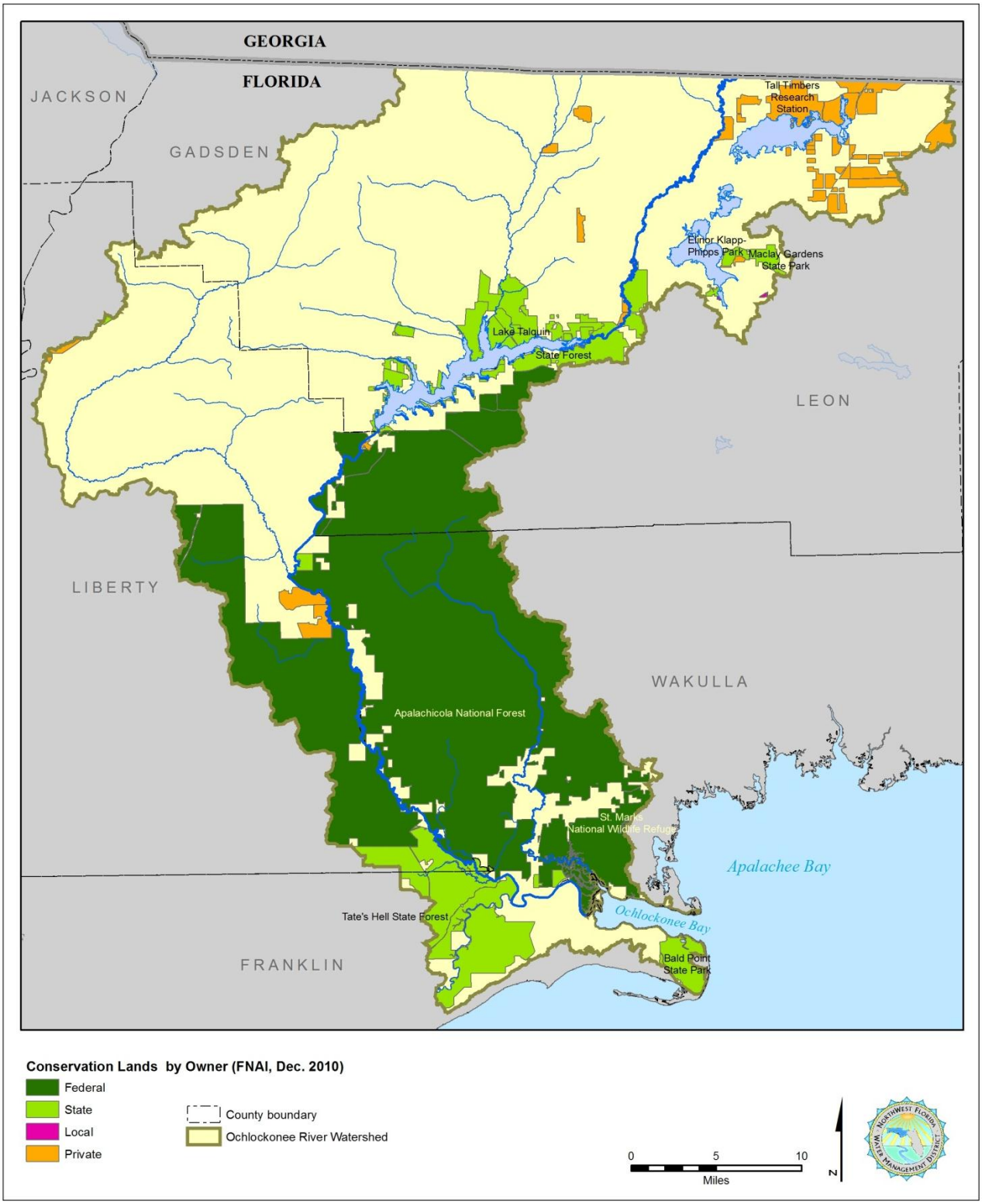


Figure 6. Ochlockonee River and Bay Watershed Conservation Lands in Florida

3.0 WATERSHED ASSESSMENT AND WATER RESOURCE ISSUES

The watershed issues described below are defined and evaluated within the framework of the District's Strategic Water Management Plan (SWMP) (NWFWMD, 2011b). In particular, the discussion relates to three of the District's statutory areas of responsibility (AORs) relating to watershed management: water quality, natural systems, and flood protection and floodplain management. Issues identified are defined as conditions that fail to meet expectations for a healthy watershed.

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.

The Florida Department of Environmental Regulation (1987) conducted a water quality assessment of the upper river basin in the mid-1980s. Major problems identified between Lake Talquin and the Thomasville area of Georgia included turbidity, sedimentation, increasing trends in total nitrogen and suspended solids, and sediment contamination and toxicity. Total nitrogen was found to have increased dramatically between the 1960s and 1980s. Sources of degradation identified included erosion, sedimentation associated with agricultural runoff, mining, and point sources. Trends toward degradation were seen to have substantially coincided with large scale conversion of forestland and wetlands within Georgia to agriculture, particularly in the 1970s.

Historic water quality challenges have been documented for Lake Jackson (e.g., Livingston 1998; Bartel *et al.*, 1992). The lake is a closed basin that does not contribute to the river flow but is considered part of the surface water basin (USGS 2008). A significant ecological decline has been previously described, including diminished water quality, bluegreen algae blooms, and extensive growth of invasive exotic plants (Leon County Science Advisory Committee, as cited in Macmillan, 1997; Livingston, 1998). Lake Iamonia has also experienced water quality problems, attributable to NPS and potentially point source pollution (Leon County Science Advisory Committee, 1997). Water quality issues in the lake have been attributed primarily to urban stormwater runoff (Leon County Science Advisory Committee, as cited in Macmillan, 1997). Effects of surface runoff appear compounded by the prevalence of septic systems in portions of the lake's basin (Thorpe and Krottje, 2000). The lake has also been the receiving waterbody for sediment deposition resulting from construction and widening of Interstate 10. Lake Jackson has been the focus of water quality improvement and habitat restoration projects through the SWIM program, with participation by the District, Leon County, the City of Tallahassee, and state and federal partners (Macmillan 1997). Through these efforts, major stormwater retrofit facilities have been completed, including regional stormwater treatment systems in the Meginniss Creek and Okeeheepkee basins. Additional restoration actions completed for Lake Jackson are described in Section 4.2.

More recently, FDEP (2003) concluded that, while data were insufficient to assess many segments of the watershed, available data appear to show a decreasing trend for total phosphorus for several reaches of the river north of Lake Talquin (FDEP, 2003). FDEP (2009) classifies 35 waterbody segments as impaired. These segments drain 336,060 acres, or 40 percent of the Florida watershed (Figure 7). Parameters of concern are primarily mercury, fecal coliform bacteria, iron, dissolved oxygen, and nutrients.

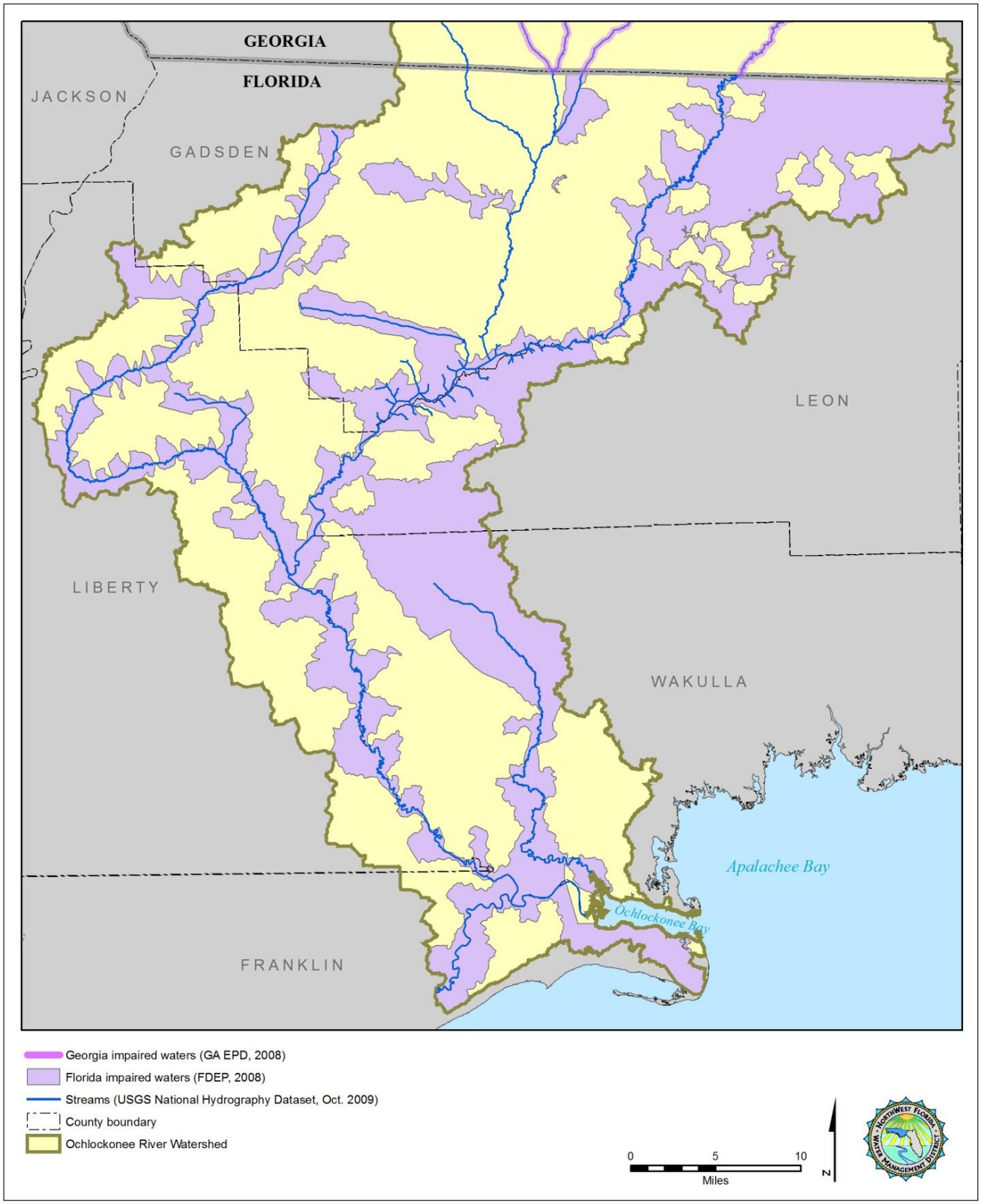


Figure 7. Ochlockonee River and Bay Watershed Impaired Waterbodies (Florida)

Urban runoff and rural NPS pollution have been identified as major sources of water quality impairment within Georgia (GAEPD, 2002). Mercury in fish tissue, fecal coliform bacteria, and low dissolved oxygen were cited as being of most concern. In 2001, TMDLs were set for 18 stream reaches for dissolved oxygen; by 2010 all but four of those reaches had improved. Georgia's 2010 305(b)/303(d) draft list of waters (GAEPD, 2010) indicates that the Ochlockonee River and a number of tributaries are not supporting designated uses. The predominant violation cited was fecal coliform. In 2006, 16 TMDLs were established for fecal coliform. All but three of those waters continued to be in violation in 2010, and three additional stream reaches were listed. Erosion and sedimentation from agricultural NPS runoff is a concern in the middle Ochlockonee River sub basin (GAEPD, 2002). A large volume of water is used to irrigate agricultural land and could potentially contribute to agricultural NPS pollution. The Georgia Environmental Protection Division (2011) estimated that, in 2008, an average of approximately 218 MGD were used for agricultural irrigation in Georgia's portion of the Ochlockonee River watershed. This region has an intensive livestock industry, including cattle, hogs, and poultry (GAEPD, 2002). Animal waste from concentrated livestock can threaten water quality if not managed and disposed of properly. Legacy pollutants from agricultural biocides that are now banned (e.g., DDT, chlordane and dieldrin) may persist in bottom sediments and continue to affect water quality (GAEPD, 2002).

A significant amount of intensive surface mining is ongoing in Gadsden County, Florida, as well as north of the state line. Mining and extraction are estimated to cover approximately 1,245 acres of the watershed within Florida. Such activities can cause turbidity, sedimentation, and smothering if not managed appropriately. Materials mined in the watershed are sand and fill material, Fuller's earth, and crushed stone (GAEPD, 2002). Fuller's earth, a type of clay, is removed through strip mining. Other clays are also mined to a lesser extent. FDEP regulates reclamation of mined land and protection of water resources under the mandatory nonphosphate program. Gadsden County's Future Land Use Map shows 11,821 acres designated for mining (Gadsden County, 2006). Most of this area is owned by BASF Corporation, which acquired Engelhard Corporation in 2006. Development of sand mines near State Road 267 has been reported as a concern for some residents in the Lake Talquin area, in part because of potential environmental impacts to the lake and tributaries. Sand mines smaller than 20 acres are exempt from noticing to FDEP under Chapter 378.804, F.S., and are therefore not held to the same reclamation standards as larger mines.

Septic systems are widespread across the watershed and are potential sources of nutrients and other pollutants. Concentrations of on-site sewage treatment and disposal systems (OSTDS) can result in degraded water quality in ground water and proximate surface waters. Figure 7 illustrates the general distribution of septic systems in the watershed. These systems may be contributing nutrients to lakes Talquin, Jackson and Iamonia. The Killearn Lakes Plantation subdivision in northern Leon County, which largely drains to Lake Iamonia, has had a continuing problem of failing septic tanks due to poor drainage. The City of Tallahassee, in cooperation with the County, has constructed a pressurized sanitary sewer system, to facilitate connection of residences.

Other potential sources of pollution include marinas, vessels, and boat ramps. There is currently one marina located on Ochlockonee Bay in Panacea. The Clean Vessel Act of 1992 prohibits discharge of raw sewage into fresh water or coastal salt water. Under the Act, FDEP administers federal grant funding for construction and installation of sewage pump-out facilities and floating restrooms at marinas, purchase of pump-out boats, and educational programs for boaters. FDEP also administers the Florida Clean Marina Program to raise awareness of environmentally friendly practices to protect Florida's waterways and offers a "clean" designation for marinas, boatyards, and marine retailers that commit to using appropriate BMPs. There are currently no pump-out facilities or Clean Marina designations in the watershed.

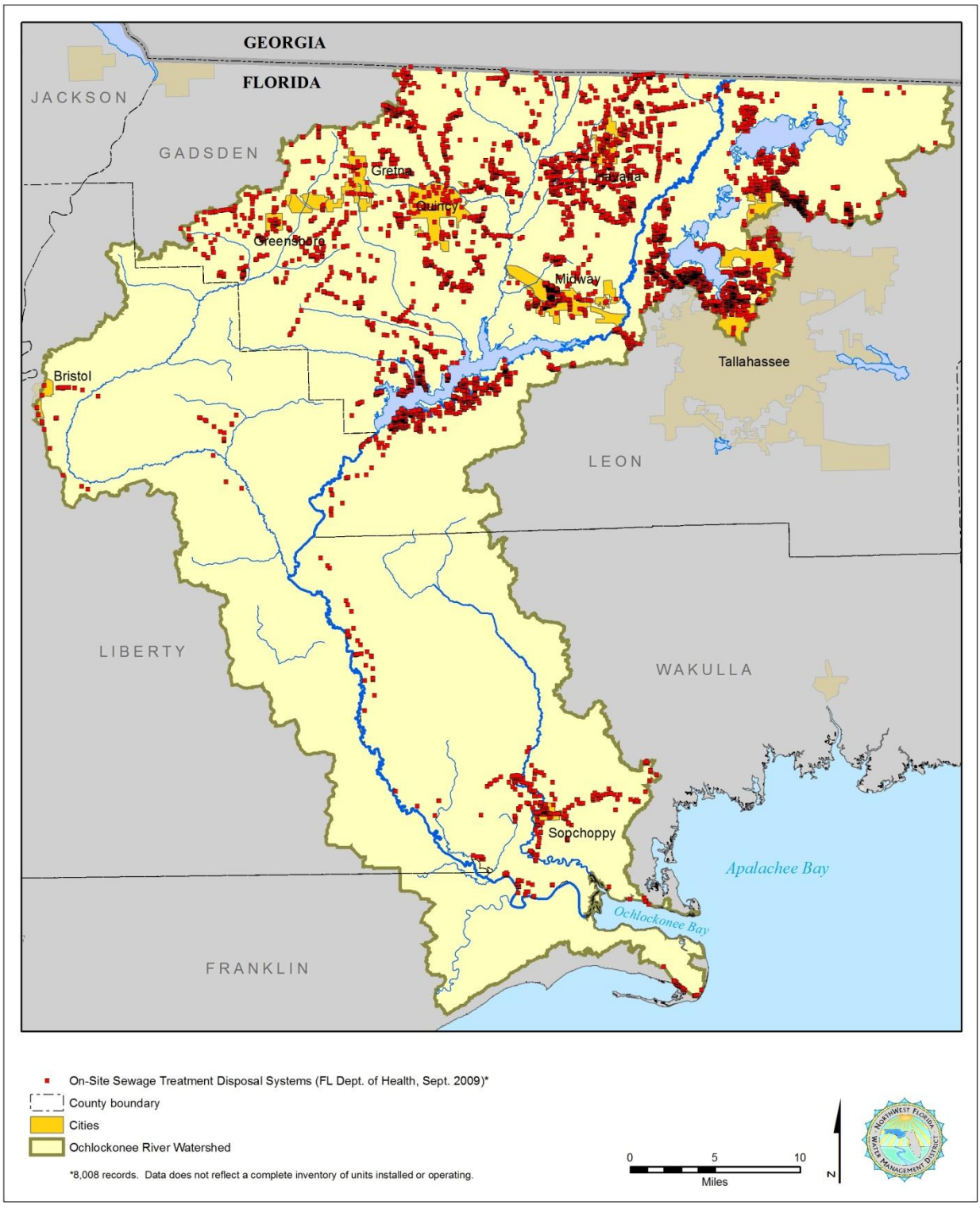
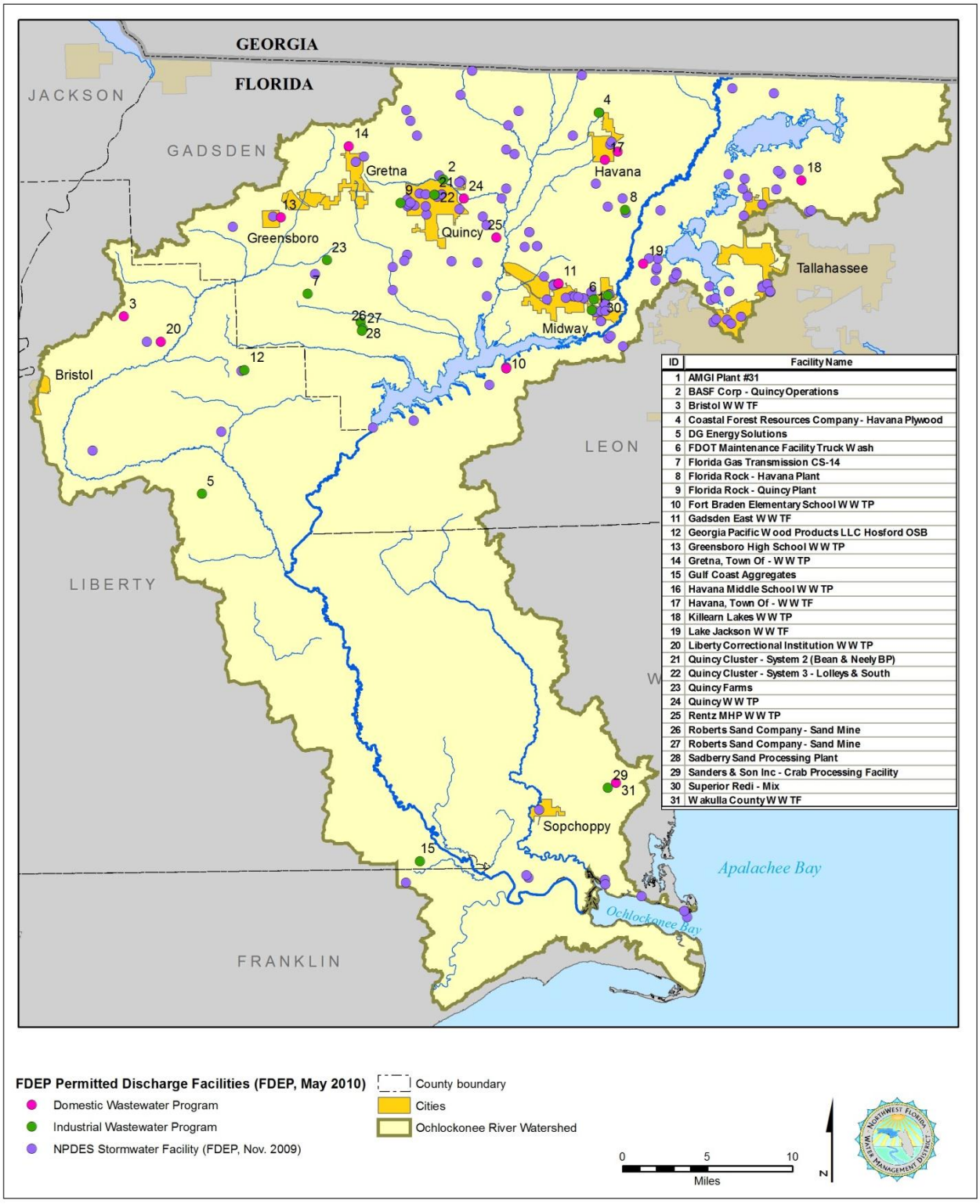


Figure 8. Distribution of On-Site Sewage Treatment and Disposal Systems in the Florida Portion of the Watershed



ID	Facility Name
1	AMGI Plant #31
2	BASF Corp - Quincy Operations
3	Bristol W W TF
4	Coastal Forest Resources Company - Havana Plywood
5	DG Energy Solutions
6	FDOT Maintenance Facility Truck W ash
7	Florida Gas Transmission CS-14
8	Florida Rock - Havana Plant
9	Florida Rock - Quincy Plant
10	Fort Braden Elementary School W W TP
11	Gadsden East W W TF
12	Georgia Pacific W ood Products LLC Hosford OSB
13	Greensboro High School W W TP
14	Gretna, Town Of - W W TP
15	Gulf Coast Aggregates
16	Havana Middle School W W TP
17	Havana, Town Of - W W TF
18	Killearn Lakes W W TP
19	Lake Jackson W W TF
20	Liberty Correctional Institution W W TP
21	Quincy Cluster - System 2 (Bean & Neely BP)
22	Quincy Cluster - System 3 - Lolleys & South
23	Quincy Farms
24	Quincy W W TP
25	Rentz MHP W W TP
26	Roberts Sand Company - Sand Mine
27	Roberts Sand Company - Sand Mine
28	Sadberry Sand Processing Plant
29	Sanders & Son Inc - Crab Processing Facility
30	Superior Redi - Mix
31	W akulla County W W TF

Figure 9. Ochlockonee River and Bay Watershed (Florida) Point Source Discharges

As of May 2010, there were 31 permitted point source facilities in Florida's portion of the watershed (Figure 8), including 18 industrial and 13 domestic facilities permitted by FDEP for wastewater discharge under the National Pollutant Discharge Elimination System (NPDES) and Florida wastewater programs. The largest industrial discharges permitted in Florida are Quincy Farms at 20 million gallons per day (mgd) (treated effluent spray irrigated onto created wetland), BASF Corporation for mining related effluent at 12.8 mgd (discharge to surface water only during heavy rain events), and a Roberts Sand Company sand mine at 1.9 mgd (no direct discharge to surface water). In Georgia, seven municipal facilities are permitted by the Georgia Environmental Protection Division under NPDES.

Nutrient discharge from clay mine operations and fertilizer production in Attapulgus, Georgia, affects Attapulgus Creek, the Little River, and ultimately Lake Talquin. This discharge has been the second highest toxic release to surface water in Georgia since 2001, and it has been in the top three since 1994 (EPA, 2009). BASF reported discharge of nearly 4 million pounds of ammonia and almost 2 million pounds of nitrate compounds in 2009 (EPA, 2009). 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, Florida, 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). Leon County requested that Georgia EPD reopen the permit to consider new information and technology for protection of Lake Talquin. Georgia EPD has done so, and a new permit application has been submitted by BASF.

The City of Cairo, Georgia, has a new wastewater treatment plant (WWTP) that is expected to improve water quality in Tired Creek. The prior plant experienced frequent spills that discharged sewage into the creek and ultimately the Ochlockonee River (McGlynn, 2006).

The City of Quincy's WWTP is permitted to discharge up to 1.5 mgd to Quincy Creek. It uses an advanced wastewater treatment (AWT) system to produce reclaimed quality water prior to discharge. The city is operating under an Administrative Order by FDEP to address the copper effluent limit.

The City of Gretna operates an AWT facility with a permitted capacity of 0.4 mgd. The plant discharges to rapid infiltration basins, an infiltration trench, and a restricted access reuse system serving nursery operations. The plant is operating under a consent order to address spills associated with inflow and infiltration and is seeking funds for system upgrades. Past discharges of untreated sewage have affected water quality in Telogia Creek, with the most recent violation being reported in 2006. A noteworthy aspect of Gretna's AWT facility is its distribution of reclaimed water for agricultural irrigation. Reuse of reclaimed water as a strategy for integrated water resource management has significant potential for improved management of water quality and quantity. Reuse opportunities and projects are evaluated in the District's reclaimed water plan (NWFWMD, 2011c).

Tributaries of Telogia Creek also receive wastewater from the Telogia Power, LLC, facility that discharges an average of approximately 0.134 mgd. This plant had an NPDES industrial wastewater permit allowing discharge to an unnamed tributary (known locally as Page Bridge Branch) that flows to Stokes Branch and then to Telogia Creek. The permit expired in 2002, and a consent order was executed in September 2009, addressing violations for acute toxicity, copper, flow, pH, temperature, and un-ionized ammonia. The permit was renewed with new conditions in January 2010. Discharge continues under an administrative order allowing the plant to avoid certain pollution limits until January 28, 2012. Facility upgrades await construction of a surface flow treatment wetland. Recent biological monitoring conducted by FDEP (2007a; 2007b) indicate degraded conditions in Page Branch and Stokes Branch.

FDEP Water Assurance Compliance System data as of October 2007 shows 85 solid waste facilities in Florida's portion of the watershed. Of these, 14 are active landfills, 55 are inactive or closed facilities, 12 are unpermitted, and four are proposed. Only six of the closed sites have ground water monitoring.

Spills and other releases from hazardous materials facilities, vehicles, and vessels are also potential sources of water quality problems. There are 62 hazardous materials facilities identified in the Florida's portion of the watershed under the Hazardous Materials Emergency Plan for District II (Apalachee

Regional Planning Council, 2009). The plan recommends actions to protect people and ecosystems in the event of a release. Facilities with certain types and quantities of chemicals on site are required to register with the State Emergency Response Commission for Hazardous Materials. An unregistered facility was reported in Gadsden County in 2009 near the Little River following a discharge of sodium hypochlorite. According to data provided by Florida Division of Emergency Management, there were 322 toxic releases reported for the five watershed counties over the past five years. Most incidents appear to be associated with vehicle crashes, boat sinkings, or buoy batteries. FDEP responds to large or problematic spills and oversees clean-up.

The Florida Department of Health issues fish consumption advisories based on potential for mercury and other pollutants in fish tissue to adversely affect public health. The 2009 advisory includes the Ochlockonee, Crooked, and Sopchoppy rivers and lakes Talquin and Iamonia. Consumption of largemouth bass, bowfin, and gar should be avoided or limited to one per month in most of these waterbodies. Marine and estuarine waters have guidelines for established for specific fish species (FDOH, 2009).

Leon County and the City of Tallahassee conduct water quality monitoring on selected water bodies. Data and assessments are available through an online water atlas (www.tlc.wateratlas.usf.edu) and the county water quality report for 2009 (Richardson, 2009).

3.2 Natural Systems

Wetlands and floodplains are integral to the Ochlockonee River and bay and provide essential functions, including water quality improvement, water storage, aquifer recharge, and fish and wildlife habitat. Wetlands and downstream water quality are vulnerable to land conversion, alteration and drainage for silviculture, and fragmentation. As has been demonstrated by past studies (e.g., Schueler, 1994), aspects of urbanization and hydrologic alteration, such as impervious surfaces, impoundment, and stream channelization, cause substantial degradation of the physical, chemical, and biological characteristics of streams. Cuffney *et al*. (2010) observed that even very low levels of impervious cover (<10%) cause immediate negative effects on macroinvertebrates in the stream ecosystem.

Public lands provide significant protection within the Ochlockonee River watershed. Bald Point State Park, Ochlockonee River State Park, St. Marks National Wildlife Refuge, Tate's Hell State Forest, and the Apalachicola National Forest provide substantial protection of wetlands and sustain integrated terrestrial and aquatic ecosystems. There are three NWFWMD wetland mitigation projects in the watershed intended to compensate for impacts caused by Florida Department of Transportation roadway projects. These projects are on Lake Jackson, on the Ochlockonee River, and in Tate's Hell swamp.

The Tate's Hell State Forest Hydrologic Restoration Plan addresses wetland habitat improvements in the Ochlockonee River watershed. Three sub-basins within the eastern side of the forest draining to the river are Womack Creek, Haw Creek, and the eastern portion of Crooked River. The plan provides for restoring surface water flow patterns through a combination of new and replacement culverts, road removal, ditch blocks, flashboard risers, and low water crossings.

Non-native invasive species are problematic in many areas of the watershed. At lakes Jackson, Talquin, and Iamonia invasive aquatic plants include hydrilla (*Hydrilla verticillata*), water lettuce (*Pistia stratiotes*), water hyacinth (*Eichhornia crassipes*), and alligatorweed (*Alternanthera philoxeroides*). The FWC Invasive Plant Management Section coordinates aquatic invasive plant management in northwest Florida. Asian clams (*Corbicula fluminea*) have been documented in the upper Ochlockonee River at sites historically inhabited by native mussels that now may be extirpated (NatureServe, 2010).

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. Lead, manganese, and other toxic substances have been identified in Ochlockonee River sediments (USFWS, 2006). Benthic habitats and species are particularly vulnerable to sedimentation, smothering, and

changes in water chemistry. Excessive bank erosion and sedimentation from erosive land uses and unpaved roads also severely degrade benthic habitat and water quality.

Instream impoundments have historically impacted natural systems through loss of headwater wetlands and functions, blocked stream passage for migrating fish and aquatic organisms, evaporative water loss, slowed current, increased water temperature, trapped sediment, scoured substrate below the dam, and degradation and loss of stream habitat. The historic and continued maintenance practice of drawdown and refilling of ponds is another alteration of the hydrologic flow regime (NWFWMD, 1998) at least locally. Impoundments have also been observed to be focal points of eutrophication and oxygen depletion (FDER, 1986).

The flow regime and natural systems in the Telogia Creek basin have been highly altered by the construction, many years ago, of farm ponds and in-stream impoundments, as well as a history of agricultural water withdrawals (NWFWMD, 2008). Biological data compiled by FDEP, with records dating from 1964 to 2008, indicate that Telogia Creek below State Road 20 in Liberty County is in better condition than the upper reach and tributaries in Gadsden County (Ray, 2010). This difference is attributable mainly to more intensive agricultural land use in Gadsden County.

In the upper Telogia Creek basin, land use is primarily agricultural. Surface water withdrawals for irrigation are permitted by the NWFWMD at 3.5 million gallons average daily rate and 12.2 million gallons maximum daily rate. The NWFWMD designated this area a Water Resource Caution Area (WRCA) in 1989 due to limited availability of surface and ground water (Figure 10). Intensive historic use and impoundments have altered the natural stream flow regime along the upper reach of the system. Surface withdrawals have been stabilized (NWFWMD, 2008), although periods of no flow have been documented during times of drought.

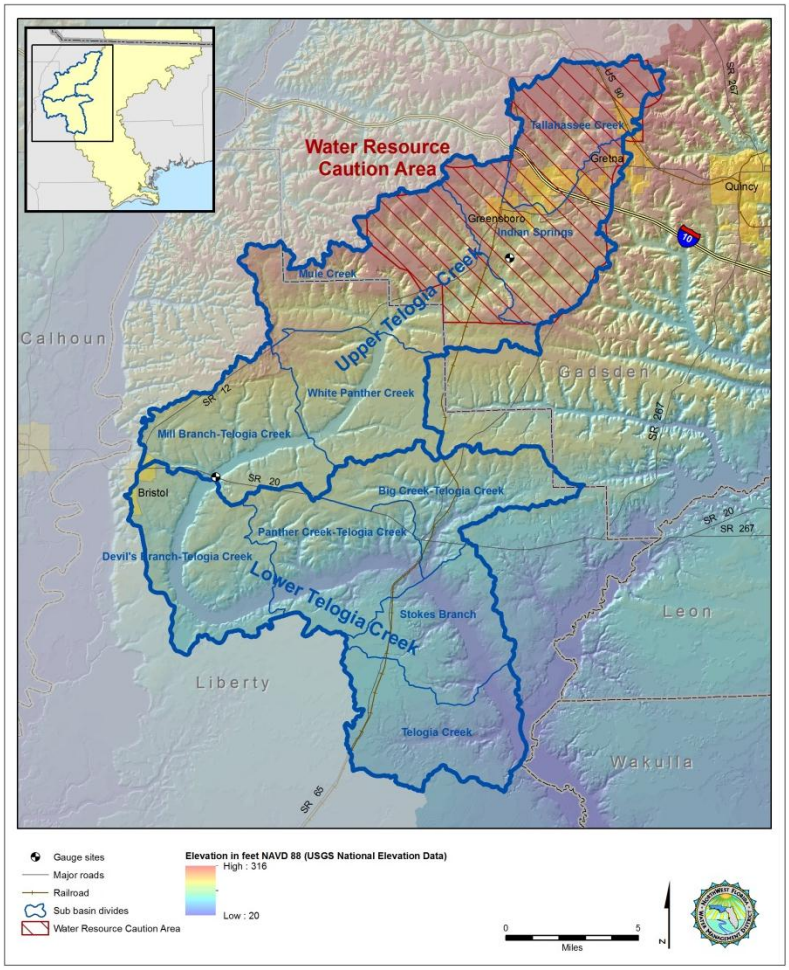


Figure 10. Telogia Creek Sub-basin

Considerable agricultural water demand occurs in the Georgia portion of the watershed and is expected to increase (GAEPD, 2002). Florida and Georgia have different water use regulations and water accounting. In Georgia, there does not appear to be a permit needed to withdraw an average of less than 100,000 gallons per day of surface water from small streams, with farm ponds being exempt (Chapter 391-3-6-.07, Georgia Rules and Regulations). Agricultural users of ground or surface water are exempt from submitting water use reports, so determining water usage and future demand is difficult (GAEPD, 2002). Georgia Geological Survey estimated 1995 usage at 31 mgd covering a USDA-NRCS estimated 56,563 acres (GAEPD, 2002). Projected for 2020 are irrigated acreage of 91,288 acres and agricultural water use of 44 mgd,

with a range between 30 and 71 mgd. BASF has a permitted industrial surface water withdrawal on Little Attapulgus Creek for 1.5 million gallons per day (GAEPD, 2002).

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.

3.3 Floodplain Protection and Management

Digital flood maps indicate that 374,797 acres (45 percent) of Florida's portion of the watershed are delineated as Special Flood Hazard Area, as shown in Figure 11. Lands prone to flooding are predominantly in the lower portion of the watershed in the coastal lowlands where wetlands cover extensive land areas. Most of this region is public conservation land, so risks to private property are limited.

Risks from flooding due to storm surge are concentrated at the southern end of the watershed near Ochlockonee Bay, Apalachee Bay, and the Gulf of Mexico. Crooked River, much of St. James Island, the lower Sopchoppy River, and the Ochlockonee River from the coast to about 30 miles upstream are vulnerable to storm surges. This area has little development within the watershed boundary and is mostly public land or private timberland. However, there have been significant developments proposed adjacent to Ochlockonee Bay.

To facilitate protection of floodplain, wetland, and coastal resources, improved flood maps and elevation data are being developed by the District under the Risk Mapping, Assessment, and Planning (Risk MAP) program, in cooperation with the Federal Emergency Management Agency (FEMA). Under Risk MAP, the District is developing a watershed level plan to identify flood hazard mapping needs and flood risks. This process and SWIM are mutually supportive, with complementary objectives, such as avoidance of adverse impacts and development of multipurpose stormwater facilities, among others.

Land acquisition programs, as noted above, protect important riverine and coastal floodplain functions, as well as habitat and water quality. Restoration efforts implemented through SWIM and wetland mitigation help restore natural hydrology, with benefits for flood protection, habitat, and water quality. The (ERP) program also addresses flood protection by protecting natural flows in an integrated manner with water quality.

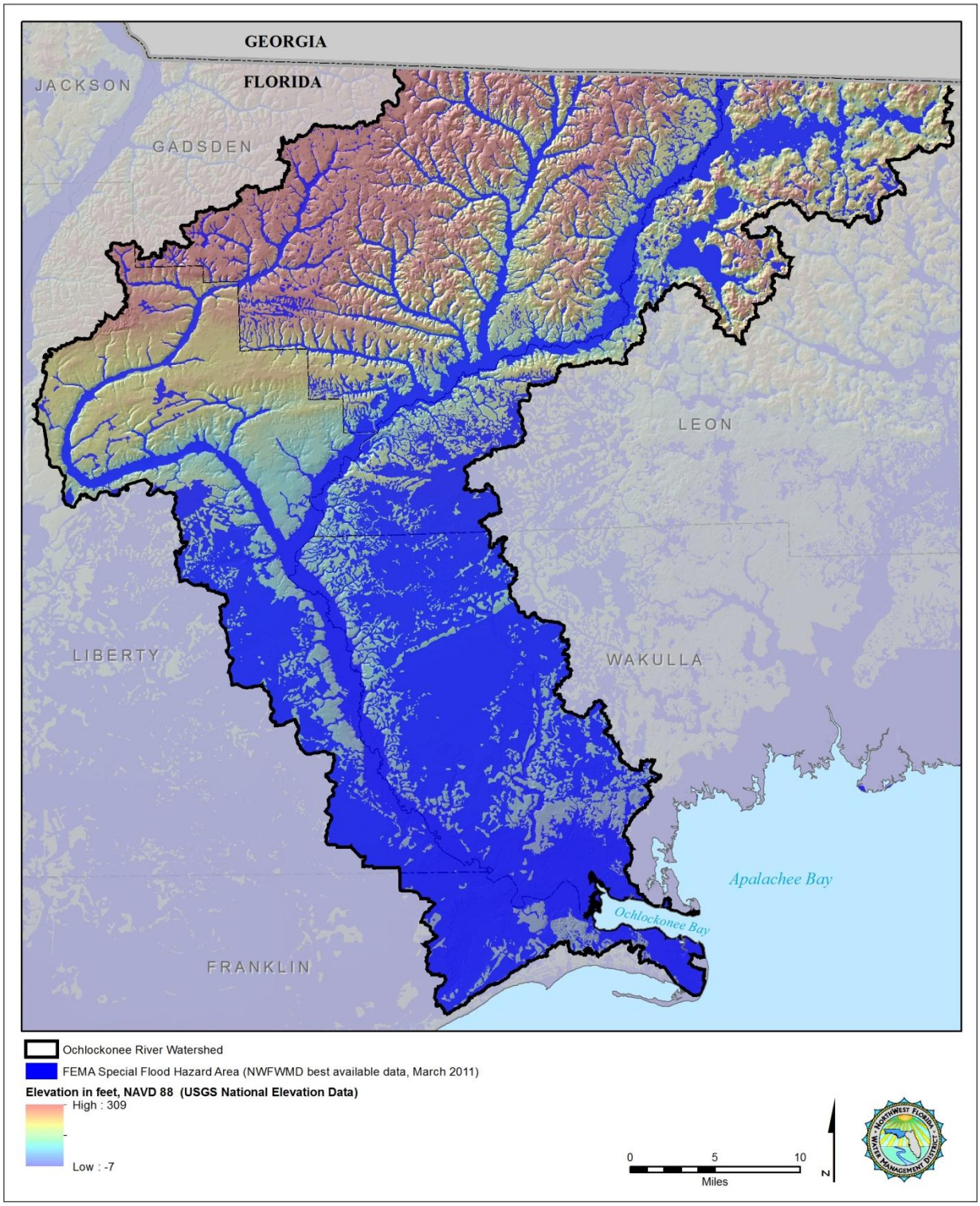


Figure 11. Ochlockonee River and Bay Watershed Flood Prone Areas

4.0 Management Actions

4.1 Management Objectives

Considering the watershed conditions described above, priority objectives for the Ochlockonee River and Bay watershed SWIM plan are outlined below. These are also intended to help implement the District's Strategic Water Management Plan (NWFWMD, 2011b) by addressing three of the District's statutory AORs 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.

While watershed needs span the responsibilities and programs of several federal, state, and local agencies, this plan emphasizes points of entry and specific management actions where the Northwest Florida Water Management District's SWIM program may best contribute to the overall watershed management effort. The priority objectives are stated broadly to generally describe the types of site-specific and in-state water management actions and projects that may be prescribed under this plan in the future.

Land acquisition programs and recent regulatory initiatives have to some extent addressed watershed conditions and issues discussed above. Water management land acquisition, management, and restoration, for example, protect water quality and enhance and restore wetland and floodplain habitats while improving public access. On the regulatory side, the Environmental Resource Permitting (ERP) program has only recently been implemented in northwest Florida. This program is intended to regulate new development in a manner that protects wetland and floodplain functions, together with water quality and flows. The program also protects the functions of isolated wetlands, which were unprotected in previous wetland regulation programs.

Table 5 outlines objectives aligned with the AORs defined above together with associated watershed issues. Descriptions of general management strategies follow, prescribing actions intended to address these issues. The actions listed are all applicable to multiple objectives, given their interrelated nature.

Table 5. Objectives and Watershed Issues

Objectives	*Watershed Issues*
Water quality protection and improvement	• NPS pollution continues in some stream reaches despite land use practices and regulatory programs intended to control pollutant sources. • Sites with historically documented water quality problems have not been adequately addressed. • Water quality and hydrologic data gaps have not been fully described or addressed.
Natural systems protection, enhancement, and restoration	• Diminished water quality and altered watershed conditions have significantly impacted stream habitat quality and viability within segments of the Ochlockonee River and some of its tributaries. • Continuing riparian and wetland restoration and preservation needs within the watershed need to be more fully evaluated and described. • Sedimentation from unpaved roads directly impacts streams and receiving waters, particularly within the middle and upper reaches of the watershed.
Flood protection – promoting natural floodplain function	• Floodplain management priorities that may benefit water and habitat quality while also providing flood protection need to be integrated with District and other agency programs.

4.2 Management Strategies

Stormwater Treatment and Management – This is inclusive of a wide array of urban, agricultural, and silvicultural BMPs; stormwater retrofit facilities, land use planning techniques for water resource protection; and other techniques for water quality protection and improvement. Potential activities include:

- Stormwater master planning;
- Retrofit construction assistance; and
- BMP planning and implementation.

Widespread implementation of best management practices, ideally implemented through a treatment train approach, maintains localized hydrology and water quality and cumulatively benefits conditions watershed-wide. Structural and nonstructural approaches to resource protection are incorporated, depending on landscape characteristics, existing land use, and approved future land uses. These retrofit activities will complement ERP, which improves stormwater management for new development. They may also be integrated with federally funded flood hazard mitigation grant programs.

Specific retrofit priorities would be identified through monitoring, local knowledge, and site assessments. Implementation is accomplished in cooperation with local governments.

Project success will be evaluated based on project implementation monitoring together with monitoring of watershed trends as described below.

Protection of Critical Lands and Habitats – Through SWIM and in cooperation with other agencies and private initiatives, District staff may identify and map priority areas for land and habitat protection. Protection of wetlands, floodplains, riparian zones, buffer areas, and ground water recharge areas would

help sustain and enhance the quality and natural function of water resources and their benefits for the community. Potential functions of the SWIM program in this effort include:

- Identification of priority parcels for protection and restoration;
- Internal and external coordination of acquisition planning and funding; and
- Assistance with private initiatives.

Ecological Restoration – This project includes stream, estuarine, wetland, lake, floodplain, and watershed restoration and enhancement. Priorities would be identified through monitoring, local knowledge, and site assessments. Restoration efforts would be implemented cooperatively. Potential projects include removing failed dams and restoring associated stream channels, restoring wetlands, removing degraded sediments, stabilizing eroded sites and unpaved roads, and vegetation reestablishment. Improved forestry, agricultural, and urban BMPs should also be implemented to restore aquatic habitat and water quality. This project is inclusive of activities specified within the Tate's Hell State Forest Hydrologic Restoration Plan (www.nwfwmdwetlands.com/index.php?Page=30).

Monitoring – Monitoring conditions and trends provides an improved understanding of resource characteristics and facilitates plan assessment and adaptive management. Monitoring includes water quality, flow, biology, stream conditions, and land cover. Remote sensing data are collected along with field parameters. Analytical results are applicable to project development and prioritization, assessment and feedback, and plan updates. Planning for hydrologic monitoring is an ongoing effort addressed in the District's Hydrologic Monitoring Plan (NWFWMD, 2011d). Project specific water quality and biological monitoring activities are conducted independently by local government initiatives, as well as state and federal government grant programs. Efforts planned specifically through SWIM would rarely occur, with SWIM instead relying upon the efforts of other agencies wherever possible.

Lake Jackson SWIM Program

Lake Jackson is a regionally significant waterbody that was identified as a SWIM priority in 1988. The Lake Jackson SWIM plan was first approved in the same year. With significant community involvement, the plan was reconfigured into the *Lake Jackson Management Plan,* with revisions completed in 1990, 1994, and 1997.

The *Lake Jackson Management Plan* is available at NWFWMD (1994) and NWFWMD (1997). These and other related documents are available at www.nwfwmd.state.fl.us/pubsdata/techpubs.html.

The Lake Jackson plan details water quality challenges in particular and emphasizes NPS pollution control. Substantial accomplishments were achieved with cooperative assistance from Leon County, the city of Tallahassee, the state of Florida, and local residents. Among the accomplishments are:

- Lake restoration, with removal of approximately 2 million cubic yards of deposited and contaminated sediment through 2001;
- Construction of major stormwater retrofit facilities, including the I-10 and Meginniss Arm basin retrofit facility, the Okeeheepkee Basin Retrofit facility, and others;
- Meginniss Arm basin sediment removal;
- The Lake Jackson Regional Stormwater Retrofit Plan; and
- Evaluations of the effects of septic systems and invasive aquatic plants.

Floodplain Management – Naturally functioning floodplains are integral to the character and quality of the river and bay system. They affect the timing and velocity of stream flows, regulate discharge from the watershed during major storm systems, protect lives and property, preserve water quality, protect bank stability, and sustain instream and downstream habitats. Floodplains and their functions are protected through a variety of strategies, including land use planning, land acquisition, wetland regulatory programs, and delineation of flood hazard areas for flood insurance purposes. Accurate elevation data and digital floodplain maps are particularly important for both public sector and private sector decision-making. Opportunities may also exist to restore natural floodplain functions, such as through reconnection of floodplain area. In addition to enhancing flood protection, such efforts also improve water and habitat quality. The District implements Floodplain mapping through its business plan (www.nwfwmdfloodmaps.com/documents.htm), as well as through the current Land Acquisition Work Plan (www.nwfwmd.state.fl.us/pubs/consolidatedAR/CAR2011.pdf). Activities that affect floodplain

functions are also addressed through Environmental Resource Permitting (http://www.nwfwmd.state.fl.us/permits/permits-ERP.html).

Public Education and Outreach – Public education and outreach are tools for all aspects of watershed resource protection. Information may be provided through a variety of media, including the Internet, brochures, documents, presentations, and participation in public events. Topics may include personal practices for preventing NPS pollution and preservation of critical habitats on private lands. Agricultural outreach activities, in cooperation with mobile irrigation laboratories, extension services, and the efforts of state and federal agricultural agencies, can be especially important in the upper Ochlockonee River and Bay watershed. Additionally, public education and awareness efforts concerning watershed management help develop public support for watershed initiatives through enhanced understanding of the issues involved and management approaches.

Intergovernmental Coordination – This includes coordination with state and local governments and federal agencies to enhance watershed protection and restoration. Efforts include coordinating local practices to assist in a coherent watershed-wide approach and to enhance BMP implementation. Additionally, coordination and cooperation is essential for leveraging multiple sources of funding and participation that are typically necessary for the success of major projects.

4.3 Implementation Funding

Funding for the SWIM program and for the Ochlockonee River and Bay SWIM Plan may be derived from several sources. Direct funding for plan implementation may be provided from:

- Water Management Lands Trust Fund, s. 373.59, F.S.;
- Water Protection and Sustainability Program Trust Fund, 403.890, F.S.;
- Florida Forever Trust Fund (construction only), s. 259.1051, F.S.;
- Legislative special appropriations, s. 373.459, F.S.; and
- General revenues of the District (ad valorem tax).

All of the above funding sources are dependent upon specific legislative appropriations. Funding for SWIM-related activities in the near term would need to come almost exclusively from the Water Management Lands Trust Fund or the District's General Fund, and potentially from local matching funds. However, when the state economy is sluggish the District does not anticipate receiving significant new revenues from any of these sources. Associated program funding, which complements and furthers implementation of this plan, may be indirectly provided by:

- Florida Department of Transportation mitigation funding, s. 373.4137 F.S;
- Water Protection and Sustainability Program Trust Fund, Alternative Water Supply (for construction of reuse facilities, and potentially other alternative water supply and water resource development projects), s. 373.1961 and s. 403.890 F.S.;
- Environmental Resource Permitting Program (ERP), s. 373.4145, F.S. and s. 62-346, F.A.C.;
- Federal Emergency Management Agency (FEMA) Risk MAP program;
- Local government funding; and
- Other state and federal funds, such as the Clean Water Act Section 319(h) grant program.

The District will continue to seek funding through grants and other sources through SWIM. When funding is limited, the District will as a general strategy utilize this plan and staff resources to leverage its internal programs to help implement SWIM strategies. This internal leverage transcends external programs as well, but internally includes guidance and coordination of funding for wetlands mitigation, FEMA Risk MAP, land acquisition, water supply, and permitting programs and activities.

In addition to implementation through public funding, additional accomplishment of plan objectives may be achieved through private landowner and other nongovernmental actions. Public outreach activities are important for facilitating such efforts and coordinating them with SWIM plan implementation.

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5.2 Note on Basin Delineation

The drainage basin delineation used for this report is based on the Watershed Boundary Dataset developed by the USDA Natural Resource Conservation Service, the US Geological Survey, and the Environmental Protection Agency. HUC# 03120002 (Upper Ochlockonee River) and HUC# 03120003 (Lower Ochlockonee River), Florida and Georgia. Retrieved from: datagateway.nrcs.usda.gov [Accessed 12/10/2009]. Modifications were made in the Florida portion based on NWFWMD staff expertise.

APPENDIX A: RELATED AND SUPPORTING PROGRAMS

NWFWMD Programs and Activities

a) Environmental Resource Permitting (ERP) — The ERP program is now fully implemented for northwest Florida. The program handles stormwater and wetland permitting for construction and development activities. ERP initiated special design standards for sensitive karst areas, including most of Leon and Wakulla counties. www.nwfwmd.state.fl.us/permits/permits-ERP.html

b) Regulation of Consumptive Use of Water and Wells — The District regulates the consumptive use of water under Rule 40A-2; wells are regulated under Rule 40A-3. www.nwfwmd.state.fl.us/permits/ruleform.htm

c) Regional Water Supply Planning – In 2008 the District updated its water supply assessment addressing the consumptive demands and the availability of ground water and surface water resources for the water supply planning regions in the basin. www.nwfwmd.state.fl.us/rmd/wsa/WSA%20Updates/WSA_Final.pdf

d) LiDAR — This District is working with the National Oceanic and Atmospheric Administration (NOAA), Florida Division of Emergency Management, and local governments to acquire detailed topographic data using Light Detection and Ranging (LiDAR) technology. Data will be available for the Florida portion of the basin as well as other areas of the District.

e) Risk Map — National flood maps are being updated by the District through the Federal Emergency Management Agency (FEMA) Risk Map Program. Flood insurance rate maps are being developed using high resolution aerial photography, LiDAR elevation data, and hydrologic studies, and are now available digitally. nwfwmdfloodmaps.com

f) Monitoring — The District operates 51 surface water and rainfall monitoring stations in cooperation with Leon County and Tallahassee. The District also cooperatively operates the Capital Area flood warning network (CAFWN), a real-time radio telemetry flood warning system of 19 stream and rainfall stations, to identify developing flood conditions for emergency management staff. The District collects long-term surface water quality data at three sites in the watershed through FDEP's Integrated Water Resources Monitoring program.

g) Land Acquisition and Management — The NWFWMD has protected about 4,080 acres to date within the Ochlockonee River watershed through fee and less-than-fee acquisition. The District's Florida Forever Land Acquisition Work Plan identifies additional areas for less-than-fee acquisition and can be viewed at www.nwfwmd.state.fl.us/pubsdata/generalpubs.html

h) Regional Mitigation Planning — The District implements the Umbrella Regional Mitigation Plan (URMP) for mitigation of regional transportation impacts to wetlands as required by state and federal law. The SWIM Plan may identify watershed acquisition and restoration priorities that would be eligible for funding through URMP. www.nwfwmdwetlands.com

i) Tate's Hell State Forest Hydrologic Restoration Plan – The District developed a plan to improve hydrology and ecology on 200,000 plus acres managed by the Florida Division of Forestry. Prior to state acquisition, surface waters and wetlands had been altered by silvicultural activities, resulting in water quality impacts to the Apalachicola Bay system. Restoration will also benefit the Ochlockonee River watershed. www.nwfwmdwetlands.com/index.php?Page=30

State and Regional Initiatives

a) Mobile Irrigation Lab — The West Florida Resource Conservation and Development Council (WFRCDC) operates a mobile irrigation lab out of Marianna as a free service to the agricultural community in Calhoun, Gadsden, and Jackson counties. The lab does irrigation efficiency assessments. This program is a partnership of FDOACS, Natural Resource Conservation Service, WFRCDC, and NWFWMD which contributes $50,000 of the $153,000 annual operating cost of the lab. Evaluations conducted during the last five years (2006 – 2010) found potential water savings of 1,840 million gallons per year and actual water savings of 1,717 million gallons

per year. This equates to actual savings of 4.7 mgd or an amount roughly equal to the water use of a medium size city. In addition to water savings, implementing the recommendations results in increased crop production at lower cost and reduced potential for ground water pollution. www.floridaagwaterpolicy.com/MobileIrrigationLabs.html

b) USFWS Watershed Threats Assessment — In 2009, the US Fish and Wildlife Service (USFWS) began conducting an inventory of sites within the Ochlockonee River and major tributaries where habitat is degraded for aquatic species, primarily fish and mollusks. A combination of remote sensing and field work will be used to locate sites, and an established system used to collect qualitative and quantitative data on in-stream and riparian features, barriers and crossings, unpaved corridors, discharges, etc. A scoring system will be used to get a total threat index for each site, inventory specific impairments, and prioritize a Basin Restoration Plan expected to be completed in 2011.

c) Total Maximum Daily Load (TMDL) Program — The federal Clean Water Act, Section 303(d), is implemented in Florida under FDEP's TMDL program to check that surface waters meet water quality standards. The process includes assessing water quality, listing impaired waters, adopting TMDLs, determining pollutant sources, and implementing strategies to reduce pollution. TMDLs are the thresholds of pollutants that a water body can assimilate and still maintain water quality standards. In Georgia, the Department of Natural Resources (GDNR) administers the TMDL program. www.dep.state.fl.us/water/tmdl/index.htm

d) State Lands — The State of Florida has identified for protection additional lands along the Ochlockonee River through fee simple acquisition of several Florida Forever Board of Trustees Projects: Ochlockonee River Conservation Area, Ayavalla Plantation, and St. Joe Timberland Projects, Dickerson Bay/Bald Point and Tates Hell/Carrabelle Tract. www.dep.state.fl.us/mainpage/programs/florida_forever.htm

e) The Florida Aquifer Vulnerability Assessment is a GIS-based model developed by the Florida Geological Survey to show the relative probability that an aquifer could become contaminated from activities on the land surface. The maps are useful in guiding land use decisions and in identifying ground water recharge areas in need of protection. www.dep.state.fl.us/geology/programs/hydrogeology/fava.htm

f) USFWS Stream Bank Restoration — Since 2007, this cooperative program of the USFWS Partners for Fish and Wildlife program and Georgia Soil and Water Conservation Commission has provided cost share for private agricultural landowners to make streamside improvements. The program targets landowners where TMDLs are exceeded and animals have access to streams. Best management practices such as installing exclusion fencing and restoring degraded areas should reduce erosion and improve water quality.

g) Little Ochlockonee River Section 319 Grant – Section 319 of the Clean Water Act established the Nonpoint Source (NPS) Management Program under which EPA provides grant funds for NPS implementation projects. Georgia Department of Natural Resources, Golden Triangle Resource Conservation and Development Council, the Natural Resource Conservation Service and other partners addressed nine miles of the Little Ochlockonee River that were impaired for fecal coliform bacteria by installing poultry incinerators to reduce the amount of poultry waste that was contaminating the watershed. The project also adopted other agricultural BMPs and conducted education programs. This waterbody is no longer considered impaired. www.epa.gov/nps/success/state/ga_ochlock.htm

h) Ochlockonee River Basin Management Plan 2002 — The Georgia Department of Natural Resources Environmental Protection Division developed a plan to assess, prioritize and strategize water resource issues and coordinate management activities of various agencies. The Georgia plan uses a broader watershed boundary than this SWIM plan and includes subwatersheds of the St. Marks and Aucilla rivers and Mosquito Creek in the Apalachicola River watershed. www.gaepd.org/Documents/ochlockonee.html

Selected Local Initiatives

a) Leon County — Leon County funds ongoing water quality monitoring and evaluation for designated lakes and streams and posts the data on the Tallahassee-Leon County Water Atlas, www.tlc.wateratlas.usf.edu. Data indicating poor water quality coming from Georgia prompted the County to seek remedies from the Georgia Environmental Protection Division and the municipalities of Cairo, Moultrie and Thomasville.

   The Tallahassee–Leon County Watershed Protection Initiative seeks to address flood control and watershed protection through stormwater capital improvement projects. The Lake Iamonia and Lake Jackson basins are included in the capital improvement plan. www.protectyourwater.org

   Leon County developed the Leon County Aquifer Vulnerability Assessment (LAVA) to provide a science-based management tool to help minimize adverse impacts on ground-water quality. www.adgeo.net/lava.php

b) Tallahassee — In 2008 the City of Tallahassee enacted a pet waste ordinance that requires pet owners to remove and properly dispose of their pet's fecal matter from public areas (Ordinance Number 08-O-23AA). This was a response to concern about coliform bacteria reported in area waters. The pet owner is also required to remove waste from his or her property if it poses a threat to the health, safety or wellbeing of any animals or persons.

   In 2009 the City adopted a fertilizer use ordinance that sets forth specific management guidelines to minimize environmental effects. The ordinance requires training and licensing of applicators (Ordinance Number 08-O-72AA).

   The Think About Personal Pollution (TAPP) public information campaign is a broad effort to educate individuals on ways to keep community waters cleaner. The program is funded by a USEPA grant for nonpoint source management. www.tappwater.org

c) Franklin County — New and existing waterfront marinas must install Type III sewage pump-out facilities to safeguard the health of public waters. New marina facilities are required to prepare and comply with a FDEP approved monitoring program to assure that no water quality problems are linked with the marina.

d) Wakulla County — Wakulla County Ordinance 2010-06 requires performance-based septic systems for all new construction countywide where central sewer is not available. Existing septic tanks and package treatment plants are to discontinue service if central sewer is made available or be replaced with performance-based treatment systems when they fail or need modification. All septic systems are to be inspected every three years by a licensed contractor. In 2010 the County also adopted a fertilizer ordinance to improve water and habitat quality.

e) Sopchoppy — The City of Sopchoppy was awarded $5.1 million in American Recovery and Reinvestment Act (federal stimulus) funds from FDEP in 2009 for wastewater improvements. The city plans to develop a sanitary sewer collection system and connect to Wakulla County's wastewater treatment facility.